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Integrating Medical English into Vietnamese Medical Curricula: A Competency-Based and AI-Enhanced Approach

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ABSTRACT: *In the context of Vietnam's rapid higher education development and increasing global integration, the demand for specialized English instruction in the medical and healthcare sectors has grown significantly. However, there remains limited context-specific evidence on how Medical English can be systematically integrated into medical curricula. This paper explores the role of Medical English in developing sustainable language education strategies for medical students, with a focus on digital transformation and internationalization. Adopting a practice-informed conceptual approach supported by institutional data, the study draws on case-based evidence from a public medical university in southern Vietnam. The findings suggest that while the current curriculum provides a stable and coherent structure, further development is needed to enhance communicative competence in clinical contexts. In response, the paper proposes a competency-based, AI-enhanced framework for integrating Medical English into medical training, combining clinical content, interactive learning, and digital tools. The study contributes a context-sensitive model that may inform curriculum development in similar educational settings, while highlighting the need for further empirical research to evaluate the impact of AI-supported instruction on measurable learning outcomes.*

KEYWORDS: **Medical English, curriculum integration, AI-assisted language learning, healthcare communication, competency-based education, Vietnam**

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1. Introduction

English for Specific Purposes (ESP), particularly Medical English, has become an essential component in the training of healthcare professionals. In Vietnam, the ongoing modernization of the healthcare system and the expansion of international collaboration have significantly increased the demand for effective English communication in both clinical and academic settings. However, the incorporation of Medical English into medical curricula remains a persistent challenge, particularly in ensuring alignment between linguistic competence and clinical relevance.

In recent years, global trends in higher education have emphasized digital transformation, sustainability, and internationalization as key drivers of curriculum innovation. Within this context, Medical English education is expected not only to improve language proficiency but also to support students in developing communicative competence for real-world healthcare environments. Emerging technologies, especially artificial intelligence (AI), offer new opportunities to enhance language learning through personalized feedback, simulation-based practice, and interactive learning environments.

Despite these developments, there remains limited context-specific evidence on how Medical English can be systematically integrated into medical curricula in Vietnam. Existing studies tend to focus either on general ESP pedagogy or on the potential of digital tools, with relatively little attention to structured models that combine language learning, clinical communication, and technology-supported instruction in a coherent framework.

In response to the identified gap, this study explores the integration of Medical English

within a competency-based medical curriculum in a Vietnamese medical university. Specifically, the study seeks to address the following research questions:

(1) How is Medical English currently integrated into the medical curriculum?

(2) How do students perceive the effectiveness of Medical English instruction within this curriculum?

(3) What role may AI-supported approaches play in enhancing Medical English teaching and learning?

To address these questions, the study adopts a practice-informed and conceptual approach supported by institutional experience, longitudinal student feedback, and descriptive data. Rather than aiming to establish causal relationships, the study seeks to provide context-sensitive insights into curriculum implementation and potential directions for innovation in Medical English education.

2. Literature review

2.1. Digital transformation and AI innovation in global medical English

Medical English is a branch of English for Specific Purposes (ESP), designed to meet the specific linguistic needs of healthcare professionals. Hutchinson and Waters (1987) define ESP as language education tailored to learners' specific goals and disciplines, making it highly relevant to the context of medical training. Basturkmen (2010) further emphasizes that ESP instruction requires a close connection between subject-matter content and language use, which directly aligns with the demand for more context-driven Medical English education.

In recent years, digital learning tools have begun to reshape this landscape, enhancing both engagement and accessibility. Recent studies suggest that AI-assisted language learning tools can enhance learner autonomy and provide immediate feedback (Semerikov et al., 2021; Yu, 2021).

Beyond technology adoption, curriculum design remains a critical concern. As Dudley-Evans and St John (1998) argue, ESP is most effective when embedded within learners' subject-area coursework. In the Vietnamese context, however, integration efforts remain fragmented. Embedding ESP within subject-specific curricula has been shown to improve knowledge retention and application (Dudley-Evans & St John, 1998; Nguyen & Nguyen, 2020).

At the same time, the communicative dimension of medical training cannot be overlooked. According to Allum and McGarr (2008), clinical communication skills such as giving instructions, taking patient histories, and explaining procedures are indispensable for safe and effective practice. Consequently, Medical English curricula must reflect authentic professional interactions rather than abstract language drills.

This perspective aligns closely with the notion of sustainability in language education, which emphasizes embedding skills in meaningful, long-term contexts. Language education has also been linked to broader sustainability goals and global development priorities (Harding-Esch & Coleman, 2021).

Alongside sustainability, AI-assisted language learning (AILE) has emerged as a powerful driver of change. AI-assisted language learning has been shown to support personalized learning pathways and interactive engagement (Semerikov et al., 2021; Zhu, 2021). Extending this, Semerikov et al. (2021) identify four domains of AILE research: (1) language-specific applications, (2) comprehensive teaching models, (3) the emergence of a new ecology in language education, and (4) identification technologies such as voice or emotion recognition. These innovations suggest the potential of AI to enhance personalization, interactivity, and learner engagement. Nevertheless, the benefits of AI come hand in hand with certain limitations. Semerikov et al. (2021) caution that concerns such as data quality, lack of ethical safeguards, and transparency in data collection must be addressed. While these challenges are significant, AILE still holds substantial potential for transforming Medical English education,

offering adaptive learning, automated feedback, and immersive simulations.

