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DEVELOPING PROFESSIONAL THINKING OF MEDICAL STUDENTS THROUGH AI-ENHANCED INTEGRATIVE TEACHING OF ENGLISH AND LATIN

Djalilova Zarnigor Obidovna
Professor, Department of Fundamental Medical Sciences
Asia International University, Bukhara, Uzbekistan
Email: djalilovazarnigorobidovna@oxu.uz

Abstract: This article explores the role of artificial intelligence technologies in the integrative teaching of English and Latin to medical students. The study emphasizes that AI-based tools can support personalized learning, medical terminology practice, automated feedback, and independent language development. Since English and Latin are closely connected with medical terminology and professional communication, their integrated teaching helps students develop not only language competence but also professional thinking. However, AI should be used as a methodological assistant under teacher guidance, not as a replacement for the teacher. The article argues that AI-enhanced integrative teaching can improve the quality of foreign-language education in medical higher institutions.

Keywords: artificial intelligence, integrative teaching, English language, Latin language, medical students, professional thinking, medical terminology, foreign-language competence, AI-assisted learning, medical higher education

Introduction

In the context of modern medical higher education, foreign-language competence has become an essential component of future doctors' professional training. Medical students need English not only for general communication, but also for reading scientific literature, participating in academic exchange, understanding international medical information, and developing professional interaction skills. Vepreva and Pechinkina (2021) emphasize that the course of "Foreign Language" for medical students should be structured according to learners' needs and should contribute to their conscious, active, and motivated acquisition of professional knowledge.

At the same time, Latin remains a fundamental language for mastering medical terminology, especially in anatomy, pharmacy, diagnosis, and clinical disciplines. Therefore, the integrative teaching of English and Latin can help medical students understand the semantic structure of terms, compare international and classical terminology, and use professional vocabulary more accurately. Such integration is important not only for language learning, but also for the development of professional thinking, because students learn to analyze, classify, interpret, and apply medical concepts in different educational and clinical contexts.

The rapid development of artificial intelligence has created new opportunities for improving foreign-language education. According to Kovalchuk, Taranenko, and Ustinova (2024), AI technologies can help teachers prepare learning materials, create tasks, check students' work, and organize practice in different language aspects. However, the authors also stress that AI cannot fully replace the teacher, since it does not possess the ability to understand the educational context, motivate students personally, or develop their critical thinking in the same way as a human teacher.

AI-based language learning tools can also support personalized learning, immediate feedback, speaking and listening practice, and student engagement. Ayala-Pazmiño and Alvarado-Lucas (2023) note that AI can enhance language learning outcomes by offering personalized learning

experiences, improving language proficiency, and increasing students' engagement. Nevertheless, the effective use of AI requires teacher training, appropriate infrastructure, and attention to ethical issues such as data privacy and human interaction.

Thus, the relevance of this article is determined by the need to develop a scientifically grounded methodology for AI-enhanced integrative teaching of English and Latin in medical higher education. The main idea of the study is that artificial intelligence can become an effective methodological tool for developing medical students' professional thinking, terminology competence, and readiness for academic and clinical communication, provided that it is used under teacher guidance and within a clearly organized didactic system.

The integrative teaching of English and Latin in medical higher education should be understood not as a mechanical combination of two language disciplines, but as a professionally oriented didactic system aimed at forming medical students' terminological, communicative, analytical, and cognitive competences. English provides access to international scientific communication, clinical literature, academic mobility, and professional interaction, while Latin forms the structural and semantic basis of medical terminology. Therefore, the integration of these two languages creates a more systematic foundation for understanding medical concepts and applying them in professional contexts.

Vepreva and Pechinkina (2021) argue that foreign-language courses for medical students should be designed according to learners' needs, professional communication situations, and modular course structure. Their study proposes a course model based on consecutive modules that support the formation of universal competencies necessary for future doctors and their integration into the professional community . This position is especially relevant for the present research, because the integration of English and Latin should be organized through professional medical topics, terminology analysis, clinical communication tasks, and independent learning activities.

