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Students' perception of educational anatomy games as a complementary tool in higher education

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ABSTRACT

The teaching of human anatomy, fundamental for courses in the health area, has historically been centered on memorization, which can demotivate students. The traditional teaching method, based on the transmission of complex information, faces difficulties due to technical language and lack of student engagement. Given this scenario, innovative pedagogical methods, such as game-based learning (APJ), emerge as a promising alternative. Educational games offer a dynamic approach to making learning more engaging, aligning with the search for playful methods that arouse interest. This research explores the potential of educational games in the teaching of human anatomy, considering theoretical contributions from scholars such as Vygotsky and McGonigal. Previous studies highlight students' preference for the use of games as a means of learning and evidence the effectiveness of different game formats. Thus, investigations on the impact of these innovative approaches in promoting more effective learning in anatomy are fundamental.

Keywords: Anatomy teaching, Educational games, Human anatomy.

INTRODUCTION

Human anatomy, a crucial discipline in the formation of health courses, historically requires students to have great memorization skills (SINGH et al., 2019). However, many students, especially freshmen, face a monotonous and demotivating learning process (Salbego et al., 2015). The traditional teaching of anatomy, focused on the transmission and memorization of structures with complex morphologies and physiologies, faces obstacles such as intricate technical language (FORNAZIERO, 2019).

In the face of these challenges, innovative pedagogical methods are needed to captivate and engage students more effectively. Authors such as Silva and Guimarães (2018) emphasize the importance of methods that make learning more enjoyable from the early stages of the course. Game-based learning (APJ) emerges as a promising approach in the teaching of anatomy (ROCHA and LEMOS, 2014).

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Educational games offer a dynamic alternative to make learning more engaging (FOUREAUX et al., 2018), in line with the search for playful methods that arouse interest, as proposed by Roman et al. (2017) and Costa et al. (2020).

This research explores the potential of educational games in the teaching of human anatomy, considering the contributions of scholars such as Vygotsky (2003), who highlights the role of play in proximal development, and McGonigal (2012), who emphasizes how good games generate positive experiences and active participation. Students' preference for frequent use of games as a means of learning (Anđić et al., 2018) and studies that evidence the effectiveness of games based on different formats, such as cards, board and Q&A strengthen the theoretical basis for research on the impact of these innovative approaches in promoting more effective learning in anatomy (KAMRA et al., 2017; HILL and NASSRALLAH, 2018; PROCHAZKOVA et al., 2019; ROHLFSEN et al., 2020).

This study investigated the students' perception of educational anatomy games, analyzing their contribution to interest in learning, understanding of concepts, ease of memorization and motivation to learn. It also evaluated the ability of games to address different anatomy topics and their usefulness in reinforcing learning outside the classroom. The results can provide subsidies for educators and game developers, helping to improve these tools and improve the teaching of anatomy.

OBJECTIVE

This study aims to investigate the effectiveness of educational games in the teaching of human anatomy, focusing on the perception of students.

METHODOLOGY

This study used a cross-sectional research design to collect data on students' perception of educational anatomy games. This type of study is suitable for assessing the prevalence of certain characteristics or opinions in a population at a given time. All ethical guidelines relevant to research with human beings were followed, ensuring the informed consent of the participants, confidentiality of data and respect for privacy. Participants had the right to withdraw their consent at any time without penalty.

All students from the selected courses were included in the sample and participated in the activity, ensuring a diverse representation of the student population. The study included 152 freshmen of Biomedicine, Pharmacy and Aesthetics courses of different ages and gender, from the UniFECAF University Center in the city of Taboão da Serra, state of São Paulo.

Data were collected using a printed questionnaire developed specifically for this study. The questions were multiple-choice about the use of educational anatomy games and the participants'

perception of their effectiveness. The answers were recorded anonymously to ensure the confidentiality of the participants.

Variables of interest included increased interest in learning anatomy, understanding of concepts, ease of memorization, motivation to learn, effectiveness in review and practice, interactive and engaging form of learning, preference for educational games over traditional methods, ability of games to address different anatomy topics, its usefulness to reinforce learning outside the classroom and the recommendation of games to other students.

The data were analyzed using descriptive statistical analysis to calculate the frequencies and percentages of responses to each question in the questionnaire.