Finally, internationalization adds another layer of urgency to these developments. According to the World Health Organization (WHO, 2020), the global mobility of healthcare professionals necessitates the use of a shared language—most often English. This underscores the importance of aligning Vietnamese medical curricula with global standards, particularly through the adoption of AI-driven solutions that enable scalable and context-sensitive instruction.

Taken together, the incorporation of AI into Medical English and ESP signals a transformative shift in how students acquire both linguistic and clinical competencies. While traditional approaches emphasized contextualized learning tailored to healthcare demands (Hutchinson & Waters, 1987; Basturkmen, 2010), the rise of digital and AI-driven tools has opened new pedagogical frontiers, especially relevant for low-resource settings such as Vietnam.

However, these studies tend to emphasize technological potential rather than concrete models for integrating Medical English into discipline-specific curricula.

2.2. AI in medical education and Vietnamese medical English contexts

In parallel, recent research has highlighted the growing role of artificial intelligence (AI) in medical education, particularly in areas such as assessment, simulation, and intelligent tutoring systems. AI-assisted tools have been increasingly used to support clinical communication training, generate practice materials, and provide adaptive feedback through interactive learning environments (Semerikov et al., 2021; Yu, 2021). These technologies enable more personalized and flexible learning experiences and offer opportunities for repeated practice in simulated clinical contexts.

Beyond assessment, AI-based learning applications have expanded to include intelligent virtual patient systems, real-time feedback platforms, and natural language processing tools that support the evaluation of clinical communication and reasoning. Such innovations contribute to narrowing the gap between theoretical knowledge and clinical practice, providing scalable and cost-effective solutions for medical education in diverse contexts (Semerikov et al., 2021).

Turning to the Vietnamese context, however, the application of AI in Medical English education remains at a relatively early stage. Initial efforts, including pilot implementations at the participating medical university, have introduced AI-powered tools such as ChatGPT to support role-play simulations and clinical vocabulary development. These practices align with broader perspectives on AI-assisted language learning, which emphasize its capacity to support learner autonomy, interactive engagement, and context-sensitive communication (Zhu, 2021).

From a sustainability perspective, Medical English education can be strengthened by embedding AI tools directly into clinical modules rather than treating language instruction as a separate component. Such integration may enhance long-term retention and improve the relevance of language learning to professional practice. In the Vietnamese context, research has also shown that embedding ESP within discipline-specific curricula contributes to improved knowledge application and learner engagement (Nguyen & Nguyen, 2020; Nghi & Nguyen, 2025).

Nevertheless, despite these promising developments, the systematic integration of AI into structured Medical English instruction remains underexplored, particularly in Vietnam. This gap highlights the need for context-sensitive models that combine language learning, clinical communication, and digital innovation within a coherent pedagogical framework.

2.3. Challenges of medical English integration in Vietnamese universities

2.3.1. Lack of a standardized curriculum

Although the role of English for Specific Purposes (ESP) in medical education has been

widely recognized (Hutchinson & Waters, 1987; Basturkmen, 2010), Medical English instruction in Vietnam remains fragmented and inconsistent. Many universities continue to rely on general English courses or short-term language modules, which provide limited preparation for clinical communication (Nguyen & Nguyen, 2020). These programs often lack a competency-based design and do not sufficiently embed language learning within professional contexts. As a result, students may acquire basic vocabulary and grammar knowledge but struggle to use English effectively in patient interactions, case presentations, or research-related tasks.

2.3.2. Resource and faculty limitations

Another key challenge is the shortage of qualified instructors who possess expertise in both English language teaching and medical knowledge. Effective Medical English instruction requires more than general linguistic competence; teachers must also be familiar with medical terminology and the communicative practices of healthcare (Dudley-Evans & St John, 1998). However, in many Vietnamese institutions, this dual expertise remains limited, which makes it difficult to design and deliver courses that meet learners' professional needs. As a result, instruction often relies on traditional approaches such as grammar-focused teaching, which have been shown to be less effective for developing clinical communication skills (Allum & McGarr, 2008).

2.3.3. Student engagement and language anxiety

Students also face challenges in engaging with Medical English. The demanding nature of medical training leaves limited time for additional language learning, and many learners report difficulties in using English confidently in professional contexts (Nguyen & Nguyen, 2020). In particular, speaking activities such as role-plays and clinical simulations may create anxiety, which can reduce participation and learning effectiveness. Recent research in Vietnam also suggests that motivation and perceived relevance play an important role in shaping students' engagement with Medical English learning (Nghi & Nguyen, 2025).

Furthermore, limited instructional time and a lack of context-based learning materials may hinder the development of fluency and communicative competence. Without sufficient opportunities for meaningful practice, students may find it difficult to apply English effectively in both local clinical settings and international professional environments.

Taken together, these challenges highlight the need for more integrated and scalable approaches that address curriculum design, resource constraints, and learner engagement simultaneously.

