Original Article

Interactive Approach in Teaching Pharmaceutical Terminology: Experience of Blended Learning

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Abstract

The article describes a study on enhancing the learning of Latin-Greek pharmaceutical terminology in the context of mixed education during war conditions. The research focuses on the use of interactive teaching methods, particularly the Miro board, to overcome challenges associated with the pandemic and war-related disruptions in traditional classroom training. This article examines the integration of interactive learning methodologies, particularly Miro boards, into the teaching of Latin-Greek pharmaceutical terminology. Faced with the challenges of the pandemic and the war, the Ukrainian higher education system adapted to a mixed education format. The study analyzes the impact of interactive methods on students' academic performance and psychological well-being. Using the example of the Miro interactive whiteboard, the technical possibilities of its use during the study of pharmaceutical terminology are demonstrated. The article illustrates the results of a survey among students regarding the use of interactive technologies and difficulties arising during distance and blended learning. The results show a significant improvement in performance among students using the Miro board, demonstrating its effectiveness in co-educational settings during wartime. The article emphasizes the importance of adapting learning tools to take into account the unique cognitive characteristics of today's students and highlights the role of interactive technologies in creating an engaging and stress-relieving learning environment.

Keywords: Interactive technologies, Pharmaceutical terminology, Mixed form of education, Blended learning

Introduction

The use of the latest methods and interactive learning technologies is a relevant aspect of the education system progression in Ukraine. More and more domestic scientists and teachers are interested in the use of certain applications and programs while working with students of higher educational institutions.

It should be noted that during the last few years, the system of Ukrainian higher education faced the urgent need to adapt the forms and methods of education to the challenges associated first with pandemic restrictions, and then with the war. For a long time, it was impossible to carry out traditional classroom training; thus, scientific and pedagogical workers began an active search for ways of using interactive teaching methods in teaching disciplines within all areas of higher education.

Materials and Methods

Several studies undertaken by domestic scientists have been devoted to the practice of using interactive methods and technologies while working with students of higher educational institutions. In particular, scientists such as V.P. Antiushko, V.S. Volkodavchyk, L.I. Senonogova, T.V. Sych, S.S. Blahun, and N.V. Stuchynska are interested in the problem. According to domestic experts, interactive teaching methods not only improve the interaction of the audience with the teacher, create appropriate feedback, and increase interest in the educational material, but are also directly related to the emotional state of the participants of such educational process [1;6;7]. It is worth mentioning that the peculiarities of the use of interactive technologies under the conditions of a mixed form of education have not yet been thoroughly analyzed. The authors of this paper are convinced that the application of interactive methods and programs in the educational process is a particularly urgent issue in modern conditions because the pandemic initially and then the war with Russia

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radically affected not only the direct form of the education organization (first of all, its distance form) but, more significant, it also influenced the psychological state of the learning process subjects. Therefore, the challenges related to the need not only to effectively present the educational material but also to overcome the potential psychological discomfort of students who have to master the discipline both in the classroom with numerous air alarms and outside it through remote communication have increased.

The purpose of the article is to investigate the key obstacles and problems in teaching Latin-language pharmaceutical terminology under the conditions of a mixed form of education and to practically confirm the expediency of using an interactive approach in teaching the mentioned discipline. The object of investigation is the process of studying Latin-Greek pharmaceutical terminology by students under the conditions of a mixed (auditory and distance) form of education. The subject of the study is the effectiveness of the interactive approach used under the conditions of the specified form of organizing educational activities.

As it has been properly stated by Blahun S.S. [3;5], who considers interactive technologies as implying cooperation, interaction, and activity through the intensification of cognitive activities, the researchers aim to track how interactivity and the use of such an application as the Miro board exactly help to overcome the cognitive and communicative barriers faced by students in the process of mastering Latin-Greek pharmaceutical terminology under the conditions of a mixed form of education considering high level of stress during the war.