Artificial intelligence technologies strengthen this process by introducing personalization, instant feedback, adaptive practice, and automated analysis of students' language production. Kovalchuk, Taranenko, and Ustinova (2024) note that AI can assist teachers in preparing learning materials, checking homework, and helping students practise different language aspects. However, the authors also emphasize that AI cannot fully replace the teacher because it lacks contextual awareness, empathy, personal motivation, and the ability to develop critical thinking in the same way as a human educator. Thus, in the proposed methodology, AI is treated as a didactic assistant rather than an autonomous substitute for the teacher.

Table 1
Functional Role of English, Latin,
and AI in Integrative Medical Language Teaching

Component	Pedagogical function	Medical education relevance	Expected learning outcome
English language	Development of academic and professional communication	Reading medical articles, presenting cases, discussing symptoms and treatment	Communicative and academic language competence
Latin language	Formation of terminological accuracy	Anatomy, diagnosis, prescription, clinical terminology	Structural understanding of medical terms
Artificial	Personalization, feedback,	Adaptive exercises,	Individualized and

intelligence	simulation, independent practice	terminology drills, clinical dialogues, error correction	interactive language learning
Teacher guidance	Methodological control and critical evaluation	Selection of AI tasks, correction of AI mistakes, ethical supervision	Responsible and professionally oriented AI use
Integrative approach	Connection of language, terminology, and professional thinking	English and Latin are taught through medical concepts	Development of professional thinking

The proposed model consists of three interconnected methodological blocks: terminological block, communicative-clinical block, and analytical-reflective block. Each block is designed to develop a specific aspect of medical students' professional thinking.

The terminological block focuses on the semantic, morphological, and structural analysis of medical terms. Students work with Latin roots, prefixes, suffixes, and English equivalents. For example, terms such as *cardiologia*, *nephritis*, *osteoporosis*, and *dermatology* can be analysed through Latin-Greek components and then contextualized in English medical discourse. AI tools may generate comparative terminology tables, pronunciation models, flashcards, and contextual examples.

The communicative-clinical block develops students' ability to use professional vocabulary in realistic medical situations. AI-supported chatbots and dialogue simulators can be used to practise doctor-patient communication, case presentation, symptom description, and medical questioning. Fitria (2021) emphasizes that AI-based technology can provide a personalized learning atmosphere, dialogue simulation, and practical language activities according to learners' level, needs, and interests.

The analytical-reflective block develops students' critical thinking and professional reasoning. In this block, students evaluate AI-generated translations, correct terminological inaccuracies, compare English and Latin terms, and justify their linguistic choices. This is important because medical language learning should not be limited to memorization; it should train students to interpret, compare, classify, and apply terminology in meaningful professional situations.

