https://doi.org/10.15625/2615-8965/22620107

From Dictionary to Digital Transformation: Toward an AI-Assisted English-English-Vietnamese Medical Dictionary for Medical Education in Vietnam

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ABSTRACT: *In the context of ongoing educational reform in Vietnam, there is increasing emphasis on sustainability, internationalization, and digital transformation in language education. For medical students, English proficiency is essential for accessing global knowledge, engaging in research, and participating in professional communication. However, existing resources such as printed bilingual dictionaries and static glossaries remain insufficient, as they often lack contextual accuracy, pronunciation support, and learner-friendly explanations. This study adopts an exploratory cross-sectional design to investigate medical students' needs and perceptions regarding English medical terminology and to inform the conceptual development of an AI-assisted English-English-Vietnamese (EEV) medical dictionary. Data was collected from 235 second-year medical students at the University of Medicine and Pharmacy at Ho Chi Minh City using a structured questionnaire. The findings indicate a high frequency of dictionary use alongside substantial difficulties related to unclear definitions, unreliable sources, and fragmented learning processes. Students expressed strong demand for simplified definitions, IPA-based pronunciation, and contextualized usage examples. Based on these findings, the study conceptually proposes a chatbot-based EEV medical dictionary that would integrate AI-generated content with human validation. While the proposed tool is not empirically evaluated in this study, it should be regarded as a preliminary conceptual direction rather than a validated educational intervention. Therefore, claims regarding educational effectiveness, institutional value, and broader applicability remain tentative and require future empirical investigation. The study provides preliminary learner-centered insights and suggests possible directions for the future development and empirical evaluation of AI-assisted language resources in medical education.*

KEYWORDS: **AI-assisted dictionary, English-English-Vietnamese, medical education, ESP, digital learning.**

➔ Received 9/9/2025 ➔ Revised manuscript received 17/3/2026 ➔ Published 16/9/2026.

1. Introduction

English proficiency is increasingly critical in Vietnamese higher education, particularly in the medical field where students must access international literature, publish research, and communicate in clinical environments. Yet, language learning remains a barrier for many. Existing bilingual dictionaries and glossaries are often insufficient for medical learners, offering inconsistent definitions and limited contextual guidance. This challenge undermines both comprehension and participation in English-medium Instruction (EMI) programs, which are expanding in Vietnam as part of broader internationalization efforts.

However, there is still limited learner-centered evidence on how Vietnamese medical students use and perceive specialized dictionary resources, particularly in relation to their actual learning needs and difficulties. Therefore, this exploratory study aims to investigate students' needs and perceptions in order to inform the conceptual development of an AI-assisted English–English–Vietnamese medical dictionary. It also seeks to provide preliminary learner-centered insights that may inform future prototype development and

empirical evaluation within comparable medical education contexts in Vietnam. In response to these challenges, carefully designed technology-supported resources may provide useful support for medical English learning. The Vietnamese government has emphasized sustainability, digital transformation, and internationalization in its education policy framework (Government of Vietnam, 2022).

Vietnam's higher education institutions are under pressure to modernize language education in line with global trends. For medical students, English proficiency is not merely a linguistic skill but a professional necessity, enabling access to international research, collaboration, and clinical practice. However, the fragmented availability of specialized resources and the lack of standardized bilingual references hinder effective learning. To address this gap, the present study is guided by the following research questions:

1. What difficulties do Vietnamese medical students experience when learning and searching for English medical terminology?

2. What features and functions do students expect from an English–English–Vietnamese medical dictionary?

3. How can these learner needs inform the conceptual development of an AI-assisted medical dictionary for medical education in Vietnam?

As the study is based on a descriptive needs-analysis survey conducted within a single institutional setting, the findings are intended to inform conceptual development rather than establish educational effectiveness or broader generalizability.

These questions are interpreted through the combined perspectives of English for Specific Purposes, Computer-Assisted Language Learning, and technology acceptance, which together help explain the relationship among learner needs, digital tool design, and perceived usefulness.

2. Literature review

2.1. AI, LLMs, and the future of dictionaries

Recent research argues that large language models (LLMs) are reshaping dictionary work. They can generate candidate definitions, examples, and sense distinctions on demand, but they also raise issues of reliability, bias, and provenance that require human curation. Three classic dictionary use cases, namely reception, production, and translation, are often used to illustrate where AI can support lexicographic work and where it risks replacing rather than augmenting human expertise.

Comparative studies in the *International Journal of Lexicography* test AI outputs directly against learners' dictionaries. One study finds AI-generated definitions can rival Macmillan for resolving "vocabulary doubts," while another compares ChatGPT with LDOCE for learner support, which can be useful but remains uneven in quality, thereby reinforcing the case for hybrid models that retain expert editorial control (Rees, 2023; Ptasznik et al., 2024).

The literature emphasizes that lexicography should be AI-assisted rather than fully automated, highlighting the need to balance computational efficiency with human expertise. This perspective informs the design of the proposed EEV dictionary model, where large language models generate draft definitions, collocations, and examples, and human editors verify terminology, ensure consistency, and secure cultural and disciplinary relevance. Such an approach may potentially respond to some limitations of traditional resources while supporting more sustainable, internationally aligned, and digitally integrated medical language education in Vietnam.

