INTEGRATING WOOCLAP AS AN EDUCATIONAL TOOL IN HISTOLOGY PRACTICE FOR HEALTH SCIENCES UNIVERSITY PROGRAMS

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Abstract

Histology is a key component of the Biology course for first-year students in most health sciences degrees in Spain. Laboratory practices using a microscope complement this subject and are essential for both Physical Therapy (PT) and Podiatry (Po) students, as they provide a basis for understanding the microscopic structure and function of tissues. Students often struggle to interpret what they observe and relate it to their theoretical knowledge. The use of virtual tools in and out of the classroom, such as Wooclap, offers an opportunity to enhance student learning by providing a platform to improve their knowledge acquisition. This study compares the use of Wooclap as a tool for enhancing learning in histology practice with traditional methods. Students enrolled in PT and Po Biology courses spend only five hours in laboratory sessions using a microscope, which is insufficient time to acquire an in-depth understanding of the subject. The development of various Wooclap events, including images of the slides observed during laboratory sessions, enhances student learning. These activities assist students in retaining concepts and visual images, enabling them to distinguish between different cells and tissues long after the sessions have ended. In academic years when Wooclap was integrated as a supplemental learning tool, student pass rates increased by 20% compared to those who did not use the platform. Approximately 81% of PTD students and 92% of PoD students completed the assigned activities. Notably, students who did not engage with Wooclap were also absent from the final exam. In terms of the types of Wooclap questions used, students found multiple-choice and matching-based questions more accessible. In contrast, tasks requiring the labeling or location of cells and structures within images were perceived as more challenging. In conclusion, the incorporation of Wooclap as a complementary tool alongside traditional laboratory practice sessions is both effective and feasible. Its use enhances student learning and facilitates the assimilation of key concepts in Histology, particularly for first-year health sciences students. The findings of this study indicate that the implementation of Wooclap in other health sciences programs has the potential to foster student engagement and comprehension.

Keywords: Physical Therapy, Podiatry, Histology Education, Wooclap, Undergraduate Perceptions.

1 INTRODUCTION

In university subjects related to health sciences, learning histology it is essential to reinforce the theoretical biology knowledge related to the fine structure of cells and tissues, through laboratory practices. During the laboratory sessions, students learn how to use the microscope to visualize, identify, and interpret the presence of cells in tissue samples on slides, allowing them to understand the three-dimensional organization of these structures. However, undergraduate students have difficulties recognizing different types of tissues in such a short time [1].

To address this problem, teaching strategies have arisen to engage and motivate students to understand the histological organization of tissues and organs through information and communication technologies as virtual microscopes [2], [3], tissue modelization [4], online atlases [5], e-learning [6], interactive programs [7] and other activities as drawing [8] or Wooclap [9], [10]. Among participatory tools, Wooclap stands out as an effective and dynamic platform. It provides a comprehensive solution that benefits both educators and learners. Through its interactive features, Wooclap encourages each student to actively engage in the learning process by fostering real-time interaction with both the instructor and classmates [11], [12]. This active involvement not only reinforces understanding but also promotes critical thinking and retention of knowledge, making learning more meaningful and memorable and enabling immediate feedback.

In the context of higher education, Wooclap has been successfully integrated across a wide range of disciplines, not only in the health sciences [13] but also in engineering [14] and social sciences [15]. Empirical evidence suggests that the platform enhances student attention and motivation, largely due to its capacity to support a variety of question formats [14]. These features enable instructors to detect misconceptions in real time and to address learning gaps promptly, thereby fostering a more adaptive and effective teaching environment [16].

In this study, Wooclap was utilized during histology practical sessions to display high-resolution tissue images accompanied by interactive quizzes, in first year physical therapy (PT) and podiatry (Po) students. This approach enabled students to identify structures, locate specific cells within tissues, and receive immediate feedback. The interactive nature of the platform enhanced student engagement, reinforced comprehension and retention, and fostered the development of diagnostic thinking skills. To evaluate student satisfaction with Wooclap, surveys were administered.

2 METHODOLOGY

The study cohort consisted of first-year students from two Health Sciences degree programs: PT and Po Wooclap, a digital interactive platform, was implemented to support Histology laboratory practices, specifically targeting the analysis and interpretation of microscopy slides. The primary objective was to enhance students' ability to accurately identify cells and tissues on histological slides during Biology Laboratory Practices (BLP) using a microscope. To develop this supplementary learning tool in a Wooclap format, BLP professors selected high-resolution microscopic images that matched the slides examined in laboratory sessions and developed targeted Wooclap activities to reinforce the identification of cell types and tissue structures. These activities served as a formative review tool aligned with the content of each session.

