THE USE OF DRAWINGS AS A LEARNING STRATEGY IN HEMATOLOGY CLASSES: THE CONSTRUCTION OF KNOWLEDGE BY THE STUDENT

O USO DE DESENHOS COMO ESTRATÉGIA DE APRENDIZAGEM NAS AULAS DE HEMATOLOGIA: A CONSTRUÇÃO DO SABER PELO DISCENTE

EL USO DE DIBUJOS COMO ESTRATEGIA DE APRENDIZAJE EN CLASES DE HEMATOLOGÍA: LA CONSTRUCCIÓN DEL CONOCIMIENTO POR PARTE DEL ESTUDIANTE

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ABSTRACT

The study of hematology is multifaceted, requiring students to have both theoretical knowledge and prior ability to visualize complex microscopic structures. This work evaluated the impact of a methodology, using drawings of leukocyte morphology along with their morphofunctional description, with students from the Pharmacy course. This is a descriptive study, with a qualitative and quantitative approach, developed with 40 students enrolled in the Basic Hematology course of the Pharmacy program. Initially, the teacher gave a theoretical-practical presentation on the main characteristics of leukocytes, using microscopic slides to introduce and contextualize the content. Then, the students were instructed to draw the visualized cells and describe them in terms of morphology and function. Subsequently, a microscopic quiz was conducted to identify cell types before and after the activity, allowing for a comparative analysis. Finally, a Google Forms evaluation questionnaire was applied. As a result, a significant level of participation in the proposed activity was observed, with 35 students (87.5%) taking part. Regarding the assessment of self-perception of knowledge, a substantial modification was observed in the parameters presented by the students after the strategy, with the consolidation of learning. Regarding the activity's contribution to academic life, 85.7% of participants stated that the methodology helped elucidate robust concepts associated with cells, and 59.5% reported that the proposal facilitated microscopic visualization. It was concluded that the leukocyte drawing activity was effective in strengthening learning and connecting the practical and theoretical aspects of the Basic Hematology discipline.

Keywords: Active Methodologies. Drawing. Learning.

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RESUMO
O estudo da disciplina hematologia é multifacetada, necessitando dos estudantes conhecimentos teóricos e habilidade prévia na capacidade de visualizar estruturas microscópicas complexas. O trabalho avaliou o impacto de uma metodologia, utilizando desenhos da morfologia dos leucócitos juntamente com sua descrição morfofuncional, com discentes do curso de Farmácia. Trata-se de um estudo descritivo, com abordagem quantitativa, desenvolvido com 40 estudantes, matriculados na disciplina de Hematologia Básica do curso de Farmácia. Inicialmente, o docente fez uma exposição teórico-prática sobre as principais características dos leucócitos, com o suporte de lâminas microscópicas, de modo a introduzir e contextualizar o conteúdo. Em seguida, os alunos foram instruídos a desenhar as células visualizadas e descrevê-las quanto a morfologia e função. Subsequentemente, realizou-se uma gincana microscópica, com o intuito de identificação dos tipos celulares antes e após à atividade, possibilitando uma análise comparativa. Por fim, aplicou-se um formulário avaliativo Google Forms. Como resultado observou-se uma adesão expressiva à atividade proposta, com a participação de 35 alunos (87,5%). Quanto à avaliação da autopercepção do conhecimento, observou-se uma modificação substancial nos parâmetros expostos pelos alunos após a estratégia, com a consolidação da aprendizagem. Quanto à contribuição da atividade na vida acadêmica, 85,7% dos participantes afirmaram que a metodologia auxiliou na elucidação de conceitos robustos associados às células e 59,5% relataram que a proposta facilitou a visualização microscópica. Concluiu-se, que a atividade de desenho dos leucócitos foi eficaz no fortalecimento do aprendizado e na conexão entre os aspectos prático e teórico da disciplina de Hematologia Básica.

Palavras-chave: Metodologias Ativas. Desenho. Aprendizagem.