These insights support the need for a human-validated, AI-supported dictionary model.

2.2. AI and Chatbots in medical education

Medical education has increasingly explored the use of chatbots to support writing, clinical reasoning, and exam preparation. Controlled studies indicate that large language models (LLMs) can enhance English academic writing for medical students, particularly those working in a second language. At the same time, "accuracy" studies remind us that model performance varies and thus requires careful oversight (Gilson et al., 2023).

Student perspectives further illustrate this

balance of opportunity and caution. Surveys of undergraduates report generally positive attitudes toward using ChatGPT as a study aid, while also highlighting concerns about errors and ethical implications. These findings suggest that institutions should provide guidance and safeguards rather than imposing outright bans. Earlier work on "chatbots for future doctors" reached a similar conclusion, viewing conversational AI as a complementary tool for training.

Building on these insights, the idea of the proposed AI-supported dictionary embedded in a chatbot resonates with current trends in medical education. Such a resource would not only extend chatbot applications into specialized language learning but also address concerns raised in prior research by ensuring transparency of sources, applying systematic quality checks, and setting clear boundaries for clinical use.

These findings suggest that an AI-supported dictionary platform could extend AI applications into medical language learning.

2.3. Medical bilingual and trilingual lexicographic resources

Vietnamese–English medical dictionaries and glossaries can be found in libraries and institutional collections, but most remain static, oriented toward printed formats, or resemble general phrase books rather than specialized learning tools. While these resources provide basic translation support, they seldom include interactive functions, pronunciation features, or integration into classroom practice. However, these elements are increasingly important for effective medical language learning.

These limitations point to the need for a new approach. The proposed EEV resource could respond to this gap by offering accurate definitions, reliable Vietnamese equivalents, IPA-based pronunciation, and contextualized usage examples relevant to clinical communication. Developed with higher education in mind, such a resource would not only strengthen existing materials but also support ongoing efforts to integrate digital tools into medical education.

These limitations reinforce the need for a more interactive and learner-centered dictionary model.

2.4. Internationalization and English-medium instruction (EMI) in Vietnam's medical programs

Vietnam's push for internationalization increasingly takes the form of English-medium Instruction (EMI), with several universities launching medical programs. Research on these initiatives underscores both their promise and their challenges. While EMI expands access and global visibility, it also exposes the need for standardized, comprehensible medical English and stronger language support mechanisms to sustain academic quality and student satisfaction.

Against this backdrop, the proposed dictionary model may potentially serve as a supportive resource. By harmonizing terminology across languages and providing clear, context-appropriate explanations, such a tool would ease cross-lingual comprehension for Vietnamese and international students alike. In doing so, it directly supports the success of EMI in medical education and strengthens Vietnam's broader strategy of integrating into the global academic community.

In this context, a standardized English–English–Vietnamese dictionary can serve as a useful support tool for effective EMI implementation.

2.5. Digital transformation policy context in Vietnam

Digital transformation has become a central priority in Vietnam's higher education agenda. Decision No. 131/QĐ-TTg (January 25, 2022) formally approved a scheme to accelerate the use of information technology and digital tools in education for the period 2022–2025, with a vision toward 2030, emphasizing learners and teachers as the core beneficiaries. Complementing this, the national program 749/QĐ-TTg (2020) sets broader cross-sector digitalization goals through 2025 and 2030. Recent policy analyses show how higher education institutions are gradually operationalizing these directives, often by combining digital platforms and rethinking the learning ecosystem.

Within this policy environment, the proposed AI-supported platform aligns closely with national priorities. As a simple chatbot application, it may offer a low-friction resource that could potentially be accessed by students and teachers. Moreover, its design allows seamless integration with learning management systems and E-learning platforms, thereby supporting the digital-first direction set by Vietnam's education policy.

Accordingly, the development of this tool aligns with these policy directions while providing a practical, learner-oriented application.

2.6. Sustainability and open educational resources (OER) in language education

Building on Vietnam's digital-first policy priorities, sustainability has also become a guiding concern in rethinking how language resources are developed and shared. Recent discussions increasingly emphasize the role of Open Educational Resources (OER) as a means to lower cost barriers, encourage adaptation and translation, and broaden equitable access to learning materials. Reviews in *Frontiers in Education* and *Sustainability* highlight how OER adoption and co-creation can make language learning both environmentally sustainable through reuse and reduced duplication and socially fair, by offering free and adaptable resources. UNESCO further underscores the value of OER in promoting inclusion, collaboration, and lifelong learning opportunities across educational systems.

From this perspective, positioning the proposed EEV dictionary as an open or semi-open resource could enhance its sustainability impact. For example, allowing open entries or teacher-contributed examples would not only reduce financial barriers for students, particularly in public universities, but also create opportunities for ongoing co-development. In this way, the dictionary may illustrate both pedagogical and economic sustainability while aligning with global recommendations for inclusive and resilient educational practices.

Positioning the proposed dictionary within an OER-oriented model may further enhance its accessibility, sustainability, and long-term impact.

To synthesize the reviewed literature, this study adopts a simple conceptual perspective. It highlights how learner needs, AI capabilities, and national policy priorities intersect to inform the design of the proposed medical dictionary.