At the same time, they create opportunities to incorporate digital and AI-supported approaches, which may help address limitations in teaching resources and learner engagement.

2.4. Conceptual framework: Medical English for sustainable education

2.4.1. Competency-Based language teaching (CBLT)

Competency-Based Language Teaching (CBLT) provides a practical framework for integrating Medical English into medical curricula. Rather than emphasizing abstract grammar or isolated vocabulary lists, CBLT focuses on measurable outcomes that reflect the communicative tasks students are expected to perform in real-world clinical environments. In the context of medical education, this means preparing learners to conduct patient history taking, provide health education, read and interpret scientific literature, and produce clinical documentation. As Richards (2006) explains, CBLT emphasizes clearly defined competencies that allow learners to demonstrate mastery through authentic performance tasks. By aligning language learning with professional practices, CBLT ensures that students develop not only linguistic knowledge but also the ability to apply it effectively in medical contexts. This outcome-oriented approach helps bridge the gap between classroom instruction and workplace demands,

thereby enhancing both clinical readiness and academic performance.

2.4.2. Sustainable language education

Alongside competency, sustainability has become a guiding principle in the design of modern language curricula. Sustainable language education goes beyond short-term proficiency goals to emphasize continuity, adaptability, and inclusivity. As Tilbury (2019) argues, sustainability in education requires embedding long-term perspectives, intercultural awareness, and ethical engagement into curriculum design. For Medical English, this involves creating programs that remain relevant as medical practices evolve, while also supporting diverse student needs and learning trajectories. A sustainable curriculum integrates language development with professional and ethical competencies, equipping students to engage in lifelong learning and to function as responsible global citizens. In practice, this means embedding English within core medical modules rather than treating it as a stand-alone subject, ensuring that students see its relevance across their careers. Such an approach promotes deeper learning, stronger retention, and long-term applicability in both local and international healthcare settings.

Despite these developments, several gaps remain in the existing literature. First, much of the research focuses on general applications of AI and digital tools in education, with limited attention to their systematic integration into Medical English instruction. Second, although policy frameworks emphasize sustainability and internationalization, there is a lack of practical, context-specific models that translate these priorities into classroom implementation. Third, relatively few studies address how linguistic competence and clinical communication can be developed simultaneously through technology-supported approaches.

These gaps highlight the need for an integrated and context-sensitive model, which this paper seeks to propose.

Overall, the literature can be grouped into three main areas:

(1) ESP and Medical English pedagogy,

(2) digital and AI-assisted learning, and

(3) curriculum integration in local contexts.

However, there remains a lack of structured, context-specific models that systematically integrate Medical English into medical curricula using AI-supported approaches, particularly in Vietnam. This gap provides the basis for the present study.

3. Methodology

This research adopts a case study design to explore the integration of Medical English into a competency-based medical curriculum at a public medical university in southern Vietnam. The case study approach is appropriate for examining educational practices within their real institutional context, particularly when the aim is to understand how curriculum design, teaching practices, and quality assurance processes interact over time.

Rather than aiming to establish causal relationships, the study takes an evaluative and exploratory perspective. It focuses on three interconnected dimensions: (1) curriculum design, (2) teaching content and instructional approaches, and (3) quality assurance through student feedback and continuous improvement mechanisms.

The primary source of data for the evaluative component is the standardized Learner Survey Questionnaire on teaching quality, developed by the university's Quality Assurance Office (Form UMP-QA/QT.06/BM.01). The questionnaire consists of 17 items measured on a five-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree"), together with one open-ended question for additional comments. The five-point scale was selected because it allows respondents to express varying degrees of agreement while remaining practical and accessible for large-scale institutional surveys. It is administered annually to approximately 400 second-year medical students through the

university's digital education management system (PMT-EMS), resulting in consistently high response rates.

Quantitative data was analysed descriptively. Responses were aggregated as the percentage of students selecting "agree" or "strongly agree" for each item, allowing for the identification of general trends across the five-year period from 2020 to 2024. These percentages therefore reflect the proportion of students expressing positive agreement with each survey item. Qualitative responses from the open-ended question were analysed using a thematic approach. Student comments were reviewed repeatedly to identify recurring patterns related to course design, teaching practices, communicative activities, and perceived learning needs. Similar responses were grouped into preliminary categories and subsequently refined into broader themes to support interpretation of the quantitative findings.

The survey is part of the university's internal quality assurance process, and participation is integrated into routine course evaluation procedures. All responses were anonymized prior to analysis to ensure confidentiality.

The data presented in this study reflect student perceptions rather than direct measures of language proficiency or learning outcomes. Therefore, the findings are interpreted cautiously and are used primarily to provide insights into curriculum implementation and learner experience within the institutional context.

3.1. Curriculum design and context

At the participating medical university, Medical English is regarded as a vital part of the undergraduate medical program. The university offers two compulsory courses, Medical English 1 and Medical English 2, which are delivered in the first and second years of study. Each course carries four credits and is structured around CEFR-based learning outcomes. The aim is not only to enhance students' English proficiency but also to integrate language learning with medical training. Rather than being taught in isolation, Medical English is closely tied to clinical content, equipping students with the communication skills needed in their future practice as physicians.