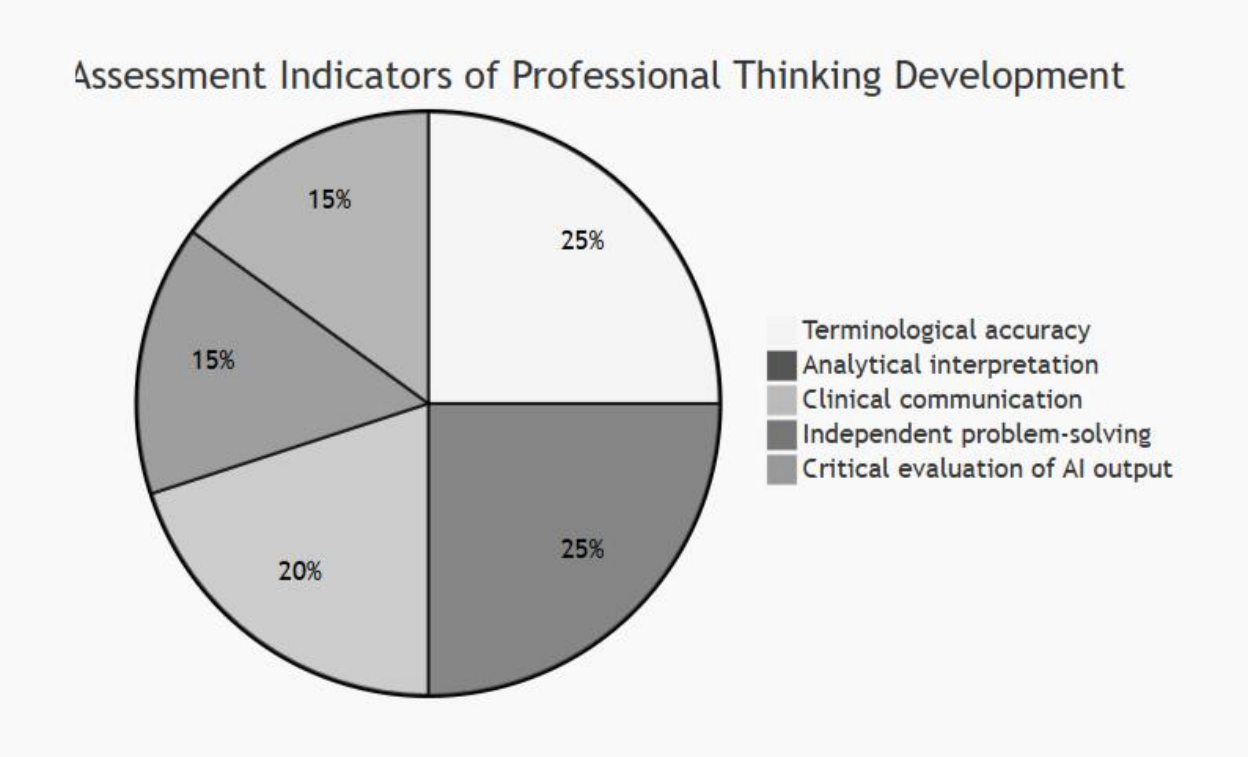
Table 2

AI-Based Tasks for Integrative Teaching of English and Latin

Type of task	**Example**	**AI function**	**Competence developed**
Terminology analysis	Analyse the term *gastroenteritis* and explain its components	Generates structural explanation and examples	Terminological competence
Comparative translation	Compare *ren*, *kidney*, *renal disease*	Provides equivalents and contextual usage	Bilingual medical vocabulary
Clinical dialogue	Simulate a doctor-patient conversation about chest pain	Creates interactive speaking practice	Communicative competence
Error correction	Correct mistakes in a medical case summary	Gives feedback on grammar and terminology	Accuracy and self-correction
Case-based writing	Write a short case report using 10 Latin-based terms	Supports drafting and revision	Academic writing competence

Critical AI evaluation	Identify inaccurate AI-generated medical translations	Encourages verification and argumentation	Critical thinking

The methodological design of AI-enhanced integrative teaching should maintain balance between terminology acquisition, communicative practice, feedback, reading and translation, and independent learning. The following pie chart presents a proposed distribution of learning activities within one instructional module. These percentages are methodological recommendations, not experimental results.



As shown in Figure 1, the largest part of the module is allocated to medical terminology practice, because the central aim of English-Latin integration is to develop students' ability to understand and use professional medical vocabulary accurately. AI-based feedback and clinical dialogue simulation each occupy 20%, since students need both linguistic correction and communicative practice. Reading, translation, and independent AI-guided learning are also essential, but they should support, rather than dominate, the professional orientation of the course.

Professional thinking in medical language education includes the ability to understand medical concepts, analyse terminology, interpret clinical information, communicate accurately, and evaluate the reliability of linguistic and professional data. In this context, AI-enhanced integrative teaching contributes to professional thinking in several ways.

First, it helps students move from mechanical memorization to structural understanding. When students analyse Latin roots and English medical equivalents, they begin to understand how medical terms are formed and how meaning is constructed. This develops semantic awareness and terminological logic.

Second, AI supports individualized learning trajectories. Students with weaker terminology knowledge can receive additional practice, while stronger students can work with more complex clinical texts and case-based tasks. Ayala-Pazmiño and Alvarado-Lucas (2023) state that AI can support personalized feedback, language proficiency development, student engagement, and more objective assessment; however, they also stress the need for infrastructure, teacher training, privacy protection, and human interaction.