2.7. An AI-assisted, sustainable, internationalized EEV dictionary for medical education

The reviewed literature converges on the need for a pragmatic and future-oriented model of digital lexicography for medical education. First, **AI-assisted lexicography** emerges as a promising approach, combining automated drafting with human editorial verification to ensure accuracy, consistency, and trustworthiness in specialized medical terminology (Rees, 2023).

Second, the literature emphasizes **alignment with medical education**. This involves embedding task-based examples, accurate pronunciation guides, and discourse patterns relevant to Objective Structured Clinical Examinations (OSCEs) and clinical ward communication (Gilson et al., 2023). By situating lexical resources within authentic medical contexts, the tool becomes more than a dictionary, functioning as a pedagogical bridge to clinical practice.

Third, **internationalization through English-medium instruction (EMI)** requires standardized terminology and bilingual scaffolding. Such features facilitate learning in diverse cohorts, particularly in programs where Vietnamese and international students study side by side. In this way, the dictionary may support not only language acquisition but also equitable participation in EMI classrooms.

Fourth, the model should demonstrate **compatibility with digital policy frameworks**. Accessible design, integration with learning management systems (LMS), and analytic features for curriculum enhancement can support both usability and institutional adoption.

Finally, the principle of **sustainability** is underscored through open educational resources (OER). Community contributions, localizable examples, and faculty curation can keep the

dictionary dynamic while reducing costs, thus ensuring long-term viability.

Despite these insights, the literature leaves several **gaps and researchable questions**. First, the question of **effectiveness** remains: "*To what extent does an AI-enhanced E–E–V dictionary improve medical students' terminology retention, reading fluency, or OSCE communication compared with conventional bilingual tools?"* Addressing this requires rigorous randomized or quasi-experimental studies (Rees, 2023). Second, the issue of **quality and safety** is critical. Future work must identify the most reliable editorial workflows to mitigate hallucinations and errors in high-stakes medical terminology, particularly through human-in-the-loop evaluation.

Third, the **equity and access** dimension calls for investigation: "*How might an OER-based deployment influence outcomes for students from under-resourced backgrounds, and what is the cost-benefit balance when combined with usage analytics*?"

Finally, **EMI outcomes** merit exploration. Case studies should determine whether EMI cohorts using such tools achieve greater mastery of medical terminology and improved academic writing performance.

In summary, the synthesis highlights a strong theoretical foundation for developing an AI-supported EEV dictionary in medical education, while simultaneously outlining clear empirical directions for future inquiry.

2.8. Limitations of current dictionary and translation tools in medical English learning

Although English is increasingly important in medical and healthcare education, the resources currently available to Vietnamese learners remain inadequate. Most students continue to rely on printed dictionaries, simple bilingual glossaries, or online translation tools, yet these are not designed to meet the specialized demands of medical study. The limitations of such resources manifest in several persistent challenges.

First, many definitions are either inconsistent or overly technical for learners. Dictionaries often provide explanations written for native English speakers or advanced researchers, with complex linguistic or scientific jargon. As a result, first-year and second-year students frequently encounter terminology that exceeds their comprehension level and feel overwhelmed rather than supported. Rees and Lew (2024) emphasize that learners require contextualized and simplified definitions, as isolated technical entries fail to support actual understanding.

Second, Vietnamese equivalents are often absent or inaccurate. Even when translations are provided, they tend to be literal and may not correspond to how terms are actually used in Vietnamese medical classrooms, hospitals, or research publications. This inconsistency leaves students uncertain about which translation is correct or professionally accepted. Terminology inconsistency is widely recognized as a major barrier to effective English-medium Instruction (EMI) in Vietnam, particularly in medical contexts where precision is essential.

Third, the process of consulting multiple resources can waste valuable study time. Learners often move between printed dictionaries, online tools, and class materials before reaching a working understanding of a single term. This fragmented process interrupts concentration and reduces study efficiency. Such inefficiencies may undermine the primary function of dictionaries, which is to serve as direct, user-centered aids.

Finally, existing resources rarely integrate features that connect pronunciation, context, and academic relevance. Students may know the theoretical meaning of a word, but they remain uncertain about how to pronounce it accurately, how to apply it in a sentence, or how it functions in professional communication. For medical students, this gap is particularly problematic, since correct pronunciation and contextual usage of terms such as *hypertension*, *ischemia*, or *myocardial infarction* are important for both patient safety and academic credibility.

Taken together, these limitations lead to lower comprehension, reduced confidence, and diminished willingness to engage in English-medium environments. Students hesitate to use terminology actively in writing, presentations, or clinical simulations. More importantly, they encounter barriers to international engagement,

including difficulty in accessing global literature, publishing research, and collaborating with foreign peers. Without an integrated, bilingual, and context-sensitive resource, Vietnamese healthcare students remain at a disadvantage in both their local studies and in their participation in the global medical community (Rees, 2023).

2.9. Theoretical framework

This study is informed by three complementary theoretical perspectives. First, English for Specific Purposes (ESP) emphasizes the importance of discipline-specific language tailored to learners' academic and professional needs. In medical education, this involves not only terminology acquisition but also the ability to use language appropriately in clinical and academic contexts.