Students participated in five 75-minute sessions. The initial session was dedicated to introducing basic microscopy techniques, including proper microscope use and the preparation and visualization of slides. During this session, students were invited to engage with Wooclap activities. The subsequent four sessions focused on analyzing different tissue samples to develop proficiency in identifying characteristics of cells and tissue organization. These final four sessions incorporated supplementary Wooclap activities.

PT and Po students were divided into four placement groups. All students received the same pre-session materials via Moodle and received identical in-class explanations from the teaching staff. Participation in the Wooclap activities was voluntary, however, students who completed these additional exercises were eligible for a maximum bonus of 10% on their lab grade.

The structure and delivery of the Wooclap activities differed slightly between the two degree programs: 1) PT students completed two Wooclap assessments, each covering two laboratory sessions (sessions 2-3 and 4-5). Each assessment consisted of 10 questions per activity, including six multiple-choice questions, three image-based identification or labelling tasks, and one matching exercise. 2) Po students completed four separate Wooclap activities, one for each session, with each consisting of seven questions: two multiple-choice questions, two image identification tasks, two labelling exercices, and one matching task.

To complement the educational content, each Wooclap activity included a brief set of questions to evaluate student satisfaction and perceptions of the tool's usefulness in supporting their learning. The survey consisted of 3 questions based on a Likert scale (ranging from 1, Strongly Disagree to 5, Strongly Agree) [17]. The responses were exported and analysed using Excel. A descriptive analysis of percentages for qualitative variables was conducted.

3 RESULTS

This paper shows the results of the use of Wooclap activities as a tool to improve the learning of histology in undergraduates from PT and Po of the Complutense University of Madrid.

3.1 Physical Therapy Degree (PTD)

In the Biology PTD program, 70 students were enrolled in the 2021-22 academic year, while 118 students were enrolled in 2024-25. The gender distribution was balanced, with males and females each comprising 50% of the student body. Approximately 73% of these students were between the ages of 18 and 19, and 70% were first-time enrollees in the course.

In terms of participation in additional activities in 2024-25, 85.5% of students completed the first Wooclap activity, while participation in the second activity dropped to 77.6%, with an average of 81% participation. Female students made up the majority of respondents (60%), compared to 40% of male participants.

An analysis of the correct answers to the Wooclap quizzes (Figure 1) by question type showed that the typology with the highest percentage of right answers was the matching quiz (86.6%). The next most correctly answered questions were the multiple-choice quizzes (71.29%). When asked to identify histological images or locate cell or tissue structures, the difficulty increased, and only 51.75% of students answered correctly.

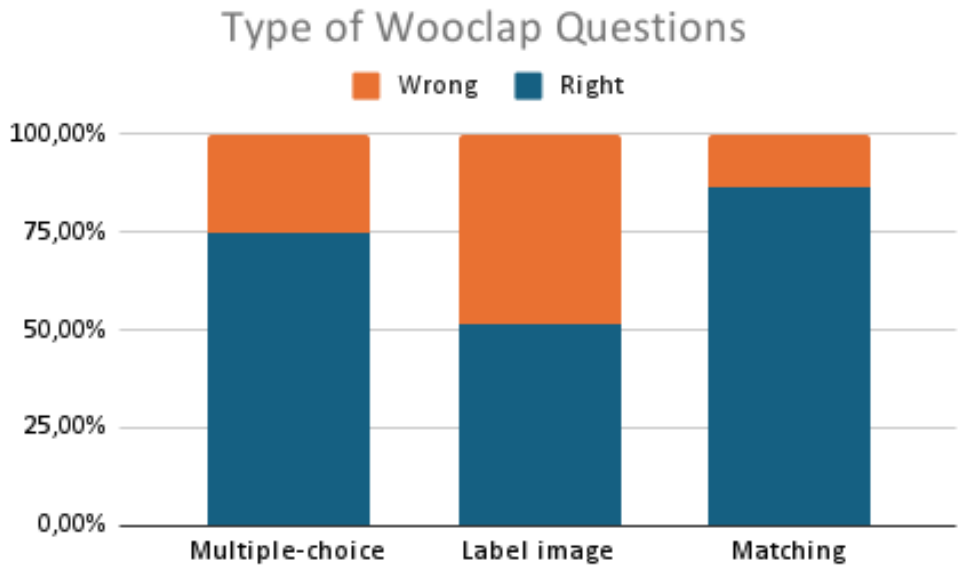

Figure 1. Relationship between right and wrong answers given by PTD students and the type of Wooclap questions.