DEVELOPMENT

The results of this research provide a deep insight into the participants' perception of the role of educational games in anatomy learning, echoing and amplifying the discussions present in contemporary educational literature. Among the demographic aspects, the predominance of the age group between 18 and 24 years, 72%, (Figure 2, question 11) reflects that the sample is mostly composed of young students at the beginning of their first higher education course. The teaching of anatomy is often monotonous and demotivating, especially for first-year students who have not yet had previous contact with the contents and do not recognize the importance of deepening the subject (SALBEGO et al., 2015). In addition, the majority of female representation, 83%, (Figure 2, question 12) reflects the current composition of courses in the health area, highlighting the relevance of these perceptions in the educational context.

The unanimous agreement in 95% (Figure 1, question 1) on the ability of educational games to make anatomy learning more interesting is in line with the trends observed by authors such as Rocha and Lemos (2014), who highlight Game-Based Learning as an effective strategy to engage students. This innovative approach not only resonates with Silva and Guimarães' (2018) perspective on the need for more engaging and attractive methods, but also reflects the ability of games to transform students' perceptions of subjects that are considered challenging.

Anatomy is a discipline with vast and detailed content, which requires significant memorization capacity, but is extremely important for the health area (Singh et al., 2019). In this way, games are no longer just entertainment and are now recognized as important tools to transmit these conceptual contents (ROCHA and LEMOS, 2014). In this scenario, instead of just memorizing content, students start to develop skills that allow them to build new knowledge (CALDEIRA, 2009).

The finding that 82% (Figure 1, question 4) of the participants believe that educational games provide a deeper understanding of anatomy concepts is congruent with the proposals of Plass et al. (2015), which highlight the ability of games to promote more meaningful learning. According to Braad (2018),

game-based educational games require metacognition, as they demand constant awareness of cognitive processes, knowledge, strategies, and feelings. The arguments of these authors converge in favor of the use of games in learning, highlighting their ability to motivate students to stay longer in the activity, their adaptability when considering students' previous knowledge and self-regulation skills, and the permission for failure, which can arouse interest in exploration and overcoming, providing learning opportunities.

The effectiveness of games in retaining information, 84% agree (Figure 1, question 5) resonates with the idea of McGonigal (2012), who highlights the ability of good games to promote positive experiences and, consequently, favor the retention of content in an active and voluntary way. This finding suggests that, by making learning more memorable, educational games can overcome challenges inherent to traditional anatomy teaching (FORNAZIERO, 2019). The traditional teaching of anatomy emphasizes the transmission and memorization of the structures and functions of the organs of the systems of the human organism. Despite the students' interest in studying their own bodies, the technical and complex language makes the contents difficult to understand, harming the teaching and learning process. (Fornaziero AM, 2019).

The positive perception of the motivation to learn anatomy, 86% agree, (Figure 2, question 6) is in line with the principles discussed by Rocha and Lemos (2014), demonstrating that games not only instruct, but also motivate students. This is crucial considering the trend of demotivation often associated with traditional teaching. It is indisputable that the use of playful activities in teaching arouses greater interest in students, making the learning experience more enjoyable and contributing to a better assimilation of knowledge (ROMAN et al., 2017; COSTA, et al., 2020).

The acceptance of educational games as an effective way to review and practice anatomical concepts, 86% (Figure 2) is supported by studies that emphasize the importance of active engagement in the consolidation of learning (PLASS et al., 2015). This highlights the relevance of games not only as teaching tools, but as valuable instruments for reviewing and reinforcing acquired knowledge.

Interaction with games of any nature promotes significant gains in people's cognitive structure (FENG et al., 2007). They also improve performance in activities that require attention, reduce distraction, stimulate rapid response, and improve basic visual ability (W.O. et al., 2012). In this sense, it is known that contact with games over time improves performance in tasks that require cognitive abilities (BOOT et al., 2008). The author Miranda (2001) points out that numerous objectives, such as learning, affection, socialization, motivation and creativity, can be achieved through didactic games.

The less unanimous view on the interactivity and involvement of educational games 44% agree, (Figures 1 and 2) suggests that, although many students perceive these elements, a portion still does not fully experience the immersion proposed by games (ROMAN et al., 2017). This diversity of perceptions

underscores the importance of considering different learning styles when implementing game-based strategies.