Second, Computer-Assisted Language Learning (CALL) highlights the role of digital technologies in supporting language acquisition. CALL research suggests that interactive and learner-centered tools can enhance engagement, accessibility, and learning efficiency.

Third, technology adoption theories, particularly the Technology Acceptance Model (TAM), suggest that users' willingness to adopt new technologies is influenced by perceived usefulness and ease of use. The high level of student interest observed in this study reflects these factors and supports the feasibility of integrating AI-based tools into medical English learning. From a Technology Acceptance Model (TAM) perspective, the emphasis on accessibility and usability reflects students' perceived ease of use, while features such as contextualized examples and pronunciation support correspond to perceived usefulness.

Together, these frameworks provide a conceptual basis for interpreting the findings and guiding the design of the proposed AI-assisted EEV medical dictionary.

3. Methodology

This study employed a cross-sectional survey design to investigate the needs and perceptions of medical students regarding the development of a digital EEV medical dictionary. The target population comprised second-year students enrolled at the University of Medicine and Pharmacy in Ho Chi Minh City. A total of 235 students from the School of Medicine voluntarily participated. Participation was anonymous, and no identifying information was collected to ensure confidentiality.

Data was collected through a structured questionnaire developed specifically for this study. The questionnaire was developed based on a review of prior literature on ESP learning needs, learner dictionary use, and AI-assisted language learning, and was adapted to the context of medical English learning. The design rationale was to identify students' practical difficulties, usage patterns, perceived needs, and preferred features for a potential English–English–Vietnamese medical dictionary rather than to measure psychological constructs or causal relationships. A small pilot was conducted with a small subset of second-year medical students to assess item clarity, wording appropriateness, and contextual relevance. Based on pilot feedback, minor revisions were made to improve wording clarity and reduce potential ambiguity in several items. However, formal psychometric validation or reliability testing (e.g., Cronbach's alpha) was not conducted, which should be acknowledged as a methodological limitation. Accordingly, the findings should be interpreted as exploratory and descriptive rather than confirmatory. The questionnaire was primarily intended to identify general learner perceptions and practical needs rather than to measure latent psychological constructs. The instrument consisted of twelve items, including both closed-ended and open-ended questions. Closed-ended items used categorical or Likert-type scales (e.g., frequency of lookup, level of difficulty, perceived usefulness), while the final item invited participants to provide suggestions on prioritizing specific medical specialties (e.g., cardiology, gastroenterology, neurology) for future development.

The first set of questions focused on students' learning practices and challenges, beginning with how often they look up English medical terms

(Q1) and how difficult they find this process (Q2). To gain deeper insight, students were also asked about the common problems they face when consulting available resources, such as unreliable sources or unclear definitions (Q3). Building on this, the survey examined students' perception of necessity by asking how essential they considered an English–English–Vietnamese medical dictionary for their studies (Q4). The next group of questions turned to desired features and needs. Students identified which dictionary functions were most important, including English definitions, pronunciation, example sentences, or images (Q5), and reported how often they encountered difficulties with existing resources when searching for specialized terms (Q6). To further evaluate perceived value, the questionnaire asked about the importance of having a dedicated medical dictionary (Q7) and the types of content students would prefer, such as simplified definitions, illustrative examples, IPA transcription, or images (Q8). In addition, students were asked which device they would most likely use to access the dictionary, either a computer or a smartphone, to better understand accessibility preferences (Q9). The next items assessed usefulness and institutional benefits. Students evaluated how helpful such a resource would be for both their current studies and future professional work (Q10) and whether they agreed that hosting the dictionary on the Faculty's website would enhance learning and research (Q11). Finally, to capture forward-looking perspectives, students were invited to suggest which medical fields or topics, such as cardiology, gastroenterology, or neurology, should be prioritized in the dictionary's future development (Q12).

The estimated completion time was five to seven minutes, allowing the instrument to be administered during class sessions or distributed online. Responses were compiled and analyzed descriptively to identify patterns in students' needs, challenges, and expectations for an AI-supported medical dictionary. The analytical focus of the study was exploratory and interpretive rather than predictive or causal.

As the study relies on self-reported data, the findings may be subject to response bias. Future research could strengthen validity by triangulating survey results with performance-based measures or usage data from digital platforms.

Accordingly, this study adopts an exploratory approach and is intended to provide initial insights rather than definitive conclusions.

Despite these strengths, several limitations should be acknowledged. The questionnaire did not undergo formal reliability testing (e.g., Cronbach's alpha), which may affect the consistency of the instrument. In addition, a convenience sampling method was employed, which may limit the generalizability of the findings beyond this specific cohort. Accordingly, the findings should not be generalized beyond similar educational contexts without further empirical investigation.

Given the exploratory nature of the study and the descriptive purpose of the questionnaire, descriptive statistics were considered appropriate for identifying general trends in learner perceptions and needs at this stage. However, future studies may incorporate inferential analysis to examine relationships between variables and provide deeper analytical insights.

Responses to the open-ended question (Q12) were reviewed and grouped through a brief inductive thematic approach, in which recurring themes and frequently mentioned medical specialties were identified and categorized. The analysis revealed that students prioritized specialties such as cardiology, gastroenterology, and neurology. Many respondents also emphasized the importance of simplified explanations and clinically relevant examples.