This integration aligns with the university's broader medical education reform. In line with the guidelines of the Party and the State of Vietnam, and in response to society's demand for comprehensive educational reform, the Faculty of Medicine at the participating medical university launched a restructured medical curriculum in the 2016–2017 academic year. The program was designed around the physician competency standards issued by the Ministry of Health, together with the university's institutional learning outcomes. Implementation has been gradual, starting with the first-year cohort of 2016 and extending through the six-year training cycle.

3.2. Content and teaching approaches

Within this reformed framework, the Medical English curriculum is closely connected to both pre-clinical and clinical modules. The courses cover essential areas of medical science such as anatomy, physiology, and pathology, organized by body systems. Alongside content knowledge, students are required to practice medical communication skills, including history taking, clinical reporting, patient education, hospital procedures, and public health dialogue. These components are deliberately designed to harmonize with the Vietnamese Medical Curriculum, ensuring that Medical English supports students' medical studies.

Teaching methods reflect the university's shift toward competency-based, student-centred education. Interactive approaches such as task-based learning, case discussions, role-plays, and student presentations create dynamic classroom environments. For instance, students work on case reports or practice history-taking conversations, applying both language and professional skills in clinical contexts. This alignment between Medical English tasks and clinical practice ensures that language learning directly supports the development of core medical competencies.

Furthermore, the new medical curriculum emphasizes both horizontal integration, which links subjects within the same academic year, and vertical integration, which connects knowledge and skills across different years. Medical English courses contribute to this by bridging communication training with scientific knowledge, allowing students to strengthen language skills while engaging in authentic medical tasks. In this way, Medical English becomes not just an English course, but a meaningful component of professional medical education at the participating medical university.

3.3. Student feedback and the PDCA cycle

A key strength of the Medical English curriculum at the participating medical university lies in its commitment to continuous improvement through the application of the PDCA (Plan–Do–Check–Act) cycle. At the end of each semester, students are invited to provide structured feedback on different aspects of the course, including content, teaching methods, assessment practices, and perceived relevance to their future medical careers. Feedback is systematically collected through a standardized Learner Survey Questionnaire.

To further demonstrate the impact and stability of this feedback system, survey data collected from second-year medical students between 2020 and 2024 were analysed. Each year, approximately 400 students participated in the survey, reflecting the relatively stable annual intake of the General Practitioner program at the participating medical university. As the survey was a compulsory component contributing to students' conduct grades, the response rate reached nearly 100%, ensuring that the results are both reliable and representative.

Given the nature of the data, this study adopts an evaluative and exploratory perspective. The findings are intended to provide insights into curriculum implementation and student perceptions rather than to establish causal relationships or generalizable conclusions.

To address these research questions, selected questionnaire items were identified based on their relevance to course design, teaching effectiveness, and learner engagement. The study was conducted as part of the university's internal quality assurance process, and all responses were anonymized prior to analysis.

4. Results

This section reports the main findings from student feedback surveys collected between 2020 and 2024. The data indicate consistent trends in how learners evaluated the Medical English curriculum, particularly in relation to course objectives, teaching effectiveness, and relevance to future professional practice. Feedback across the five years also underscores the role of student input in driving curriculum improvements through the PDCA cycle. The following results are presented with supporting figures and percentages to illustrate these patterns in greater detail.

4.1. Research question 1: Current integration of medical English into the curriculum

To address Research Question 1, findings related to curriculum alignment and instructional integration were examined. The results indicate that Medical English is integrated into the curriculum through alignment with program learning outcomes (PLOs), coherence between course learning outcomes (CLOs) and instructional content, and the incorporation of clinically relevant teaching practices.

Across the five-year period (2020–2024), student responses consistently reflected positive perceptions of curriculum alignment. Between 84.0% and 91.5% of respondents agreed or strongly agreed that the CLOs were appropriate to their level, aligned with the PLOs, and consistently reflected in lecture content (Table 1). In particular, agreement regarding the consistency between lecture content and CLOs remained above 90% across all five years, suggesting a relatively stable relationship between curriculum planning and instructional delivery.

The findings also suggest that Medical English instruction is not delivered as an isolated language

subject but is integrated with clinically relevant content and teaching practices. For example, between 82.0% and 87.0% of students reported that lecturers linked theoretical knowledge to clinical practice, while approximately 84.0%–86.0% indicated that lecturers actively encouraged classroom interaction through questioning and discussion.

Across the five-year period, student responses remained relatively stable, with only minor fluctuations across indicators. Some modest improvements can be observed in teaching-related items, particularly lecturer feedback and classroom interaction, although these patterns should be interpreted cautiously. Overall, the findings suggest a relatively coherent and consistently implemented model of Medical English integration within the curriculum.

4.2. Research question 2: Student perceptions of curriculum effectiveness

To address Research Question 2, student perceptions of teaching effectiveness, classroom interaction, and curriculum relevance were analysed based on longitudinal survey data collected between 2020 and 2024.