RESUMEN
El estudio de la hematología es multifacético y requiere que los estudiantes posean tanto conocimientos teóricos como la capacidad previa de visualizar estructuras microscópicas complejas. Este trabajo evaluó el impacto de una metodología, utilizando dibujos de la morfología de los leucocitos junto con su descripción morfofuncional, con estudiantes del curso de Farmacia. Se trata de un estudio descriptivo, con un enfoque cualitativo y cuantitativo, desarrollado con 40 estudiantes matriculados en el curso de Hematología Básica del programa de Farmacia. Inicialmente, el profesor impartió una presentación teórico-práctica sobre las principales características de los leucocitos, utilizando preparaciones microscópicas para introducir y contextualizar el contenido. Posteriormente, se instruyó a los estudiantes para que dibujaran las células visualizadas y las describieran en términos de morfología y función. A continuación, se realizó un cuestionario microscópico para identificar los tipos de células antes y después de la actividad, lo que permitió un análisis comparativo. Finalmente, se aplicó un cuestionario de evaluación mediante Google Forms. Como resultado, se observó un nivel significativo de participación en la actividad propuesta, con 35 estudiantes (87,5%) participando. En cuanto a la autoevaluación del conocimiento, se observó una modificación sustancial en los parámetros presentados por los estudiantes tras la estrategia, con la consiguiente consolidación del aprendizaje. Respecto a la contribución de la actividad a la vida académica, el 85,7% de los participantes afirmó que la metodología ayudó a dilucidar conceptos fundamentales relacionados con las células, y el 59,5% indicó que la propuesta facilitó la visualización microscópica. Se concluyó que la actividad de dibujo de leucocitos fue eficaz para fortalecer el aprendizaje y conectar los aspectos prácticos y teóricos de la disciplina de Hematología Básica.

Palabras clave: Metodologías Activas. Dibujo. Aprendizaje.

1 INTRODUCTION

Hematology is a specialty of medicine that studies the morphological, biochemical, and functional aspects of blood components and the organs involved in the process of formation, proliferation, differentiation, and maturation of blood cells, as well as quantitative and qualitative cellular changes (Jiménez, 2017; Borelli, 2023). This specialty deals with the detailed study of the physiological mechanisms of the red series, composed of erythrocytes whose main function is to perform tissue oxygenation, consisting of leukocytes that participate in the body's defense, and platelets, which play an indispensable role in homeostasis and coagulation (Jiménez, 2017; Hoffbrand; Moss, 2018). In addition, Hematology is dedicated to the study of pathologies resulting from changes in blood elements, such as anemia, polyglobulia, hemostasis disorders, coagulopathies and neoplasms, including the prevention, diagnosis, evolution and treatment of these conditions (Melo; Silveira, 2019; Lima *et al.,* 2024).

The discipline of Hematology, in the undergraduate course in Pharmacy, serves to train the student for the future exercise of the profession in Clinical Analysis. This subject is taught with theoretical and practical classes and in the latter, there is the performance of several laboratory techniques, highlighting the blood count. The realization of this exam is the main focus of teaching and is characterized by being a relatively difficult procedure to be performed, because the students who are going to take this discipline have a very elementary notion about optical microscopy and need the constant support of the teacher and monitors to establish themselves in this area.

The correct performance and interpretation of the blood count requires an in-depth understanding of the morphology of blood cells, their modifications associated with various diseases, as well as knowledge of how to use the microscope appropriately as a practical tool for the visualization of cells in the blood smear (Failace, 2015; Silva; Ribeiro Neto; Santos, 2017). The morphological identification of white blood cells, for example, requires visual training, concentration, and attention to microscopic details, which can be initially challenging (Rodak *et al*., 2020; Silva; Ribeiro Neto; Santos, 2017). Thus, during undergraduate studies in Pharmacy, many students face difficulties in transposing what they learn in theory to what they observe under the microscope. This fact may occur due to the resistance to playful and visual methods by many teachers, remaining in traditional teaching, which can create a distance between theory and practical reality (Lima *et al.,* 2019; Ferreira *et al.,* 2024; Marinho, 2025). In addition, there are factors intrinsic to the student, such as social and financial conditions, cognitive overload, lack of motivation and lack of interest, such individual attributes can lead to a stressful and inefficient scenario of the teaching-learning

process, reducing student engagement (Oliveira; Caggy, 2013; Freeman *et al.,* 2014; Salvatierra, 2019).