4. Results

The results are organized around key themes, including students' use of medical terminology, challenges in accessing resources, and expectations for a dedicated medical dictionary. Overall, the findings suggest considerable demand for a reliable, accessible, and learner-centered tool.

Table 1. Results of 11 closed-ended questions from UMP's 235 Medical students

Questions	Results
1. Frequency of use **"***How often do you look up English medical terminology?"*	Frequently: 121 (51%) Sometimes: 104 (44%) Rarely/Never: 10 (4%)
2. Level of difficulty **"***How difficult do you find it to search for English health-related terminology?"*	Very difficult: 42 (18%) Difficult: 117 (50%) Normal: 64 (27%) Easy: 12 (5%)
3. Common difficulties **"***Which of the following problems do you encounter when looking up medical terms?"*	Unclear definitions: 82 (34.9%) Unreliable sources: 70 (29.8%) Incomplete information: 56 (23.8%) Other: 27 (11.5%)
4. Perceived necessity **"***How necessary is an English–English–Vietnamese medical dictionary for your study?"*	Very necessary: 181 (77%) Necessary: 54 (23%) Not necessary: 0
5. Desired features **"***Which features are most important to you?"*	English definitions: 210 (89%) Pronunciation: 186 (79%) Example sentences: 174 (74%) Images: 98 (42%)
6. Awareness and needs **"***How often do you experience difficulties with existing resources when searching for specialized terms?"*	Very often: 52 (22%) Often: 102 (43%) Sometimes: 63 (27%) Rarely: 18 (8%) Never: 0
7. Importance of specialized dictionary **"***How important do you think a dedicated medical dictionary is for your study?"*	Very important: 176 (75%) Important: 56 (24%) Not important: 3 (1%)
8. Content expectations **"***Which of the following elements would you prefer?"*	Simplified definitions: 196 (83%) IPA transcription: 182 (77%) Illustrative examples: 169 (72%) Word forms: 143 (61%) Images: 102 (43%)
9. Accessibility **"***Which device would you primarily use to access the dictionary?"*	Smartphone: 129 (55%) Laptop/desktop: 70 (30%) Tablet: 36 (15%)
10. Perceived usefulness **"***How useful would the dictionary be for your study and future work?"*	Very useful: 154 (65%) Useful: 75 (32%) Neutral: 6 (3%) Not useful: 0
11. Agreement on institutional value **"***Do you agree that hosting such a dictionary on the Faculty's website would promote learning and research?"*	Strongly agree: 142 (60%) Agree: 79 (34%) Neutral: 14 (6%) Disagree: 0

The following findings present a detailed overview of students' responses, highlighting both quantitative trends and qualitative insights that emerged from the survey. Overall, the findings reveal a consistent pattern in which students frequently rely on dictionaries while simultaneously expressing dissatisfaction with the clarity, reliability, and contextual relevance of existing resources. This trend suggests that currently available tools may not adequately address the specialized learning needs of medical students.

Question 1. Frequency of use

Most students reported frequent or occasional use of dictionaries for medical terminology, while only a small proportion indicated limited use.

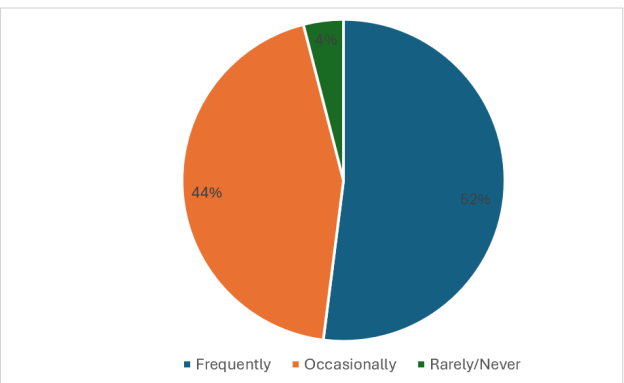


Figure 1. Frequency of use

Question 2. Level of difficulty

Many students reported that searching for English medical terminology was difficult, with only a small minority finding it easy.

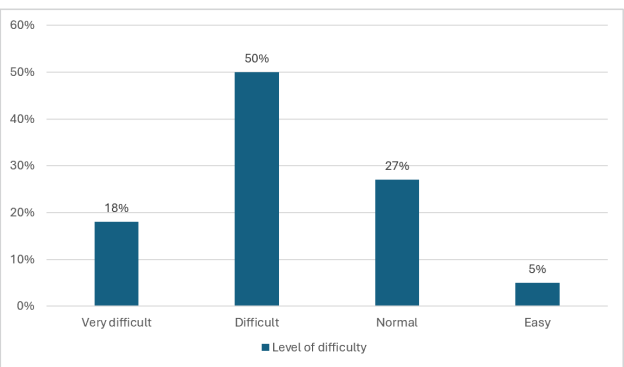


Figure 2. Level of difficulty

Question 3. Common difficulties

The most commonly reported challenges included unclear definitions, unreliable sources, and incomplete information.

Question 4. Perceived necessity

Nearly all respondents considered an English–English–Vietnamese medical dictionary necessary for their studies.