Overall, teaching quality indicators received consistently positive evaluations across the five-year period. Most students reported that lecturers effectively linked theoretical content to clinical practice, with agreement levels ranging from 82.0% to 87.0%. Similarly, between 84.0% and 86.0% of respondents agreed that lecturers encouraged classroom interaction through questioning and discussion, suggesting a relatively active learning environment.

Student satisfaction with the timeliness of lecturer feedback also remained consistently high, increasing from 80.0% in 2020 to 85.9% in 2024. Minor improvements can be observed across several teaching-related indicators over time, although the findings should be interpreted cautiously given their perception-based nature.

4.3. Areas for improvement and implications for curriculum development

Taken together, the survey findings indicate generally positive student perceptions of the Medical English curriculum across the five-year period. While most indicators remained consistently high, qualitative comments from students also pointed to several areas for further improvement. In particular, students frequently expressed a desire for more opportunities to practice speaking and engage in interactive classroom activities, especially those related to clinical communication.

At the same time, minor upward trends can be observed in several teaching-related indicators, including lecturer feedback and classroom interaction. These patterns may suggest gradual adjustments in teaching practices over time,

Table 1. Student satisfaction results at the participating Medical University (2020–2024)

Questions	2020	2021	2022	2023	2024
1. The course learning outcomes (CLOs) are appropriate to students' ability to absorb knowledge.	85.2%	84%	87.2%	85.9%	86.5%
2. CLOs are aligned with the program learning outcomes (PLOs)	89%	91.1%	88%	90.3%	89.7%
3. The lecture content is consistent with CLOs.	90%	90.8%	91.5%	92%	90.4%
4. The lecturer links theory to clinical practice.	82%	83.3%	82.9%	86%	87%
5. The lecturer asks questions and encourages student responses.	84.7%	84%	85.2%	85.1%	86%
6. The lecturer provides timely feedback on students' assignments	80%	82.7%	84%	86.3%	85.9%

although the findings should be interpreted cautiously given their perception-based nature.

Overall, the findings highlight both strengths and areas for refinement within the curriculum, particularly in relation to communicative practice, learner engagement, and the continued adaptation of instructional strategies to student needs.

And the chart below illustrates the result comparison of different criteria across five years.

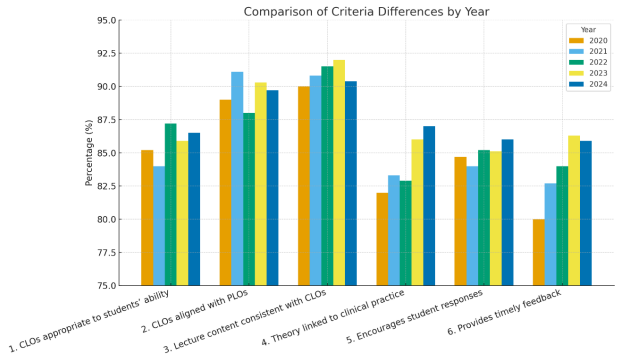


Figure 1. Student satisfaction results at the participating Medical University (2020–2024)

4.4. Research question 3: The potential role of AI in medical english instruction

To address Research Question 3, the study considered how AI-supported approaches may respond to challenges identified through student feedback and curriculum implementation. In particular, the need for increased speaking practice, interactive learning opportunities, and more individualized feedback emerged as recurring themes in student evaluations.

Within this context, AI-assisted tools may offer potential support for Medical English instruction. Preliminary classroom applications at the institution have included the use of AI-supported writing tools, pronunciation practice platforms, and conversational agents for role-play activities. These tools appear to provide additional opportunities for students to engage with clinical language in more interactive and flexible ways.

However, given the exploratory nature of these applications, the findings presented here should be interpreted cautiously. Rather than demonstrating measurable effectiveness, the results primarily suggest possible directions for future curriculum development and innovation in Medical English teaching.

5. Discussions

The findings from student feedback highlight several areas for further development, particularly the need for increased opportunities for speaking practice and more interactive learning activities. These observations suggest that while the current curriculum provides a stable and coherent structure, additional strategies may be needed to enhance communicative competence in clinical contexts.

In this context, digital technologies, especially artificial intelligence (AI), appear to offer potential avenues for addressing these challenges. Previous studies have suggested that AI-assisted language learning can support personalized feedback, learner autonomy, and simulation-based practice (Semerikov et al., 2021; Yu, 2021). In Medical English education, such tools may help bridge the gap between language learning and clinical communication by enabling students to engage in more realistic and repeated practice.

Within the institutional context examined in this study, initial efforts to incorporate AI tools into Medical English instruction have been explored since late 2022. These applications include the use of AI-supported writing tools, pronunciation practice platforms, and conversational agents for role-play activities. While these practices remain at an exploratory stage, they appear to provide additional opportunities for students to engage with clinical language in a more interactive and flexible manner.

These innovations are not implemented in isolation but are integrated within the existing PDCA (Plan–Do–Check–Act) cycle that guides curriculum development. Student feedback continues to play a central role in informing instructional adjustments, such as the expansion of role-play activities, small-group discussions, and case-based learning tasks. This iterative

process may contribute to maintaining alignment between curriculum design and learner needs over time.