The COVID-19 pandemic and the full-scale war of Russia against Ukraine affected the educational process because education initially took place in full distance form, and then it transformed into a combination of the latter with the classroom form. There is no doubt that distance learning can be useful in many issues: the ability to plan educational activities anywhere and anytime with virtually no restrictions; the availability of educational materials through the use of interactive technologies and multimedia (hence increasing interest in learning); the possibility of multiple reviewing of electronic material at the desired pace. Moreover, the unlimited communication between students, and during training – with teachers online results in the development of *soft skills*. However, it is worth focusing on the following problems that arise during distance learning:

1. Lack of motivation: distance learning may seem less important or meaningful to some students, especially if they do not have face-to-face contact with the teacher and fellow students.
2. Lack of structure: without a regular schedule and a fixed place where learning takes place, it can be difficult to organize time and adhere to a schedule of learning sessions.
3. Loneliness: distance learning can be a lonely experience, especially if students do not have the opportunity to interact with other students or instructors.
4. Lack of access to hardware and software: some students may have trouble accessing the necessary computer hardware to accomplish the required tasks to complete the course.
5. Lack of instant feedback: not being able to get an instant response from a teacher can create problems for the students who need help with their studying.
6. Internet connection problems: if students have Internet connection problems, they may miss important material taught in class or be disconnected from the learning community.
7. Low level of students' self-organization: distance learning requires significant self-discipline and focus.

Because both classroom and distance learning have their advantages and disadvantages, one can often observe a trend towards mixed learning or *blended learning* – a kind of hybrid method, which is a combination of online, traditional, and independent learning. The concept of *blended learning* is closely intertwined with the concept of adaptive learning, the main goal of which is to optimize and organize the learning process in a way that all its participants have the conditions of maximum accessibility and effectiveness of receiving educational services, regardless of personal characteristics and abilities [2;13;15]. Modern researchers (teachers) emphasize the importance of adaptive learning under the conditions of war, which should contribute to improving the interaction between the teacher and the student, thus reducing the impact of stress on the successful mastery of educational material. Apparently, under the conditions of constant intense stress during the war, the use of interactive technologies is more effective, which helps to relieve the psycho-emotional tension that arises among students when studying the material: the research is primarily into mastering Latin-Greek pharmaceutical terminology. Therefore, the use of modern computer technologies and applications is one of the means of increasing the adaptability of the learning process under the conditions of martial law and minimizing the stress factor when mastering the material. Undoubtedly, at this stage, both students and teachers in Ukraine are constantly in extreme psychological circumstances, under which the level of stress is consistently high. Despite this, the educational process must be continuous, because our country needs highly qualified specialists, especially doctors.

Under the conditions of war, the staff of the Bogomolets NMU have also an urgent need to organize such a form of student education that, first of all, would ensure high-quality educational services provided and, at the same time, allow students who are abroad or in the temporarily occupied territories of Ukraine to become full participants of the educational process even in remote mode.

Therefore, the university introduced a synchronous mixed classroom and distance form of education, in which the

educational process is carried out in a continuous mode with the use of both traditional classroom and distance learning methods and techniques. At the same time, the teachers of each of the university disciplines faced the challenge of adapting the educational material to this form of education organization.

Thus, to optimize the educational process under the conditions of a mixed form of education, the teaching staff had to master the tools of interaction with students that would be most effective in current circumstances. In particular, the teachers of medical terminology had to choose such interactive tools, which would not only be convenient when working in class but would also prove their effectiveness when teaching complex material of pharmaceutical terminology.

Here, it should be noted that while teaching Greek-Latin pharmaceutical terminology, it is necessary to take into account the following specific features:

1. pharmaceutical terminology covers an extremely large number of terms (the names of compounds and medicinal substances), for the acquisition of which the students have to learn rather a considerable amount of material by heart;
2. as a section of pharmaceutical terminology, medical prescription is regulated by an extremely large number of strict rules that require students to be attentive, focused, and scrupulous;
3. when learning pharmaceutical frequency segments, the students should develop visual memorization skills as much as possible to be able to write and pronounce the names of compounds and substances correctly.