The preference expressed by 61% (Figure 2, question 9) of the participants for the use of educational games compared to traditional methods highlights the paradigm shift that is taking place in the teaching of anatomy. This reinforces the idea that educational games are not only accepted but also desired by students as a viable and effective alternative to traditional teaching. Educational games are considered an effective way to complement traditional teaching methods, offering greater effectiveness in the acquisition of knowledge compared to traditional expository classes (BRAZ, 2014; WEINTRAUB, HAWLITSCHEK and JOÃO, 2015).

The finding that 60% (Figure 2, question 10) of the participants believe that educational games adequately address the different topics of anatomy validates the versatility of this approach, pointing to the ability of games to cover a variety of anatomical contents. As an example, card-based games have demonstrated comparable or superior effectiveness to traditional teaching methods, being well accepted by students and resulting in improvements in formal assessments.

The receptivity of students 89% (Figure 2, question 11) towards the potential of educational games to reinforce anatomy learning outside the classroom suggests that these tools can serve as complementary resources, extending the educational experience beyond the physical boundaries of the institution (ANDIĆ et al., 2018). In addition, the effectiveness of the games was proven by the improvement in the results of evaluations after their application (PROCHAZKOVA et al., 2019; ROHLFSEN et al., 2020).

The recommendation expressed by 93% (Figure 2, question 12) of the participants for the use of educational games adapted for anatomy highlights not only the acceptance, but also the recognition of the success of these approaches by the students themselves (WEINTRAUB, HAWLITSCHEK and JOÃO, 2015). Studies reveal that students have a great interest in using games as a learning tool and would prefer them to be incorporated more frequently into classes (ANDIC et al., 2018). This high recommendation rate suggests that students not only value the effectiveness of educational games for their own learning, but also see potential for collective benefit, highlighting the socially engaging aspect of these tools (FERNANDES, 2010).

By integrating these results with the perspectives of the aforementioned authors, it is evident that the game-based approach is not just an illusion but an effective response to the challenges faced in teaching anatomy. Authors such as McGonigal (2012), Plass et al. (2015), and Rocha and Lemos (2014) emphasize the ability of educational games to generate positive experiences, promote engagement, and favor knowledge retention (all elements corroborated by the results of this research).

In addition, the preference expressed for educational games compared to traditional methods highlights the need for innovation in the teaching of anatomy (BRAZ, 2014), overcoming the limitations