Question 5. Desired features

Students consistently prioritized English definitions, pronunciation support, and contextualized examples, suggesting a preference for resources that combine clarity, usability, and practical application.

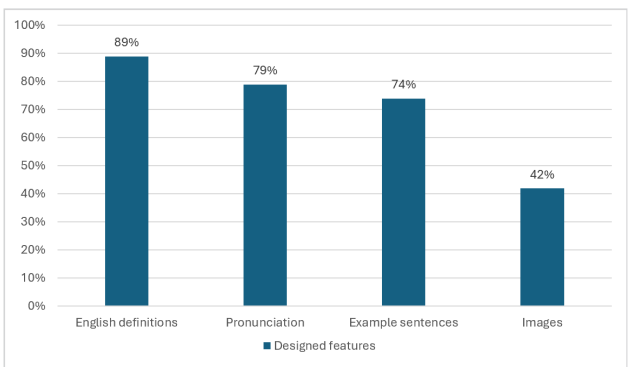


Figure 3. Desired features

Question 6. Awareness and needs

Difficulties with existing resources were commonly reported, indicating that current tools do not fully meet students' needs.

Question 7. Importance of a specialized dictionary

Most students regarded a specialized medical dictionary as important for their learning.

Question 8. Content expectations

When asked about preferred content elements, most respondents favored simplified definitions, IPA transcription, and illustrative examples, while word forms and images were also appreciated. These findings suggest that students value tools that combine clarity, phonological guidance, and contextual application.

Question 9. Accessibility

The preference for smartphones suggests that accessibility and mobile compatibility may play an important role in students' engagement with digital learning resources.

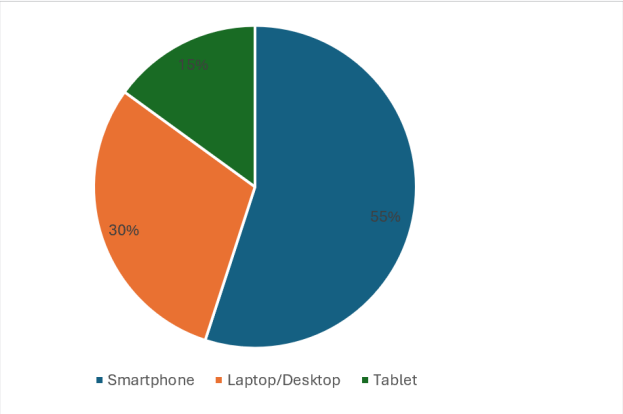


Figure 4. Accessibility

Question 10. Perceived usefulness

Most students perceived the dictionary as useful for both academic study and future professional practice.

Question 11. Agreement on institutional value

Students generally supported the institutional integration of such a resource, reflecting positive perceptions regarding its potential usefulness for both individual learning and broader academic support.

Question 12. Content suggestions

Taken together, the findings suggest considerable learner interest in a specialized, accessible, and context-sensitive medical dictionary that integrates clarity, reliability, and practical usability. However, these findings reflect self-reported perceptions and should not be interpreted as evidence of educational effectiveness.

5. Discussions

The findings suggest a potential mismatch between students' reported needs and the capabilities of existing dictionary resources. The high proportion of students reporting difficulty in accessing medical terminology suggests that current tools are not adequately designed for specialized learning contexts, which aligns with previous research indicating that general-purpose dictionaries often fail to address domain-specific language needs.

Furthermore, students' strong preference for simplified definitions and contextualized examples reflects the importance of cognitive accessibility in ESP learning. Rather than highly technical explanations, learners require definitions that are accurate yet comprehensible at their level, supporting ESP principles that emphasize learner-centered adaptation. The preference for mobile access also highlights the importance of integrating language resources into students' daily learning practices, suggesting that students perceive accessibility and usability as important considerations when engaging with digital learning resources (Otto, 2022).

The findings of this study suggest that medical students at the University of Medicine and Pharmacy face persistent challenges in accessing and applying English medical terminology. The survey of 235 second-year students indicates that the majority frequently consult dictionaries yet remain dissatisfied with existing resources due to unclear definitions, unreliable sources, and incomplete information. These findings are consistent with prior research on the limitations of traditional dictionary resources in specialized contexts.

However, these findings are based on self-reported perceptions and may not fully reflect actual language performance or learning outcomes.

The strong consensus that a specialized dictionary is both necessary and useful provides further justification for the proposed dictionary model. The preference for mobile devices highlights the importance of designing resources that are compatible with students' daily study habits, which aligns with prior research emphasizing accessibility and learner-centered design in digital learning environments (Otto, 2022).

In line with previous research highlighting terminology inconsistency as a barrier to effective English-medium instruction, this study suggests the need for a standardized, context-sensitive bilingual dictionary. By incorporating Vietnamese equivalents adapted to professional usage, the tool may support comprehension and learners' confidence in both academic and clinical settings.

The integration of AI-driven features,

including interactive queries, IPA pronunciation, and contextualized examples, responds directly to students' expressed needs. de Schryver (2023) argues that AI lexicography should prioritize user-centered design, and the survey evidence here supports that claim. Importantly, while students expressed enthusiasm for AI-assisted tools, concerns about accuracy in AI-generated outputs remain evident, highlighting the continued necessity of human oversight and expert curation.