Having chosen an interactive approach as the one that will allow overcoming didactic challenges in teaching pharmaceutical terminology within a blended learning environment, the authors of the article assumed that one of the most effective tools for this is the Miro interactive whiteboard. Therefore, taking into account the multifunctional interface of the application (the possibility of creating a large number of diverse educational tasks, which, apparently, perfectly combine the game aspect with learning), it was assumed that this interactive application will help improve students' concentration, increase their confidence in learning results, and develop memorization by increasing the visibility of the educational material.

As it was noted by Antiushko V.P., Volkodavchyk V.S., Senonogova L.I., and Sych T.V., due to the gamification of the educational process with the involvement of interactive technologies, the students themselves become active participants in the creative process of solving complex educational tasks. This, in turn, enables direct practical mastering of theoretical provisions [7]. Therefore, the effectiveness of the use of interactive technologies, namely the Miro board, is ensured not only by a multifunctional interface but also by gamification of educational tasks. Naturally, this playful aspect of using the technology should also contribute to reducing stress when learning pharmaceutical terminology.

Results and Discussion

To confirm the originally suggested hypothesis about the potential effectiveness of using the Miro board in teaching pharmaceutical terminology, it was decided to involve 5 groups of students in learning using this method, to compare their success with 5 other groups that studied without using interactive methods. It was done to find out the impact of focus groups of students on academic performance using the observation of their academic activities and the final questionnaire through the Google form.

For collaboration in the research groups, it was decided to use interactive learning technologies, namely the Miro online whiteboard toolkit, which allows one to work online while making corrections to the documents posted on it, and that can be authorized in various visual and supplemented visual aids: tables, documents, links, images. The mechanism of the Miro board allows one to store all the necessary materials in a virtual form, all students of the academic group can propose and synchronize their ideas and solve tasks together regardless of the format and location.

This teaching method actively involves the students in the learning process, as opposed to using slides for visualization, such as in a PowerPoint presentation. However, because the learning materials are always in "close contact", students take fewer notes and therefore have poorer memorization abilities. The choice of materials for presentations and visual explanations is extremely important because, with different possibilities and different colors, information can be lost; thus, the teacher needs to choose the means to keep the students' attention, which can be achieved by alternating them, diversifying the types of activities and interactive tasks. Now, it is important to outline the main aspects of teaching the thematic module of pharmaceutical terminology using the selected interactive application.

During the teaching of the "Recipe. Basics of pharmaceutical terminology" content module for students of the 222 Medicine specialty, the following toolkit of the Miro interactive board was used:

1. Using the blackboard as an ordinary classroom to explain the correct spelling of the names of medicines in Latin. More importantly, the teacher had the opportunity to highlight the features of writing in a different color (capital letters, endings, use of diphthongs or digraphs, transliterations of words of Greek origin into Latin).
   The teacher can use the Miro interactive board for a visual demonstration of the features of writing the names of drugs in Latin, which students have the opportunity to use while continuing to write dictation.
   One of the academic groups was asked to perform the task of systematizing pharmaceutical segments by drug

groups. Thus, grouping the proposed blocks into separate columns, the students concluded that the method speeds up the process of memorizing these groups of medicines and their correct writing in Latin.