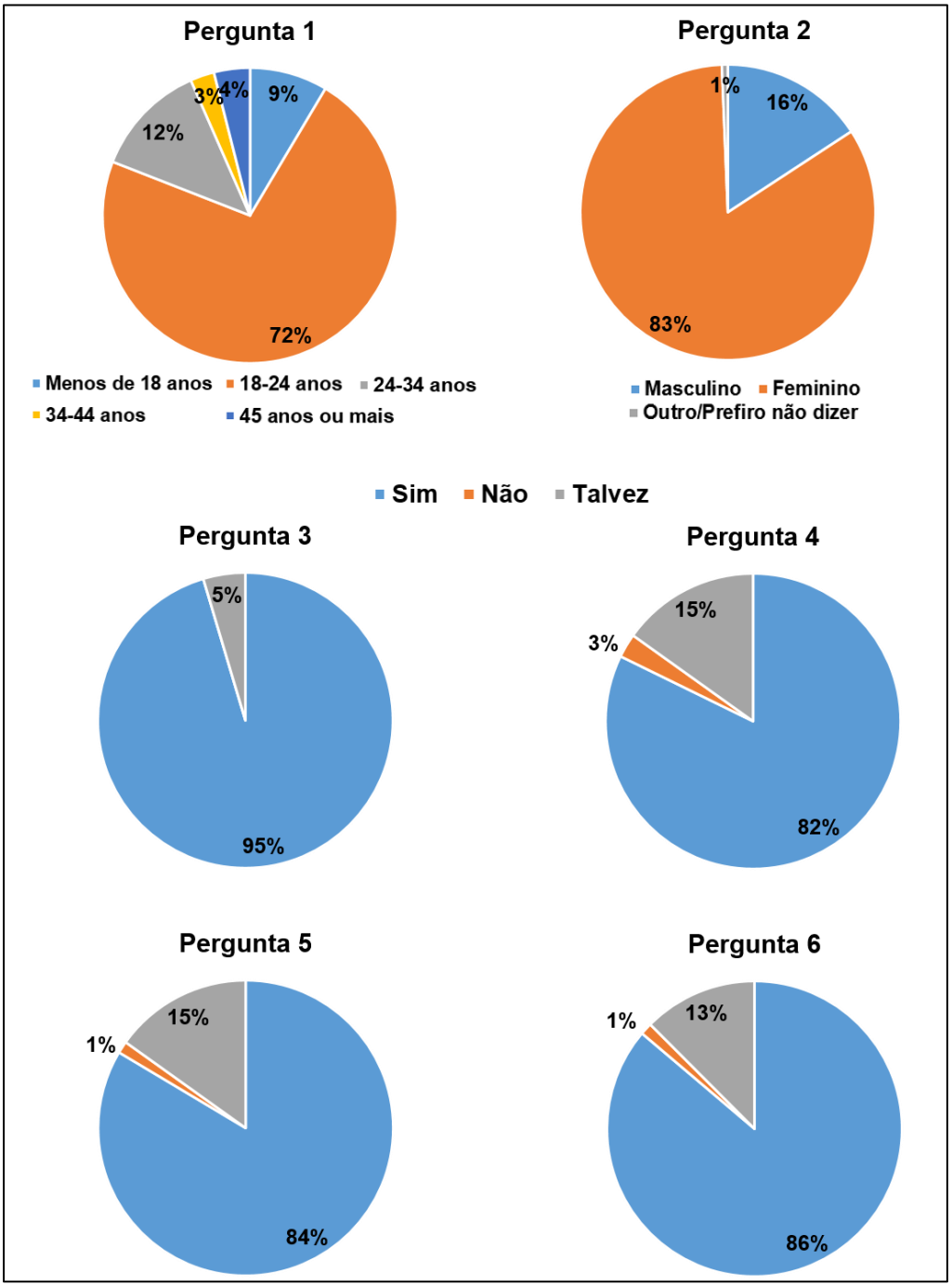
of the traditional approach, recognized by Santos et al., (2017). Although the use of information and communication technologies for the production and execution of educational games has been a trend, not all higher education institutions have access to these resources (REIS et al., 2016; LOBO and MAIA, 2015). However, other types of games, such as dramatization and card games, have been adopted as more economically accessible alternatives (LUCCHETTI et al., 2017; HILL and NASSRALLAH, 2018; PAIVA et al., 2019).

The finding that card-based games, board games, task accomplishment games, and questions and answers have been effective in anatomical learning adds a practical dimension to the discussion, demonstrating the diversity of possible approaches with educational games accessible to university centers (KAMRA et al., 2017; HILL and NASSRALLAH, 2018; PROCHAZKOVA et al., 2019; ROHLFSEN et al., 2020; VAENA and ALVES, 2018; MOSALANEJAD et al., 2020; HANCOCK et al., 2021; RAHM et al., 2021).

It is worth noting, however, that although most participants expressed a positive view of educational games, a significant percentage still expressed doubts or more neutral considerations (answering "maybe" in several questions). This diversity of responses highlights the importance of flexible approaches, capable of meeting different learning styles and individual expectations (VYGOTSKY, 2003). Therefore, educational game implementation strategies must be carefully planned to provide a comprehensive educational experience.