In this way, the "making of drawings by the students themselves" can be a pedagogical proposal that is inserted in the context of Active Methodologies, as it is characterized by the student's protagonism. Active Methodologies, which have been widely discussed and implemented in higher education, especially in the areas of health, are presented as teaching strategies that place the student at the center of the learning process, stimulating their active participation in the construction of knowledge (Ferreira *et al.,* 2024; Azevedo *et al*., 2025; Rocha *et al*., 2025; Rodrigues; Coutinho, 2025). In this format, the student ceases to be a passive listener of information and becomes a critical, creative, reflective, autonomous and independent subject about the contents studied, and this behavior is fundamental for their professional training (Cunha *et al.,* 2024; Ferreira *et al.,* 2024; Azevedo *et al*., 2025; Pancotto; Rosenau, 2025; Rodrigues; Coutinho, 2025). In addition, studies show that active approaches promote greater interaction between students and content, greater knowledge retention, stimulation of long-term memory, and consequently better academic performance, when compared to traditional teaching methods, highlighting some of the benefits of adopting this model (Freeman *et al.,* 2014; Ferreira *et al.,* 2024; Oliveira *et al.,* 2024; Azevedo *et al*., 2025).

Under this bias, the use of drawing stimulates the detailed observation, interpretation and creative and authorial reproduction of cellular structures, promoting visual reasoning and active learning, in which the student becomes the protagonist of his learning (Lima *et al.,* 2019). In addition, the act of drawing allows the visualization of concepts considered abstract for the student and promotes connections between the subjects studied (Pagliarini, 2016). Therefore, drawing should not be seen only as an artistic activity, but also as a way of learning that enhances the understanding of theory (Schwamborn *et al.,* 2010; Fiorella; Zhang, 2018). Thus, the use of illustrations is a potentially effective strategy, especially in disciplines that involve visual components, such as Hematology.

In this context, the present study aimed to evaluate the impact of the application of a methodology, using drawings of the morphology of leukocytes together with their morphofunctional description, carried out in order to solve the difficulties in microscopic visualization and to evaluate whether the learning was effective among the students of the Basic Hematology discipline of the Pharmacy course.

2 METHODOLOGY

This is a descriptive study, with a quantitative approach, developed with the aim of implementing and evaluating an active strategy in the teaching-learning process in Hematology. In this sense, we sought to use the drawing of blood cells, with emphasis on leukocytes, associated with the detailed description of their morphological and functional characteristics as a pedagogical tool for the fixation of contents and significant construction of knowledge. The methodology was structured in sequential stages and was applied in a class composed of 40 students from the 4th semester, regularly enrolled in the Basic Hematology discipline of the Pharmacy course. Initially, the professor responsible for the course made a theoretical-practical presentation on the main characteristics, classifications and functions of leukocytes, with the support of microscopic slides, in order to introduce and contextualize the content.

In the subsequent stage, the students were encouraged to produce schematic and illustrative images of the cells they had visualized, along with the description of the relevant morphological aspects, such as the size and color of the cell, cytoplasmic composition and nuclear shape, and also the physiological functions performed by each leukocyte. In addition, the students had the monitors of the discipline as an auxiliary element during the execution of the illustrations.

After completion, all students received a score, as an incentive to engagement, participation and commitment to the proposed activity. Then, as a complementary step, a practical gymkhana was carried out using microscopes, in which slides with leukocyte cells were added in order to analyze observation, microscopic interpretation and the ability to identify cell types before and after the activity, enabling a comparative analysis of its impact. Finally, an evaluation form was applied through the *Google Forms platform* in order to measure the perception of the students in relation to the adopted methodology, as well as its effectiveness in class learning.

Among the evaluative criteria contained in the form, the participants had to rate their ability to distinguish granulocytes and agranulocytes before and after the activity, using a Likert-type scale, composed of "very bad", "bad", "moderate", "good" and "excellent". Simultaneously, the students evaluated the activity of the drawing in terms of its efficacy for the association between the theoretical content and the cells seen in the blood distension, as well as its cooperation for the microscopic differentiation of leukocytes during the practical class and for the establishment of knowledge about these cells. Finally, the undergraduates selected those leukocytes that they had the greatest degree of difficulty in understanding morphofunctionally during exercise. This instrument allowed the collection of relevant data

on the acceptance of the method and its efficiency, enabling the analysis of its implementation in subsequent classes.