2. In class, the teacher used the Miro virtual whiteboard to learn new terms and Latin pharmaceutical expressions from the minimum vocabulary list that students need to know as well as images to demonstrate the meaning of unknown substances (turpentine, camphor, castor oil, etc.)**.** The students could match these terms by creating a variety of tasks and exercises.
   For example, as is shown the colored stickers with prepared vocabulary in advance were used for the systematization task, and, as a result, memorizing pharmaceutical phrases used with the adjective "purified" (lat. depuratus, purificatus, rectificatus) on a specific example.
3. Creation of a collective virtual project with the possibility of adding personal ideas, images, text blocks, etc. In this case, the students can interact, discuss, and collaborate on a project (e.g. writing a pharmaceutical problem for asynchronous real-time collaboration). Sometimes participants lose the opportunity to contribute, which negatively affects remote brainstorming. To solve this problem, Miro gives each board editor equal editing rights, and all the changes are visualized online. Thus, communication for visualization is not just formed into a monologue or dialogue, but as a full-fledged polylogue.
4. The teacher creates simple visual instructions and tasks using images, colors, and categories for distributing the material, for example, while talking about the instructions for the use of substances in the Latin part of the prescription in the genitive case, the use of the imperative and conditional modes in the pharmaceutical expressions of the prescription line. This helps students better understand the material and remember it.
5. Use of templates and ready-made layouts that are useful for creating visual instructions and tasks, convenient and effective exercises. An offline whiteboard can be connected to Miro because the service works with Sketch, Adobe Creative Cloud, Rally, and Jira. A mobile application for iOS or Android can take notes by taking pictures of paper stickers, which are then recognized as digital stickers on an online whiteboard. Next, mnemonic cards, stickers, and notes can be created as in kanban boards for working with the project. Most importantly, there is no need to download materials to gadgets since the board is available online.
6. Just like on a real whiteboard, one can visualize things with shapes, add and format text, brainstorm ideas with stickers, and write with a pen. It is also possible to add frames or boxes to structure ideas and projects. They work just like pages or artboards on the canvas. Frames are great for displaying a whiteboard in presentation mode.
7. The teacher has the opportunity to mention someone on the downloaded file, thus redirecting the task to the student, and pointing out their mistakes. Even small features like being able to see each other's cursors may create a sense of presence, which is hard to have remotely.

Observing the learning dynamics and academic results of the students who studied the content module using an interactive approach, it was assumed that their academic performance should be higher compared to students who mastered the material using a traditional approach. Therefore, the evaluations of students in focus groups were compared. As a result, the success rate of students who worked with the Miro interactive whiteboard was 18-20% higher, which proves the effectiveness of the approach.

Also, to verify the originally mentioned hypothesis that the use of interactive technologies (and primarily Miro board) is effective and appropriate in the study of pharmaceutical terminology under the conditions of a mixed form of education during the war, a student questionnaire was conducted. The students were asked to answer questions aimed at 1) clarifying and outlining the main difficulties of studying pharmaceutical terminology by medical students; 2) identifying the main psychological problems that students face when studying the discipline, in particular, during a mixed form of education; 3) confirming/disproving the effectiveness of using interactive applications under the conditions of a mixed form of education. Now, the survey and its results will be considered in more detail.

Constant stress in war conditions affected such cognitive processes as memorizing new information, its analysis, etc. as evidenced by the results of the student questionnaire. 61% of the students surveyed said that the war had a powerful effect on their studies, as it became more difficult to concentrate and remember new material. Only 39% of students experienced minor difficulties, but their academic performance almost did not change.

Regarding the attitude of the students to the relevance of studying such a section of medical terminology as Latin prescription, 78% of students answered "yes", because the skills and competencies that will be needed when studying pharmacology are formed; 17% said "no", considering it a relic of the past since doctors mostly write electronic prescriptions using official language; and 6% of students found it difficult to answer Such results, on the one hand, show sufficient motivation of medical students to study pharmaceutical terminology; and, on the other hand, indicate that its study is quite difficult. Therefore, teachers face the need to use optimal educational tools when teaching this section of medical terminology.