Third, AI encourages reflective and critical learning when students are required to evaluate AI output. Since AI-generated translations or explanations may contain inaccuracies, students should not accept them passively. Instead, they should compare AI responses with dictionaries, textbooks, teacher explanations, and medical context. This process develops critical digital literacy and professional responsibility.

Table 3
Indicators for Assessing Professional Thinking in AI-Enhanced Integrative Teaching

Assessment indicator	Description	Possible assessment task
Terminological accuracy	Correct use of English and Latin medical terms	Define and use 15 medical terms in context
Structural analysis	Ability to identify roots, prefixes, suffixes, and meanings	Analyse Latin-based medical terms
Clinical communication	Ability to use terminology in professional interaction	Perform a doctor-patient dialogue
Analytical interpretation	Ability to explain medical concepts through language	Interpret a short clinical text
Critical evaluation of AI output	Ability to detect and correct AI-generated mistakes	Check an AI-generated translation
Independent learning	Ability to use AI responsibly for self-study	Prepare an AI-supported terminology portfolio

The assessment of AI-enhanced integrative teaching should include not only language accuracy, but also professional reasoning, terminology interpretation, communication, and critical evaluation. Sysoyev (2023) notes that the integration of AI tools into higher education is still at an early stage and that many university teachers lack a systematic understanding of the organizational, didactic, and methodological potential of AI technologies . Therefore, assessment should also measure whether students and teachers are able to use AI consciously and methodologically.

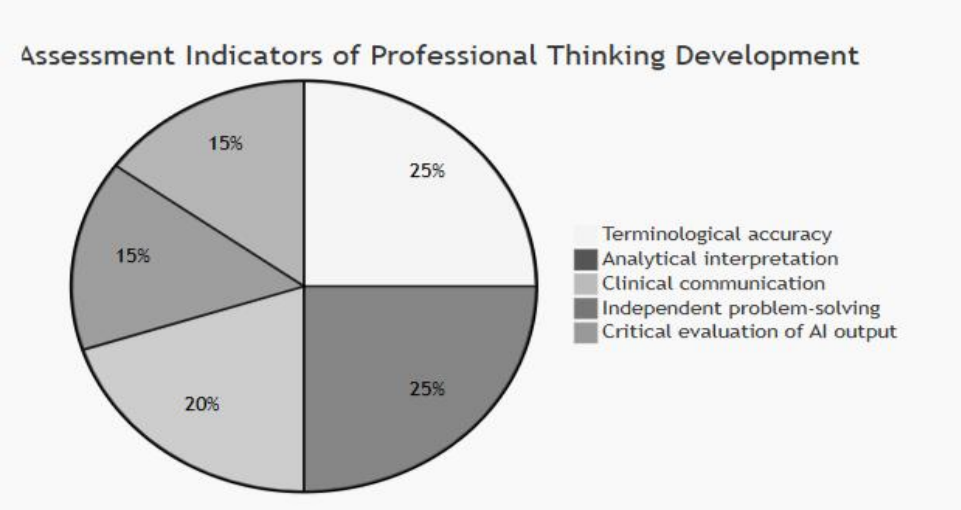


Figure 2 demonstrates that terminological accuracy and analytical interpretation should be the leading assessment criteria, because they directly reflect the integrative nature of English and Latin language learning. Clinical communication is also highly significant, as medical students must be able to use terminology in real communicative contexts. Independent problem-solving and critical evaluation of AI output are included as separate criteria because students should learn to use AI as a supportive tool while maintaining academic responsibility and professional judgment.

The effectiveness of AI-enhanced integrative teaching depends on several pedagogical conditions. First, AI tools must be selected according to educational objectives rather than technological novelty. A tool is pedagogically valuable only when it helps students understand, practise, apply, or evaluate professional language material.

Second, teacher guidance remains central. The teacher designs tasks, controls content accuracy, explains difficult terminology, organizes interaction, and teaches students to use AI ethically. This corresponds to the position of Kovalchuk et al. (2024), who argue that AI use in foreign-language teaching should be accompanied by a system of relevant tasks and clear algorithms of interaction between teachers, students, and AI tools .

