

Technology-Supported Self-Regulated English Learning in Medical Education: A Cognitive Perspective

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Abstract: *Medical English learning requires more than knowledge of vocabulary because medical students must understand, organise, practise, retrieve, and apply language in academic and clinical situations. Digital resources, including videos, podcasts, online articles, pronunciation tools, simulations, and artificial intelligence, provide flexible opportunities for such learning. Their educational value, however, depends largely on how students use them. Drawing on cognitive learning principles, Mayer's Cognitive Theory of Multimedia Learning, and Zimmerman's model of self-regulated learning, this paper examines how technology can support attention, information processing, memory, goal setting, practice, monitoring, and reflection in Medical English learning. The discussion follows the self-regulated learning cycle of forethought, performance, and self-reflection and considers how suitable digital tools can assist students at each stage. Particular attention is given to artificial intelligence, which can support personalised practice, feedback, clinical communication exercises, and writing development, but may weaken active learning when it replaces rather than supports the learner's own cognitive effort. The paper also stresses the continuing role of teachers in guiding resource selection, developing learning strategies, interpreting feedback, and connecting digital activities with authentic medical communication. Effective technology-supported Medical English learning therefore depends on purposeful tool selection, active cognitive engagement, learner responsibility, reflection, and appropriate teacher guidance.*

Keywords: Medical English, self-regulated learning, cognitive learning, educational technology, artificial intelligence

A medical student may study for several hours a textbook chapter yet remain unsure how to explain the symptoms a patient is experiencing in English. Another student may understand a lesson on medicine but be unable to write down a case summary in English clearly. A third student may know hundreds of medical English words but be unable to produce some of them correctly in a conversation. Such examples demonstrate the importance of understanding the processes of learning Medical English. Learning Medical English is not a matter of accumulation of vocabulary. The students must be able to process the language they are exposed to, relate the new information to their existing knowledge, practice, identify their problems, and determine what they have to address.

Technology has created new opportunities to address the identified challenges. A student who was previously dependent on a class teacher and a textbook can learn medical English by listening to a podcast on a commute, reviewing the pronunciation of a certain word using a digital dictionary, watching a video with a demonstration of a medical interaction, practicing the writing skills with an AI application, and reading a medical article published in an international journal. Multiple studies on the use of technology in medical English learning have highlighted the benefits of such an approach and identified practical problems that may impede the positive experience and outcomes. Technology-supported instruction received positive evaluation from instructors, yet several practical issues were noted that may interfere with the effective use of the available resources.

However, the availability of technology is not always a guarantee of substantial learning outcomes. For example, a

mobile phone can provide a student with an outstanding language learning application, but at the same time, it can offer several various sources of distraction. An AI tutor can give a detailed explanation of a particular sentence within seconds, but copying the solution without thinking can prevent the student from engaging in the learning process. Finally, a video can illustrate a complicated aspect of medical science in a more accessible way than pages of dense text in a book, but without active learning, the educational outcome will stay at the same level. Therefore, cognition and self-regulation should be considered as essential parts of any educational process.

Therefore, instead of asking whether technology can support language learning, it might be more productive to formulate a question regarding how exactly it can enhance medical students' self-regulated English learning. Considering the cognitive approaches to language learning is essential because it is this area that makes the primary difference between traditional and contemporary methods. Specifically, cognitive learning theories and models are primarily concerned with such aspects of language learning as perceiving, processing, organizing, storing, retrieving, and connecting information. In combination with the principles of self-regulated learning, they can provide the necessary theoretical basis for finding out how exactly technology can support medical students' English learning.

According to Zimmerman, self-regulation is "self-generated thoughts, feelings, and actions that are planned and cyclically adapted to the attainment of personally valued goals" (Zimmerman, 2000, p. 14). Self-regulated learning, therefore, is the process of regulating one's learning and strategic behaviors throughout the whole cycle of learning experiences

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in order to achieve specific educational goals (Zimmerman, 2000). Therefore, it is no surprise that self-regulated learning is increasingly gaining traction within the educational studies field (Zimmerman, 2000). This paper will explore the concepts of cognitive learning and self-regulated learning in combination with the educational technology area of study in order to see how exactly technology can facilitate language learning.