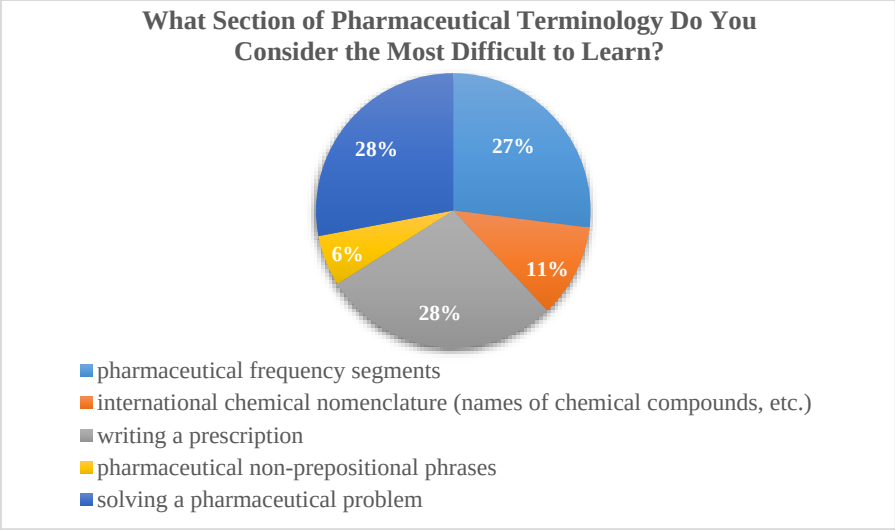

Figure 1. The most difficult sections of pharmaceutical terminology in students`opinion.

The opinions of students regarding the difficulty of studying pharmaceutical terminology were distributed as follows **(Figure 1)**:

- pharmaceutical non-prepositional expressions (6%),
- international chemical nomenclature, names of chemical compounds, etc. (11%),
- pharmaceutical frequency segments (27%),
- writing a prescription (28%),
- solving a pharmaceutical problem (28%).

Therefore, such results are directly correlated with the data of the answers to the previous question of the questionnaire, as they quite demonstratively reflect those aspects of studying this section of the discipline that pose difficulties for students, namely pharmacy sections, writing a prescription in Latin, and applying acquired skills when solving pharmaceutical tasks. Thus, it is likely that students who experience difficulties in studying these interrelated topics lose motivation to study them, arguing that this material is out of date. Next, the authors of this paper aim to prove that the use of an interactive approach, in particular, the Miro board, contributes both to the motivation of students and to improve the assimilation of the material during the study of the specified sections.

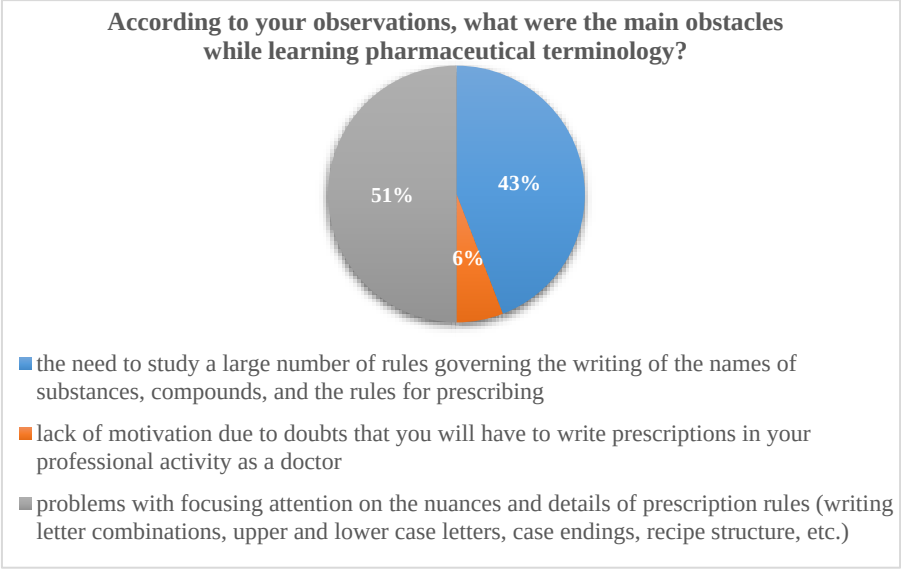

Figure 2. Illustration of students`survey about the obstacles while learning pharmaceutical terms.