As the study relied on descriptive survey data collected within a single institutional context, the findings should be interpreted as exploratory and indicative rather than as evidence of actual educational impact or implementation success. The proposed AI dictionary model should therefore be interpreted as a design implication derived from needs analysis rather than an empirically validated intervention. At its current stage, the proposed model should be viewed as a conceptual and design-oriented framework rather than a fully operational educational technology solution.

This study also situates the proposed AI dictionary within broader educational reform. It may help reduce reliance on imported resources while supporting longer-term accessibility. It may also support greater consistency in medical terminology across languages and integrates AI into daily learning practices, contributing to technology integration in education (Government of Vietnam, 2022).

Nevertheless, this study has several limitations. The survey was conducted with a single cohort of second-year medical students at one institution, which may limit the generalizability of the findings. Future research should include a wider range of health science disciplines and multiple institutions to improve broader applicability. In addition, longitudinal studies are needed to evaluate the potential impact of the dictionary on students' learning outcomes and professional readiness. Future research should also incorporate prototype development, usability testing, and empirical evaluation of learning outcomes in authentic educational settings.

5.1. Conceptual design implications for an AI-assisted medical dictionary

To respond to the limitations identified in current lexical resources, this study outlines a conceptual design direction for an AI-assisted English–English–Vietnamese (EEV) Medical Dictionary, informed by the needs analysis presented above. Conceptually, such a resource may function not only as a reference source but also as a potentially supportive learning aid tailored to the linguistic and professional needs reported by healthcare students in Vietnam.

One intended feature of the proposed conceptual model involves the integration of artificial intelligence and natural language processing (NLP) to generate learner-friendly definitions, examples, and collocations, subject to human validation and editorial review. AI can supplement traditional lexicographic practices by providing rapid, contextualized definitions, although careful human verification remains necessary to ensure reliability. By combining AI-generated content with expert review, if developed and empirically evaluated, such a resource may potentially improve accessibility and contextual support while still requiring human oversight for accuracy and consistency.

The second feature is the provision of bilingual and context-sensitive support. Existing bilingual dictionaries often provide literal translations without accounting for professional usage. In contrast, the proposed dictionary could include Vietnamese equivalents that reflect authentic medical discourse. In English-medium Instruction (EMI) programs, students may struggle when terminology is not standardized or when Vietnamese equivalents are inconsistent. A trilingual approach, in which English definitions are paired with clear Vietnamese equivalents and contextual examples, may help address this gap.

Third, the dictionary incorporates pronunciation guides and usage examples. Rees and Lew (2024) found that learners may benefit from improved contextual understanding and pronunciation support when dictionaries integrate phonetic transcription and authentic usage contexts, rather than providing definitions in isolation. For medical students,

this feature is especially valuable, as accurate pronunciation of terms such as *hypertension* or *myocardial infarction* is crucial for professional communication.

Finally, the digital format supports sustainability, internationalization, and digital transformation, the three pillars of current Vietnamese education reform. As an open-access, continuously updated tool, the dictionary may help reduce reliance on expensive imported materials, contributing to sustainability (Otto, 2022). By standardizing English medical terminology, it may help prepare students for international collaboration and publication, thus supporting internationalization. Furthermore, its integration into a chatbot platform suggests how AI can serve as a practical tool for digital transformation in higher education (Government of Vietnam, 2022).

In conclusion, the proposed AI EEV Medical Dictionary should be understood as a design proposal rather than a fully validated solution.

5.2. Proposed features of the conceptual AI-assisted EEV medical dictionary

Based on learner responses, several proposed features may be considered in the future development of an AI-assisted EEV medical dictionary.

5.2.1. Accurate English definitions contextualized for medical use

Instead of generic or overly technical definitions, the proposed resource may provide learner-friendly explanations written in clear academic English. This approach reflects findings from Rees and Lew (2024), who emphasize that contextualized definitions improve learner comprehension compared to isolated dictionary entries.

5.2.2. Reliable Vietnamese translations adapted to professional contexts

Current bilingual glossaries often fail to match the terminology used in Vietnamese hospitals and classrooms. The proposed dictionary could include curated equivalents aligned with local practice, which may help reduce confusion and support professional accuracy.

5.2.3. IPA-based pronunciation guides for oral accuracy

Clear pronunciation is critical in medicine, where mispronouncing terms such as *ischemia* or *hypertension* can lead to miscommunication. If integrated with International Phonetic Alphabet (IPA) guidance, the proposed resource may align with recommendations from learner dictionary studies that highlight the role of phonological support in boosting learner confidence.

5.2.4. Practical usage examples drawn from healthcare communication and research

Authentic examples could be incorporated to illustrate term use in patient interactions, academic writing, and clinical guidelines. Such contextualization reflects de Schryver's (2023) argument that AI-enhanced lexicography should prioritize user needs by embedding terms in real discourse situations.

5.2.5. Interactive functions for personalized learning

Unlike static glossaries, the chatbot-based design may enable learners to request simplified definitions, compare related terms, or practice usage through short exercises. Studies suggest that students value chat-based AI tools for their interactivity, despite concerns about accuracy, highlighting the importance of combining human oversight with AI responsiveness.