3 RESULTS AND DISCUSSION

3.1 PROFILE OF THE PARTICIPANTS

The adhesion of the students to the proposed activity was expressive, with the participation of 35 students, corresponding to 87.5% of the class formed by 40 students. This data shows a relevant level of engagement of academics, a considerable aspect when it comes to the implementation of active strategies in higher education. Strong participation can be understood as a strong indication of the acceptance of the pedagogical proposal, as well as its potential to arouse the interest of students in the content exposed, a factor that is essential for the efficiency of the teaching-learning process, making it less tedious.

3.2 EVOLUTION OF SELF-PERCEPTION OF KNOWLEDGE

Regarding the evaluation of the self-perception of knowledge, a substantial change was observed in the parameters exposed by the students before and after the methodology. Regarding granulocyte leukocytes (rod and segmented neutrophils, basophil and eosinophil), it was found that, prior to the illustrative exercise, 28 students (80%) classified their knowledge as ranging from very bad (8.6%), poor (37.1%) and moderate (34.3%). This initial data suggests a difficulty in assimilating the contents linked to this cell group, possibly associated with the complexity of understanding its morphological character, as well as the limitations presented in traditional teaching methods, commonly centered on the exposure of pictures from textbooks that differ from authentic visualization under the microscope, corroborating the obstacle of integrating theory and practice.

After applying the methodology, a significant inversion was observed in this panorama, with the same number of students, 28 students, corresponding to 80% of the total number of participants, categorizing their knowledge as good (54.3%) or excellent (25.7%). This change in the self-perception of comprehension demonstrates a strong indication that the didactic model adopted was effective in consolidating cell morphology.

At the same time, similar results were observed with regard to agranulocyte leukocytes (lymphocyte and monocyte). Prior to the activity, 23 students (65.7%) considered their understanding as very bad (8.6%), bad (17.1%) or moderate (40%), reinforcing, once again, the existence of gaps in initial learning. After the suggested intervention, there was an evolution in the level of security in the self-perception of knowledge, with 31 students (88.6%) evaluating it as good (48.6%) or excellent (40%). This significant increase reinforces the

effectiveness and demand of the technique used, indicating that initiatives that encourage the active participation of the student as a central agent in their intellectual and scientific construction process can add to the solidification and self-confidence in their learning.

The aforementioned results are in agreement with the literature studied, which showed that drawings executed by the students themselves favor the development of effective learning of the proposed content (Schwamborn *et al.,* 2010; Fiorella; Zhang, 2018; Cromley; Du; Dane, 2020; Navratil; Kühl, 2023).

The integral analysis of the data of the present study allows us to conclude that the pedagogical approach not only favored the improvement of the self-perception of knowledge, but also played a crucial role in the positive impact on the assimilation of the subjects, enhancing its conceptual and practical mastery, elements that are closely related to academic self-confidence. However, it is worth noting that self-perception, although significant, has a subjective bias since it can be influenced by personal factors such as motivation, interest and individual stimulus. Thus, its interpretation must be made in a critical and rational way, combined, when possible, with other evaluative criteria.

3.3 IMPACT ON THE INTEGRATION BETWEEN PRACTICE AND THEORY

Regarding the students' view of the contribution of the activity to their academic life, 30 participants (85.7%) stated that the methodology fulfilled its initial objective of assisting in the elucidation of robust concepts and functional details associated with the defense cells of the human body. This answer signals the relevance of tools that can overcome the traditional aspects of teaching blood cells and that emphasize the importance of integrating the function with its given morphology, especially white blood cells. Thus, the assimilation of this morphofunctional basis is essential and should be consolidated during graduation, enabling the training of professionals capable of detecting possible pathophysiological changes.