Third, AI integration should be gradual. At the initial stage, students can use AI for vocabulary practice and pronunciation. At the intermediate stage, AI can support translation, dialogue, and writing. At the advanced stage, students can evaluate AI-generated content, compare terminology, and prepare case-based professional outputs.

Table 4

Stages of Implementing AI-Enhanced Integrative Teaching

Stage	Main objective	AI-supported activity	Teacher's role
Stage 1: Introductory	Familiarization with AI tools and medical terminology	Vocabulary cards, pronunciation, simple translation	Explains rules and controls accuracy
Stage 2:	Understanding English-	Root analysis, term	Guides semantic and

Terminological	Latin medical term structure	classification, bilingual glossary	morphological analysis
Stage 3: Communicative	Application of terminology in medical situations	Clinical dialogue simulation, case discussion	Organizes interaction and feedback
Stage 4: Analytical	Development of professional reasoning	AI-generated case analysis, translation comparison	Develops critical thinking
Stage 5: Reflective	Responsible and independent AI use	Portfolio, self-assessment, AI-output evaluation	Evaluates learning outcomes

The scientific significance of the proposed model lies in its attempt to connect artificial intelligence, integrative language teaching, medical terminology, and professional thinking within one didactic system. Unlike general AI-assisted English learning, this model is specifically oriented toward medical higher education and combines English and Latin as complementary professional language resources.

The practical significance is connected with the possibility of applying the model in English and Latin classes for first-year medical students. It can be used to design modules, practical exercises, terminology portfolios, clinical dialogue tasks, translation activities, and assessment rubrics. The model may also support the development of AI-based methodological recommendations for teachers working in medical higher education institutions.

AI-enhanced integrative teaching of English and Latin can improve the quality of medical language education if it is implemented through a scientifically grounded methodology, teacher supervision, ethical AI use, and professionally oriented assessment. In this model, AI does not replace the teacher; rather, it expands the didactic possibilities of the teacher and creates more flexible conditions for developing students' professional thinking.

The conducted theoretical and methodological analysis shows that AI-enhanced integrative teaching of English and Latin can become an effective direction in modern medical higher education. The integration of English and Latin is especially important for medical students because both languages serve professional purposes: English supports academic, scientific, and clinical communication, while Latin forms the structural basis of medical terminology. Therefore, their integrated teaching allows students not only to memorize professional vocabulary, but also to understand the semantic, morphological, and functional structure of medical terms.

The proposed model demonstrates that artificial intelligence can support terminology practice, clinical dialogue simulation, automated feedback, translation analysis, and independent learning. In this context, AI becomes a methodological tool that helps individualize the learning process, increase students' engagement, and create additional opportunities for practising professional language skills. Previous research also confirms that AI tools can support personalized learning, improve language proficiency, and provide objective feedback, although their effective use requires infrastructure, teacher training, and ethical regulation.

At the same time, the study confirms that artificial intelligence cannot replace the teacher in the process of foreign-language education. AI lacks the ability to fully understand the pedagogical context, support students emotionally, motivate them toward personal and professional growth, and develop critical thinking in a human-centered way. Therefore, the role of the teacher changes from a simple transmitter of knowledge to a designer of educational trajectories, moderator of AI-supported tasks, evaluator of learning outcomes, and guide for responsible digital learning.

The article also emphasizes that the effective integration of AI into English and Latin language teaching requires a clear didactic system. Such a system should include professionally oriented content, terminology-based tasks, clinical communication situations, AI-supported feedback, independent work, and critical evaluation of AI-generated materials. This approach corresponds to the needs of medical education, where students must learn to understand and produce professional texts, communicate in academic and clinical contexts, and consciously plan their further professional development.

Thus, AI-enhanced integrative teaching of English and Latin contributes to the development of medical students' professional thinking, terminological competence, communicative readiness, and digital literacy. The scientific value of this approach lies in connecting artificial intelligence, integrative language teaching, and medical professional training within one methodological framework. Its practical significance is reflected in the possibility of applying the model in medical universities for designing AI-based exercises, terminology portfolios, clinical dialogue tasks, translation assignments, and assessment criteria.

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