5.3. Accessibility and usability

A potential advantage of such a platform may lie in its accessibility. If developed, students could potentially access the resource on mobile devices or desktop computers without substantial technical setup, thereby supporting learning both in classrooms and during self-study. This is consistent with Otto and Kerres's (2022) perspective that sustainable digital tools must minimize barriers of cost and complexity, thereby widening participation and access.

5.4. The Proposed EEV dictionary for sustainable language education in Vietnam

Conceptually, the proposed dictionary model may align with broader language education reforms in Vietnam, which emphasize the three

pillars of sustainability, internationalization, and digital transformation (Government of Vietnam, 2022). As an open and continuously updated resource, it may help reduce dependence on imported textbooks and reference materials, thereby contributing to sustainability. By standardizing bilingual terminology, it may enhance internationalization in English-medium Instruction (EMI) programs, where inconsistent term use remains a challenge. Finally, by integrating AI-assisted tools directly into student learning practices, it may illustrate one possible direction for implementing digital transformation in language education practice.

5.4.1. Sustainability

If developed as an AI-assisted, continuously updated, and low-cost resource, the proposed dictionary may help reduce dependence on imported printed materials, many of which quickly become outdated or inaccessible. This approach reflects Otto and Kerres's (2022) argument that open and renewable digital tools can enhance sustainability in higher education by lowering barriers to access and ensuring long-term availability.

5.4.2. Internationalization

By providing more standardized medical terminology, the proposed resource could support students' engagement with global literature, English-medium Instruction (EMI), and international academic communication. Terminology consistency is widely recognized as critical for success in EMI contexts, particularly in medical education where ambiguity in translation can impede both learning and clinical practice.

5.4.3. Digital transformation

Integrating AI-assisted dictionaries into daily study habits aligns with the Vietnamese government's National Plan on Digital Transformation in Education (Decision 131/QĐ-TTg, 2022). AI-assisted lexicography reflects a shift in how learners engage with vocabulary, offering interactivity, personalization, and contextualization beyond what static resources typically provide. By encouraging engagement with AI-assisted learning resources, the proposed model may offer one possible avenue for supporting digital literacy in medical education although this potential requires future empirical investigation.

6. Conclusions and recommendations

The proposed AI-assisted English–English–Vietnamese Medical Dictionary represents a conceptual direction for exploring how digital tools may support responses to linguistic challenges in Vietnamese medical education. By addressing problems of inconsistency, accessibility, and contextualization, if developed and empirically evaluated, the proposed tool may potentially support learners by improving access to reliable terminology, pronunciation guidance, and contextualized examples. At the same time, it is intended to reflect the principles of sustainability, internationalization, and digital transformation.

The findings of this exploratory study provide preliminary learner-centered insights suggesting that the integration of AI assistance with human expertise may represent one possible direction for future medical lexicographic development. The proposed approach may offer a context-sensitive conceptual direction that aligns with broader discussions on sustainable and locally responsive educational technology in Vietnam. By addressing learners' needs for clarity, accessibility, and contextualization, the EEV Medical Dictionary may support students' ability to engage with international academic and professional communities.

As an exploratory study conducted within a specific institutional context, these conclusions should be interpreted with caution. Accordingly, the proposed dictionary model should be interpreted as a conceptual direction for future development rather than as a fully validated educational intervention.

Recommendations

The EEV Medical Dictionary has multiple applications across the domains of teaching, learning, research, and healthcare practice.

- In terms of teaching, lecturers may consider integrating dictionary entries into lesson slides, ensuring consistent terminology across classrooms and reducing ambiguity in bilingual instruction. de Schryver (2023) notes that user-centered lexicography may support classroom effectiveness when examples and definitions are tailored to specific disciplines.
- In terms of learning, students may benefit from reduced reliance on fragmented searches and be able to focus more on comprehension, critical thinking, and bilingual communication. Recent studies suggest that medical students generally view chat-based AI tools positively for their efficiency and accessibility, although human oversight remains necessary to ensure accuracy.
- In terms of research, the dictionary may support accurate writing of scientific papers in English, helping early career researchers overcome linguistic barriers that often prevent publication in international journals. Rees and Lew (2024) demonstrate that learners perform better when dictionaries provide authentic examples of academic usage.
- In terms of healthcare practice, beyond academia, professionals may use the dictionary for cross-lingual consultation and communication in clinical contexts. This supports both patient safety and professional collaboration, key concerns in internationalized healthcare systems.

As an exploratory and concept-driven study, this research provides initial insights into learner needs rather than a fully validated solution. The proposed EEV dictionary represents a potential direction for improving medical English learning in Vietnam through greater accessibility, consistency, and contextualization.

Future research should focus on prototype implementation, usability testing, and empirical evaluation of the tool's potential impact on vocabulary acquisition, reading comprehension, and clinical communication. Expanding the study across institutions and disciplines will also be necessary to ensure broader applicability.

By examining learner perceptions within a specific educational context, this study contributes preliminary insights to ongoing discussions on the role of AI-assisted resources in language education and highlights the potential value of context-sensitive, learner-centered design in medical English learning.

7. Acknowledgements

The authors would like to thank the participating students at the University of Medicine and Pharmacy at Ho Chi Minh City for their time and valuable contributions to this study.

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