In addition, the students' perception regarding the reading of slides under the microscope after the developed strategy was evaluated, in which 22 students (59.5%) reported that the proposal facilitated the visualization of the cells in the blood distension under the aid of the microscope during the practical class in the laboratory. Although this percentage is comparatively lower than the others, it still includes the majority of participants, showing that this didactic method had repercussions on the improvement of the practical ability of microscopic observation.

Another factor that clarifies this quantitative finding is that the identification of blood cells in hematological slides requires not only theoretical knowledge, but also laboratory experience that is acquired through the development of specific visual skills obtained by

recurrent practice. In this sense, the activity reveals itself as an initial facilitator, contributing to the habituation with the cellular structures and the technical criteria for their correct identification.

From this perspective, the methodology was able to promote the integration between practice and theory, a fact that was validated by the students, of whom 24 (64.9%) agreed that the artistic and descriptive exercise served as an efficient instrument in establishing this connection. Therefore, pedagogical approaches that transcend the limit between concept and execution are essential to promote critical and reflective attitudes during the study, aiming at the application of scientific knowledge in real situations in the laboratory.

Corroborating the data found in the present research, there is a study carried out by Oliveira, Silva and Duarte (2019) with students of the Histology discipline of the Physiotherapy Course of a Public University, whose result showed that the drawing method based on the observation of histological slides, helped in the theoretical-practical development of the undergraduates.

3.4 DIFFICULTIES EXPERIENCED BY STUDENTS

Despite the positive results, the analysis of the data was not restricted to this aspect and evidenced the specific difficulties faced by the students. According to the evaluative form, the leukocytes that presented the highest level of difficulty in terms of morphological differentiation and identification under the microscope were eosinophils and monocytes, while in terms of functional characterization were basophils and eosinophils. These impasses can be justified by the intrinsic characteristics of these cells, such as the coloration of the granules, the low frequency in blood smears because they are few in the peripheral circulation, and the morphological similarity with other granulocytes, especially in the case of basophils, whose granules are profoundly dark, obscuring the visualization of their nucleus.

Thus, understanding the functions of these leukocytes can be more complex, since it involves immunological processes, such as allergic reactions and responses to the presence of parasites, which are not commonly addressed in depth in the initial semesters of training. In addition, during the elaboration of the activity, the monitors of the discipline played an essential role as mediators of learning, offering a follow-up of the classes and reinforcing the main criteria to be observed under the microscope and reproduced in the drawing. After applying the methodology, the monitors were also active in answering questions and mitigating, together with the students, these difficulties that were listed later.

From a critical point of view, the outcomes obtained demonstrate that the applied strategy has potential as a teaching tool, as reports in the literature show that the execution

of a drawing is associated with the stimulation of memory and perceptions, with a consequent increase in the capacity for observation and concentration (Ramos; Porfírio, 2011; Palheiro, 2020).

However, the results of the present study also highlighted the need for adjustments and complementations, especially with regard to the development of more refined practical skills, the approach to contents considered more complex, such as leukocyte functions, and the establishment of a greater number of evaluation criteria.

In summary, the investigation of the data suggests that the use of active pedagogical approaches, such as the combination of cell design and its morphofunctional description, can represent an interactive and strategic resource in the teaching of Hematology, enabling the improvement of skills crucial to the training of pharmaceutical professionals. Therefore, its implementation should be continuous, improved and integrated with other pedagogical schemes, in order to enhance its effects and explore its applicability in the study of other areas, such as Histology, Embryology and Anatomy, frequent disciplines in health courses.

4 FINAL CONSIDERATIONS

The design of white blood cells associated with their morphological and functional description demonstrated efficacy in strengthening learning and in the connection between the practical and theoretical aspects of the discipline of Basic Hematology. Therefore, the data obtained indicate that visual and active strategies can minimize common difficulties in cell identification, increase student engagement and favor a more solid and interactive learning. In addition, there has been an evolution in the visual understanding of leukocytes, indicating that the method has helped in the critical and detailed observation of their morphological characteristics, although there are still some difficulties in differentiating and identifying more complex cellular attributes.

In this way, illustration presents itself as an important and effective pedagogical tool in the learning process of blood cells, especially leukocytes, indicating the need for its progression and continuous application with the improvement of more objective evaluative criteria in order to maximize its effect in the academic context.

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