However, the findings should be interpreted with caution. The data presented in this study are based on student perceptions rather than direct measures of language proficiency or communicative performance. As such, positive evaluations may reflect satisfaction with the learning experience rather than demonstrable improvements in clinical communication skills. This distinction is important when considering claims about curriculum effectiveness.

Furthermore, while AI technologies offer promising possibilities, their integration into Medical English education also raises several important considerations. These include the reliability of AI-generated content, the need for expert validation, potential overreliance on automated feedback, and issues related to data privacy and access to digital resources (Semerikov et al., 2021). In addition, the effective use of AI tools requires appropriate teacher training and institutional support, which may vary across educational contexts.

There is also a risk that excessive reliance on AI tools may reduce learners' critical thinking and independent problem-solving skills, particularly if such tools are used without adequate pedagogical guidance.

In summary, these findings suggest that the integration of digital tools within a competency-based framework may enhance the learning environment; however, further research is needed to evaluate their impact on measurable learning outcomes. Future studies may benefit from incorporating performance-based assessments or experimental designs to provide more robust evidence of effectiveness.

5.1. Interpreting curriculum challenges and the potential of AI-Supported approaches

The findings of this study suggest that the Medical English curriculum provides a relatively coherent and stable learning experience, particularly in terms of curriculum alignment and instructional effectiveness. However, student feedback also highlights several continuing challenges, especially the need for greater opportunities for speaking practice and more interactive learning activities. These findings are broadly consistent with previous studies on Medical English and ESP instruction, which have emphasized the importance of contextualized communication practice and discipline-specific interaction in supporting learner engagement and professional readiness (Dudley-Evans & St John, 1998; Allum & McGarr, 2008).

At the same time, the findings indicate that curriculum development in Medical English should move beyond traditional language instruction toward more flexible and technology-supported approaches. This aligns with broader discussions in AI-assisted language learning, which suggest that digital tools may support learner autonomy, personalized feedback, and repeated communicative practice (Semerikov et al., 2021; Yu, 2021). In the context of medical education, such approaches may be particularly relevant in addressing limitations related to instructional time, classroom interaction, and opportunities for authentic communication practice.

In response to these challenges, AI-supported tools have increasingly been explored as complementary resources in Medical English instruction. Previous studies suggest that AI-assisted language learning may support personalized feedback, learner autonomy, and repeated opportunities for communication practice (Semerikov et al., 2021; Yu, 2021).

Within the institutional context examined in this study, initial applications have included AI-supported writing tools, pronunciation practice platforms, and conversational agents to facilitate role-play activities. These tools may provide students with additional opportunities to engage with clinical vocabulary, rehearse doctor–patient communication, and receive immediate feedback in a more flexible learning environment. Such practices appear particularly relevant in contexts where classroom time for communicative activities is limited.

However, these applications remain exploratory and should not be interpreted as evidence of demonstrated effectiveness. Rather, they represent practical attempts to address challenges identified through student feedback, particularly the need for more speaking practice and interactive learning opportunities.

For instructors, AI alleviates the burden of repetitive error correction, allowing them to dedicate more time to facilitation, mentoring, and advanced teaching tasks. Importantly, the use of AI is embedded within the PDCA cycle that guides curriculum development at the participating institution. Feedback on AI-assisted activities is systematically collected and analysed to refine future course design, ensuring that the integration of technology remains responsive to learner needs and consistent with the long-term goals of competency-based medical education reform.

Notably, the integration of AI remains at an exploratory stage. The incorporation of AI appears to offer potential opportunities for making Medical English learning more interactive, flexible, and student-centred. By embedding digital innovation within a competency-based framework, the program may contribute to modernizing language education but also supports the university's broader vision of training a new generation of physicians who are clinically skilled, technologically competent, and globally minded.

5.2. Implications for an AI-Enhanced medical English model (AIMED)

Building on the findings of this study, the AIMED (AI-Enhanced Medical English Development) approach is proposed as a context-sensitive and practice-informed framework for supporting Medical English instruction. The model was developed in response to challenges identified through student feedback, particularly the need for greater opportunities for communicative practice, interactive learning, and individualized feedback.

Rather than functioning as a stand-alone language model, AIMED is intended to align Medical English learning more closely with clinical content and competency-based medical education. In this respect, the model reflects broader discussions in ESP and Medical English pedagogy, which emphasize contextualized communication, authentic professional tasks, and integration with discipline-specific learning (Dudley-Evans & St John, 1998; Richards, 2006).

At the same time, the proposed framework draws on perspectives from AI-assisted language learning, where digital tools have been suggested to support adaptive learning, repeated communicative practice, and learner engagement (Semerikov et al., 2021; Zhu, 2021). Within the institutional context examined in this study, selected elements of the AIMED approach have been explored in Medical English classes, although implementation remains partial and exploratory rather than standardized across the curriculum.

Accordingly, AIMED should be understood as a structured pedagogical proposal rather than a validated instructional model. Its value lies primarily in offering a context-sensitive framework that may inform future curriculum development and empirical evaluation in Medical English education.