Specifically, English plays a critical role in medical education for a number of reasons. First of all, the majority of international literature, research, journals, conferences, databases, textbooks, guidelines, and other resources are available in English. Therefore, language learning can be essential for a student's ability to engage in the international medical community. At the same time, Medical English is becoming more critical for communication and effective language learning than ever before. The latest studies also confirm the importance of Medical English for students' language learning, international outreach, and effective communication during their future professional development.

Technology has expanded the opportunities for such learning. Medical students are exposed to real language in journal articles, medical websites, videos, podcasts, online lectures, patient-interview simulations, and other learning technology tools. They can get help with pronunciation or definitions through pronunciation aids, dictionaries, grammatical indicators, automated feedback, and other language-assisting technology.

The educational value of such tools is determined by how the student engages with them. Imagine a student preparing for a clinical communications exercise. That student could view a ten-minute video of a doctor questioning a patient. Or, the student could watch the video a second time, looking for ways physicians ask patients about their symptoms, then practice asking questions, record their attempts, compare them to the physician's questions, identify one area for improvement, and move on. The same technology is used, but the experience of the learner is substantially different.

Partially because of such considerations, technology offers multiple educational opportunities for language learning. It is possible for students to learn language through repeated exposures, work at their own pace, receive feedback, access authentic materials, and learn independently. However, at the same time, technology can lead to information overload, distractions, superficial learning, and overreliance on automated assistance. Regulation of such factors is crucial to successful learning with technology.

A cognitive view focuses on the fact that learning is an active process in which learners do not simply absorb the information presented to them. Rather, they must pay attention to the information, process it, organize it, relate it to other information, and remember it for later use.

Mayer's Cognitive Theory of Multimedia Learning is critical to understanding how learning with technology works. Mayer proposed that students process new information by engaging verbal and pictorial representations in distinctive mental processes and utilizing a limited capacity for each. His theory

focuses on the idea that learners must engage in selective attention and informative processes to organize verbal and pictorial representations of information and connect them to their existing knowledge.

This has significant implications for Medical English. A lesson can include textual explanations, diagrams, pictures, narration, animation, subtitles, hyperlinks, and exercises. More is not necessarily better, since a student has to read, listen, watch, react to alerts or pop-up messages, and take notes simultaneously. Mayer and Moreno define cognitive load as a "learners' mental activity in attending to important aspects of the instructional materials and organizing this information in working memory" (2003, p. 43). It is not just about quantity but rather quality of information that should be processed by the students.

For instance, when studying medical English for patient history-taking, one should not cram all the possible phrases heard in a video. Instead, one could first focus on various ways of asking about pain and its characteristics and then move to classifying them according to the type of pain. Thirdly, they have to connect this new information with the previously acquired facts on medical communication. Finally, the student may recite these phrases in context during the conversation with the patient.

From this, it can be inferred that technology should be used wisely to avoid cognitive overload while learning Medical English. An overabundance of tools may overwhelm a student instead of helping them succeed. It is always necessary to remember that the learner still plays an active role in the educational process and cognitive load.

Self-regulated learning is another interesting concept that sheds light on the responsibility of students for their education. I never considered myself a passive recipient of knowledge, but seeing the process from this perspective has given me enormous motivation. SRL encourages students to view themselves as "agents of their own behavior" (Zimmerman, 2002, p. 173). They may set goals, choose an appropriate strategy, determine their effort, and evaluate progress. Overall, this approach helped me understand that I can control my learning, which in turn stimulates my progress.

Zimmerman's cyclical model of self-regulated learning entails three major phases: forethought, performance, and self-reflection. Such a framework can be applied to technology-assisted Medical English learning in terms of analysing instructions, setting goals, planning and motivational beliefs, learning, and reflection. The idea of the first phase is to set specific goals and plan the necessary activities to achieve them. A medical student's goal "I want to improve my English" is too general to effectively guide the learning process. Instead, the student might set a goal "I will learn and practice ten expressions related to taking a patient's history this week".