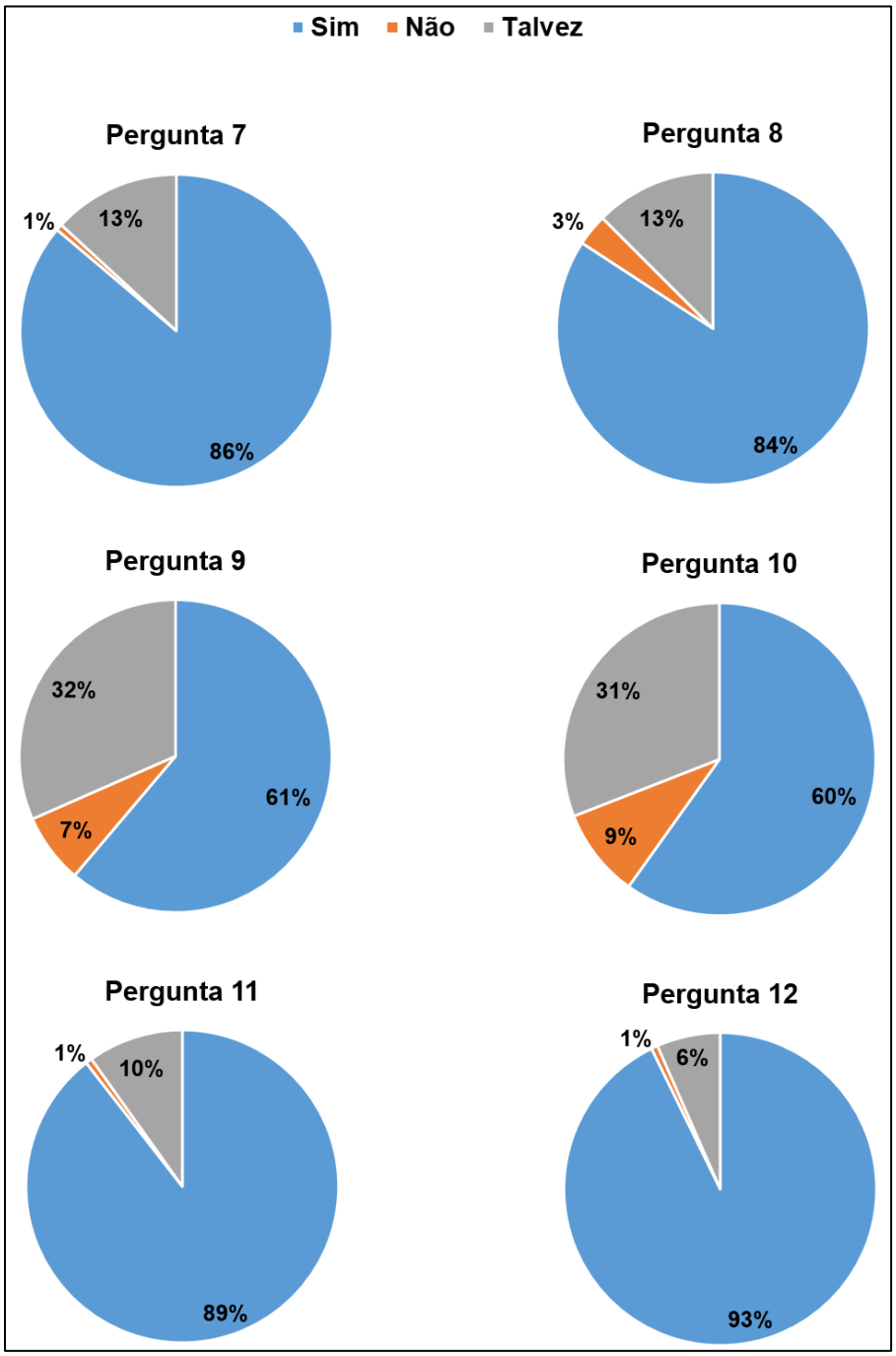
Therefore, the results of this research, when contextualized with the perspectives of other research, reveal not only a widespread acceptance of educational games in the teaching of anatomy, but also point to their transformative potential. When considering student preference, perceived effectiveness, and nuances identified in the research, it becomes evident that educational games represent a valuable approach to addressing contemporary challenges in anatomy teaching, providing an innovative and assertive alternative in the educational setting.

Figure 1: Distribution of the percentage of the questionnaire carried out with the students participating in the anatomy games: questions from 1 to 6.