The AIMED approach is designed as a six-step instructional cycle that integrates language learning with clinical content and AI-supported activities. It begins with structured clinical case summaries, followed by the development of doctor–patient dialogues, audio-based listening practice, comprehension tasks, student role-play activities, and feedback supported by both instructors and AI tools.

This model is intended to create a coherent learning sequence in which students engage with all four language skills including reading, listening, speaking, and vocabulary development within authentic medical contexts. By combining case-based learning with iterative feedback, the approach may support the development of communicative competence in healthcare settings.

However, it is important to emphasize that the AIMED model is proposed as a context-specific framework rather than a fully validated instructional model. While initial classroom applications suggest its potential usefulness, further empirical research is required to evaluate its effectiveness across different student groups and institutional settings.

In this sense, AIMED should be understood as a structured pedagogical proposal informed by practice, which may serve as a foundation for future development and systematic evaluation in Medical English education.

The six-step AIMED process can be illustrated as follows:

Step 1. Case Summary (Standardizing Clinical Scenarios)

- **Input:** Begin by selecting representative diseases within a specific body system (for example, in the respiratory system: pneumonia or asthma; in the digestive system: gastritis or diarrhoea).
- **AI support:** A structured case summary is then developed, covering the essential components: Chief Complaint, Medical History, Signs and Symptoms, Physical Examination, Diagnosis, and Treatment.
- **Output:** The result is a clear and concise case summary of approximately 150–200 words, written at a B1 English proficiency level and incorporating key medical vocabulary to ensure readability and accessibility for learners.



Figure 2. Illustration of Step 1 output in AIMED approach

Step 2. Doctor–Patient Dialogue

- **Input:** The standardized case summary developed in Step 1 serves as the basis.
- **AI support:** A clinical dialogue is constructed with around 10 conversational turns, moving through the typical sequence of a doctor–patient dialogue, including greeting, eliciting the chief complaint, history taking, physical examination, providing medical advice or treatment, and closing the consultation.
- **Output:** The product is a model doctor–patient dialogue that integrates appropriate medical terminology, effective history-taking questions, and clear treatment recommendations, offering learners a realistic template for clinical communication.

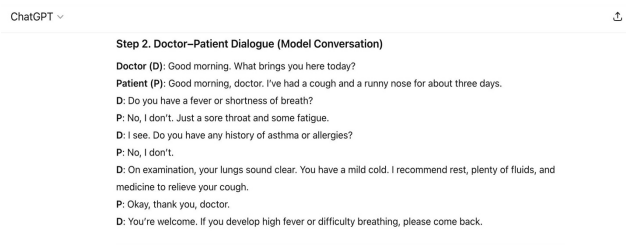


Figure 3. Illustration of Step 2 output in AIMED approach

Step 3. Audio Drill (Listening Practice)

- **Input:** The standardized doctor–patient dialogue produced in Step 2.
- **AI Support:** Text-to-Speech technology is employed to generate two distinct voices. The doctor's voice is formal and clear, while the patient's voice sounds natural, occasionally including hesitations or fillers (e.g., *"uh…"*, *"well…"*) to mirror real-life interaction.
- **Output:** A set of audio files in MP3 or WAV format is produced, which learners can use for listening comprehension and shadowing exercises, thereby strengthening both their listening accuracy and spoken fluency in Medical English.

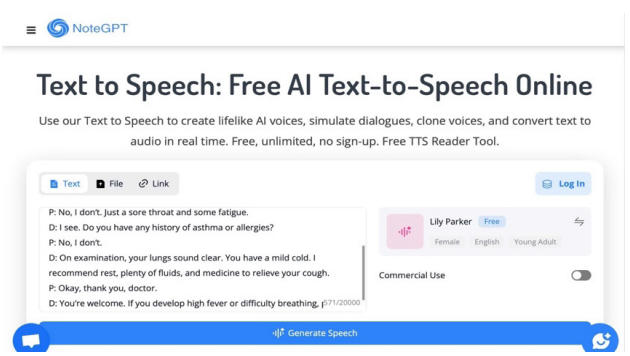


Figure 4. Illustration of Step 3 output in AIMED approach

Step 4. Listening Comprehension

• **Input:** The audio file of the model dialogue generated in Step 3.

• **AI Support:** A series of comprehension activities is designed to accompany the dialogue, reinforcing understanding while encouraging learners to actively apply medical English in context.

• **Output:** A complete package of listening comprehension tasks, including a variety of question types such as multiple-choice, gap-fill, true/false, and short-answer exercises.

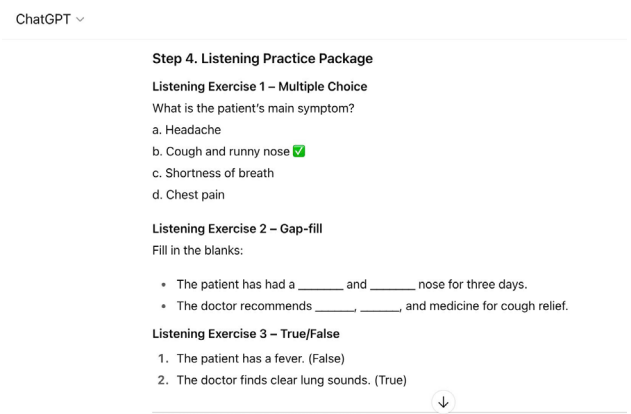


Figure 5. Illustration of Step 4 output in AIMED approach

Step 5. Student Role-Play in Doctor – Patient Dialogue

• **Activity 1:** Practice the model dialogue through guided drills.