With regard to the first stage, technology can be used to break down the goals into smaller attainable tasks, such as watching a particular video, making flashcards, practising pronunciation, or generating realistic role-play situations

using an AI tool. The key point is to integrate a personal goal into the dynamic system of learning activities. Moreover, to motivate the student to engage in the tasks, one might use the goal-setting technique in which the student should rationally decide why achieving the goal is important for them.

Performance is a period during which a learner undertakes planned actions and monitors their progress. At this stage, cognitive strategies play the most significant role. For example, a medical student might listen to a medical podcast, paying attention to the speaker's pronunciation, new words, contextual implications, and defining significant phrases from the material. The student may stop the podcast to replay confusing moments or record new terms with their definitions. All actions are taken to fully comprehend the material and engage in active learning.

Modern technologies offer a variety of tools for effective coding and labelling of materials with useful or doubtful content. The ability to pause, rewind, replay, underline, bookmark, search, and record helpful moments helps a medical student achieve the best learning performance. However, technology-assisted learning might become a distraction from studying due to pop-up notifications, advertisements, social media, and multiple tabs with different tasks. Therefore, an individual should manage their time and technological activities to maintain the quality of learning. To conclude, the final stage of self-regulated learning is reflection, meaning that the learner assesses their performance and plans future activities. In the context of Medical English, a student should reflect on how well they performed each task: did they understand a medical conversation, did they make any errors, how did they operate with pronunciation, etc. Technology can be used for self-assessment through multiple choice tests, written assignments, and recording devices to measure one's performance.

A personal learning journal or e-portfolio might be used to store all electronic achievements and measure progress. Finally, an AI tool is likely to provide the best performance for assessing a written medical task. However, the quality of reflection relies on an individual's capacity to detect errors and learn from them. After obtaining recommendations from the AI tool, the student should understand their mistakes and improve their performance in the next rounds of learning. Reflection therefore completes the cycle. The student uses the results of one learning experience to make decisions about the next one. This is consistent with Zimmerman's view of self-regulation as a cyclical process rather than a fixed personal characteristic.

Artificial intelligence has added a new dimension to technology-supported language learning. Students can now ask AI systems to explain vocabulary, simplify complex sentences, generate role-play situations, provide writing suggestions, simulate conversations, or give feedback on language use. For Medical English, these possibilities can be particularly useful because students can practise situations that resemble real communication.

For example, a student preparing for a clinical communication task could ask an AI tool to simulate a patient

with a particular complaint. The student could then practise asking questions, receive feedback on language, and repeat the interaction with greater confidence. Such activities may create opportunities for practice that are difficult to provide individually for every student in a large classroom. At the same time, AI raises an important question: Is the technology helping the student learn, or is it simply doing the learning task for the student?

If a student asks AI to write an entire case summary and submits the response without examining it, the technology may solve the immediate problem but contribute little to language development. If the student instead studies the response, identifies useful expressions, compares them with their own writing, revises the text, and reflects on recurring errors, AI becomes part of a self-regulated learning process.

The distinction is important. Technology should extend the learner's cognitive activity, not replace it. The goal is not to make learning effortless. The goal is to make learning more purposeful, supported, and manageable.

The discussion above highlights the close relationship between cognitive processes, self-regulated learning, technology, and Medical English development. In this learning process, the learner remains actively involved in planning, carrying out, monitoring, and evaluating English learning activities. Self-regulated learning develops through a continuous cycle of forethought, performance, and self-reflection, with reflection informing subsequent learning decisions and goals. Cognitive processes operate throughout this cycle as learners attend to information, process and organise new knowledge, retain it through memory, monitor their understanding, and reflect on their learning. Technology supports these processes by providing access to digital resources, interactive activities, personalised practice, feedback, and opportunities for independent learning. In Medical English learning, these resources can help students engage with language used in academic, clinical, and professional contexts while allowing them to select learning strategies according to their individual needs. Thus, technology is viewed not simply as a medium for delivering English content but as a resource that can support cognitive engagement and self-regulated learning throughout the learning process.