Among the main obstacles on the way to learning pharmaceutical terminology, the interviewed students singled out:

- lack of motivation due to doubts that they will have to write prescriptions in their professional activity as a doctor (6%),

- the need to study a large number of rules governing the writing of the names of substances, compounds, and the rules for prescribing (43%),
- the presence of nuances and a significant number of recipe rules (writing letter combinations, upper and lower case letters, case endings, recipe structure, etc.) (51%) **(Figure 2)**.

A significant percentage of students who have indicated difficulties in mastering pharmaceutical terminology is quite predictable. It should be noted here that not only the actual complexity of the material, but also the need for maximum concentration of students' attention and extreme scrupulousness is an obstacle to high-quality assimilation of a significant number of rules for writing the names of compounds, pharmaceutical frequency segments, and prescribing prescriptions in general. The influence of social networks has also had a significant impact on the cognitive abilities of pupils and students, who are characterized by clip and fragmented thinking and attention. Therefore, teachers face a challenge to qualitatively and effectively adapt the presentation of material and educational exercises to such cognitive features of modern pupils and students.

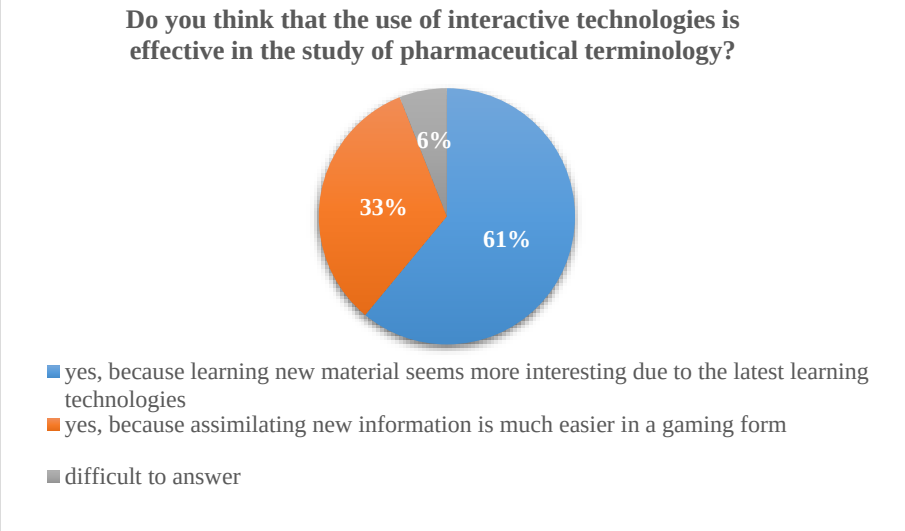

Figure 3. The results of the students` survey on the effectiveness of using interactive technologies whiles learning pharmaceutical terms.

61% of surveyed students consider the use of interactive technologies effective while studying pharmaceutical terminology because mastering new material seems more interesting due to the latest learning technologies. 33% of respondents believe that learning new information in a gaming form is much easier, and only 6% of respondents found it difficult to answer **(Figure 3)**. The surveyed students noted the positive effect of using the Miro board in classes.

Conclusion

1. The use of an interactive approach, in particular the Miro board, is an effective tool for teaching Latin-Greek pharmaceutical terminology due to a wide interface that allows not only to practice specific practical skills with the use of numerous options for task variability and high-quality visualization of specific terminological material but also helps to create a team space and to activate students' cognitive activity by the gamification of learning.
2. In our opinion, one of the main advantages of the interactive approach and the mentioned application, in particular, is that the game aspect of performing practical tasks greatly helps to relieve psychological stress and contributes to the formation, so to speak, of healthy academic enthusiasm.
3. In addition to the conditions of a mixed form of education, the use of the Miro board minimizes the communication distance between students who are in the classroom or join the class remotely.
4. Thus, both the absolute practical expediency and performing tasks through the Miro board are expedient to create a relaxed friendly, and, at the same time, productive atmosphere in the class, as well as to minimize the level of stress caused by the daily circumstances of life during the largest war in the modern world.

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