Figure 2 shows the scores obtained in the PTD laboratory practices during two academic years. The 2020-21 course was taught following the traditional method, with lectures before the use of histological slides under the microscope. During the course 2024-5, Wooclap supplementary activities were implemented.

During the academic year 2021-22, the students who did not take the exam and failed reached 36,5%. Of the remainder, 26.5% were in the range between 5 and 7, while 37,35% were over 7. On the other hand, the results of the 2024-25 academic year are noteworthy, since only 11.9% of the students did not take the exam or failed it. A total of 48.3% of the students were in the range between 5 and 7, and 29.83% exceeded 7.

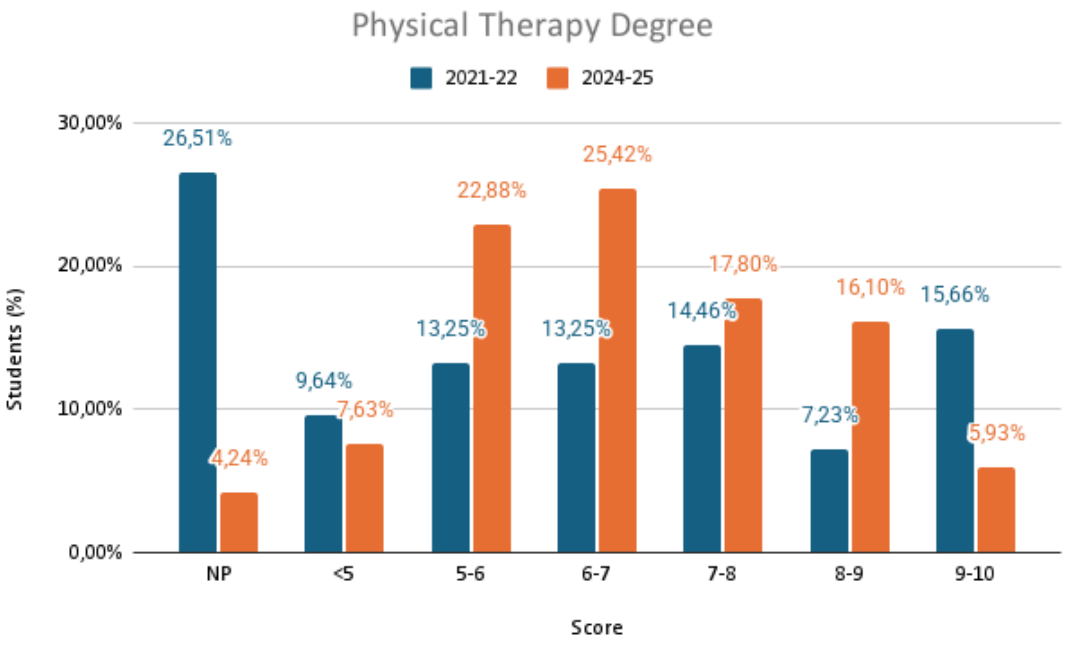

Figure 2. Percentage of students according to the score obtained in 2021-22 (without Wooclap activities) and 2024-25 (with Wooclap activities) academic years.

3.2 Podiatry Degree (PoD)

In the Biology PoD program, student enrollment was 74 in the 2021-22 academic year, increasing slightly to 82 in 2024-25. The majority of students (83%) were between the ages of 18 and 19. The gender distribution showed a lower proportion of male students, accounting for 16% in 2021-22 and 27% in 2024-25, while female students constituted the majority.

In 2024-25, 92% of students participated in the Wooclap activities, showing consistency across all four sessions. Seventy-five (25.3%) students completed the first three Wooclap activities, while there was a slight drop in participation in the final session, with only 72 (23.6%) students taking part.

Figure 3 shows the scores obtained in the PoD laboratory practices during two academic years. The 2020-21 course was taught following the traditional method, with lectures before the use of histological slides under the microscope. During the course 2024-5, Wooclap supplementary activities were implemented.