• **Activity 2:** Perform a role-play using the transcript as support.

• **Activity 3:** Engage in free role-play with comparable clinical scenarios, applying target vocabulary and sentence structures.

To extend the activity, students can work in pairs to record their role-play as a short video and upload it to *Padlet.com*. This allows the entire class to review both their own dialogue and those of their peers, while also providing the instructor with a complete set of student outputs. In this way, feedback can be delivered efficiently without requiring every pair to present their dialogue in front of the class.

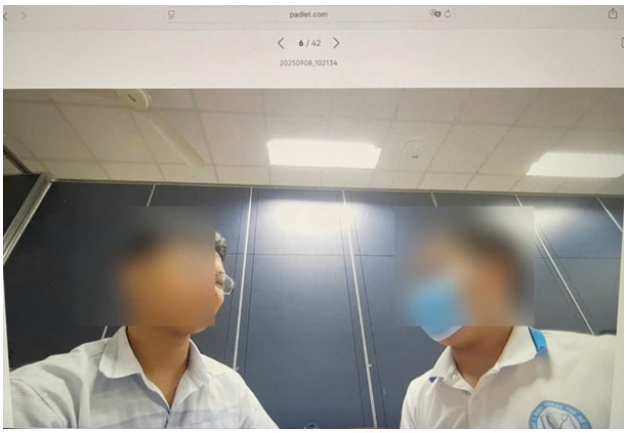


Figure 6. Illustration of Step 5 output on Padlet.com, following AIMED approach in one medical English class at the Participating Medical University

Step 6. Feedback and Continuous Improvement (PDCA Cycle)

• **Input:** Student role-play free dialogues in Step 5, which provide evidence of performance in three areas:

Language: fluency, pronunciation, and vocabulary use.

Communication: interaction skills and ability to express empathy.

Medical competence: accuracy in applying clinical terminology.

• **AI Support:** Automated tools assist by scoring pronunciation, flagging grammatical errors, and providing analytics that highlight areas needing attention.

• **Output:** Instructors combine AI-generated data with their own evaluations to deliver constructive feedback. At the same time, student comments are incorporated to refine case materials and dialogue tasks, ensuring continuous improvement of the learning cycle in line with the PDCA model.

By applying the demonstrated six-step model of the suggested **AIMED Approach**, even a single case such as *Common Cold – Cough* can provide second-year medical students with an integrated learning experience. Within one lesson, students are able to practice all four essential skills: **Reading** through the case summary, **Listening** via AI-generated audio

drills, **Speaking** through guided and free role-plays, and **Vocabulary** reinforcement through targeted exercises. This illustrates how AI may support the transformation of a simple clinical case into a comprehensive language training module that supports both communicative competence and professional development.

By cycling through these six stages, the AIMED Approach may help strengthen communicative competence in healthcare settings while also demonstrating how artificial intelligence can be systematically embedded into medical English education to foster sustainable learning outcomes.

6. Conclusions and recommendations

This study has explored the incorporation of Medical English into a competency-based medical curriculum at the institution, with a focus on digital innovation and student-centred learning. The findings, based on longitudinal student feedback, suggest that the current curriculum appears to provide a relatively stable and coherent learning environment, while also highlighting areas for further development, particularly in relation to communicative practice.

Within this context, the proposed AIMED (AI-Enhanced Medical English Development) approach offers a structured framework for integrating artificial intelligence into Medical English instruction. By combining case-based learning, interactive dialogue, and iterative feedback, the model is intended to support the development of both linguistic competence and clinical communication skills.

However, the findings of this study should be interpreted with caution. The analysis is based on a single institutional context and relies primarily on student perceptions rather than direct measures of learning outcomes. As such, the study does not seek to establish causal claims regarding effectiveness but rather to provide insights into curriculum implementation and potential directions for innovation.

The paper contributes to the existing literature by proposing a context-sensitive and practice-informed framework for exploring the integration of Medical English into medical curricula, particularly in settings undergoing digital transformation. Rather than presenting a validated instructional solution, the study offers preliminary insights into how language instruction, clinical communication, and AI-supported approaches may be aligned within a competency-based curriculum. It also highlights the importance of aligning language instruction with clinical training and quality assurance mechanisms.

Future research may build on this work by conducting empirical evaluations of the AIMED approach across different institutions and student populations. In particular, performance-based assessments and experimental designs may provide more robust evidence regarding the impact of AI-supported instruction on language proficiency and clinical communication.

Recommendations:

- The AIMED approach may be further piloted, refined, and empirically evaluated across different medical education contexts to better understand its applicability and potential scalability.
- Institutions may consider investing in faculty development to support the effective use of AI tools in language teaching.
- Ongoing student feedback mechanisms should be maintained to ensure continuous curriculum improvement.
- Further collaboration across institutions may support the development of shared resources and best practices in Medical English education.

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