During forethought, digital tools can help learners identify needs, set goals, select appropriate resources, and plan learning activities. During performance, technology can provide opportunities for practice, repetition, multimedia input, interaction, and feedback. During self-reflection, digital tools can help learners review performance, identify weaknesses, record progress, and decide what to practise next.

The relationship between cognitive processes, self-regulated learning, and technology can be understood as a continuous learning process rather than as separate stages. Medical students begin by recognising their English learning needs and setting realistic goals, such as improving their ability to understand medical articles, communicate with patients, or write clinical reports. They then choose suitable digital resources and engage with them through attention,

information processing, memory, practice, and interaction. During this process, students can use digital feedback and other forms of support to monitor their progress and identify areas that need further practice. Reflection is equally important because students need to consider what they have learned, which strategies were useful, and where they still experience difficulty. For example, a student who struggles to explain a patient's symptoms in English may use a digital conversation tool to practise, review the feedback, repeat the activity, and gradually improve the way the information is communicated. In this way, technology becomes part of an ongoing process in which students plan, practise, monitor, reflect, and adjust their learning.

The aim is not to encourage students to use technology for the sake of technology but to enable learners to take advantage of the right tools for the particular learning needs. A pronunciation application might be useful when focusing on medical terms pronunciation, while a writing tool may be more relevant when practising developing clinical documentation skills. The value of technology is largely determined by purposeful use, active cognitive engagement, and learners' willingness to be responsible for their progress. Teachers' role is crucial, as they support learners in selecting the relevant resources, developing effective learning strategies, understanding the feedback, and relating digital practice to medical communication. When combined, these factors contribute towards enhanced learner autonomy while maintaining the focus on meaningful use of language in medical contexts.

Teachers can explicitly teach learners how to regulate their learning. Learners may know how to use an application, but they do not know how to learn from it. Teachers can model how to set goals in terms of note-taking, self-monitoring, reflection, and strategy selection. The digital activities need to promote active cognitive engagement. Instead of asking learners to simply watch the video, teachers can encourage learners to identify key expressions, organise the information, explain in their own words, and apply the language in a new clinical context. Subsequently, AI needs to be introduced with clear boundaries. Learners need support in understanding how the AI can be beneficial or how it may undermine their progress. The AI feedback should become the basis for reflection and revision.

Finally, teachers are still vital, even in technology-assisted learning contexts. Technology can offer accessibility, flexibility, and support, but it is the teacher who supports students in evaluating the information, selecting effective learning strategies, linking the language learning to professional contexts, and understanding the relevance of the particular learning experiences.

Technology has transformed the landscape for learning English, but the technology's presence is only part of the story. What the learners do with the given opportunities determines the learning outcomes. A medical student who establishes meaningful goals, focuses on the relevant information, practises intentionally, self-monitors, uses the feedback, and reflects on the process is likely to benefit more from the technology-assisted opportunities than a student who mindlessly goes through online activities.

A cognitive perspective offers a useful insight into the phenomenon. Learning involves attention, processing, organisation, storage, and active use of the information. Self-regulated learning adds the reflective component, which includes planning, monitoring, and evaluating. Technology can support each stage, but it cannot replace the learner's responsibility.

The presented ideas are unified around the cyclical view of the learning process that involves forethought, performance, and self-reflection. It also acknowledges the fact that Medical English learning has a specific purpose, as students are preparing not for an exam but for engaging in a variety of communication experiences with real patients and colleagues in the future.

The message, thus, is simple: technology is most useful when it empowers the learner rather than replaces him/her as the driver of the learning process. A cognitive and self-regulated approach can enable medical students to benefit from the given technology-assisted opportunities while also supporting educators in designing the teaching/learning contexts where technology, learner autonomy, and teacher guidance are unified. The suggested framework can be the basis for further empirical studies that seek to understand the relationships between these factors in actual Medical English settings.

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