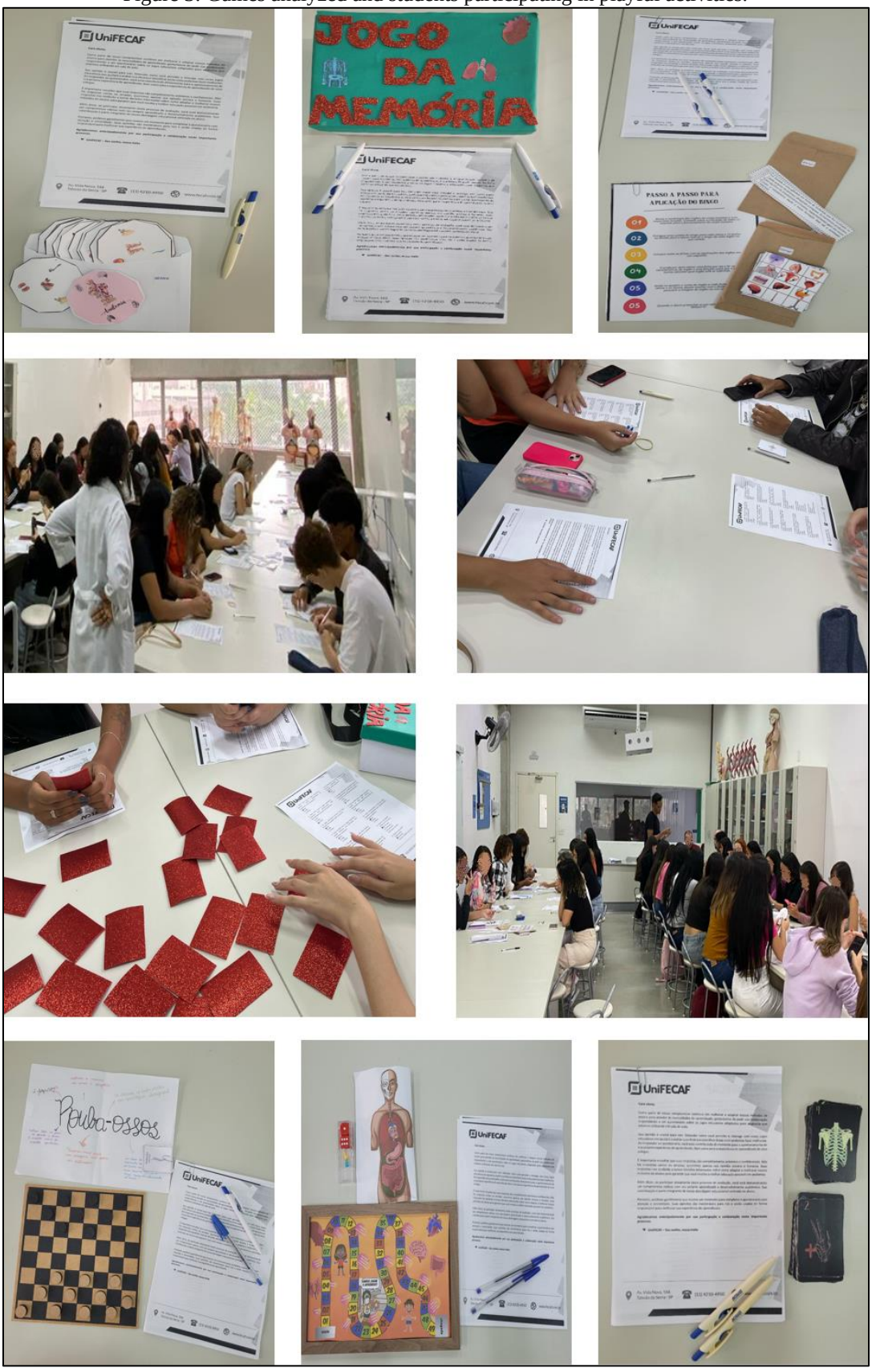
Source: the authors.

Figure 2: Distribution of the percentage of the questionnaire carried out with the students participating in the anatomy games: questions from 7 to 12.



Source: the authors.

Figure 3: Games analyzed and students participating in playful activities.



Source: the authors.

FINAL CONSIDERATIONS

Based on the answers provided by the survey participants on educational anatomy games, it can be concluded that these tools are widely accepted and perceived as beneficial for learning the discipline. Most students believe that educational games make learning anatomy more interesting, facilitate memorization, improve motivation to learn, and are effective in reviewing and practicing concepts. In addition, participants consider educational games to be an interactive and engaging way to learn about the human body, expressing a preference for them over traditional teaching methods.

The results suggest that educational anatomy games are a valuable tool in the teaching of the subject, and can increase interest, motivation and learning effectiveness. However, it is important that these tools are developed in a way that comprehensively and effectively addresses the different topics of anatomy, ensuring that they meet the needs of students in a complete way.

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