During the academic year 2021-22, the students who did not take the exam and failed reached 52%. Of the remainder, 28.0% were in the range between 5 and 7, while 20% were over 7. On the other hand, the results of the 2024-25 academic year are noteworthy, since only 29,27% of the students did not take the exam or failed it. A total of 18.3% of the students were in the range between 5 and 7, and 35,37% exceeded 7.

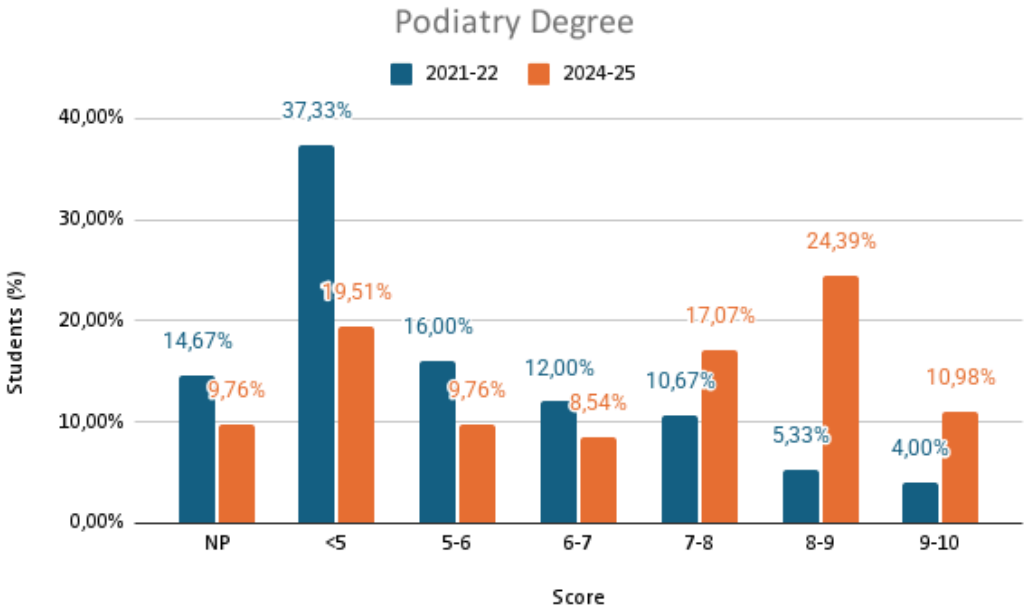

Figure 3 . Percentage of students according to the score obtained in 2021-22 (without Wooclap activities) and 2024-25 (with Wooclap activities) academic years.

3.3 Differences between Groups

A comparison of student performance between the 2021–22 and 2024–25 academic years reveals notable differences associated with the implementation of Wooclap activities (Figures 2 and 3). In the 2021–22 cohort, when Wooclap was not used, showed better performance in the group of Physical Therapy (PT) than in the Podiatry (Po), with 12% of difference in results between the two qualifications. However, in the 2024–25 cohort, which incorporated Wooclap as a supplementary learning tool, both groups showed overall improvements in their scores with non differences between groups. (Table 1)

The performance improvements were very similar between groups, which showed a very substantial increase (22-23%) in mean scores for the subject. This suggests that the integration of interactive digital tools may be especially beneficial for students in degree programs that traditionally involve less hands-on exposure to histological analysis. The data support the conclusion that Wooclap positively influenced students' engagement and comprehension, with a potentially greater impact observed in the Podiatry group.

Table 1. Subject pass.

	2021-22 Course (%)	*2024-25 Course (%)*	*Difference (%)*
Group PT	68.57	92.04	23.47
Group Po	56.25	78.38	22.13

3.4 Evaluation

To know the teaching-learning process using Wooclap as an educational tool, a survey was designed by professors to be filled out by undergraduate students. To assess the answers, the survey was part of the last questionnaire and was completed by 181 students (91.4 %) for both PTD and PoD.

Concerning the first question, "*Wooclap has helped me to consolidate concepts*", the responses were very positive, with 71% (average 4/5) of the respondents claiming to have found useful to carry out the

activity to reinforce their knowledge (Fig. 4_Q1). The second question, "*The images reflect what has been observed in practices*", present a good average (3.7/5) of satisfaction, with 63% of the students stating that chosen images used in the Wooclap exercises reflect the histological samples observed under the microscope during the practical sessions (Fig. 4_Q2). A slightly lower level of satisfaction is observed for the last question, "*I found it very difficult to complete the exercise*". It is important to highlight that 49% of the students affirmed that they found difficulties carrying out the proposed exercises (Fig. 4_Q3).

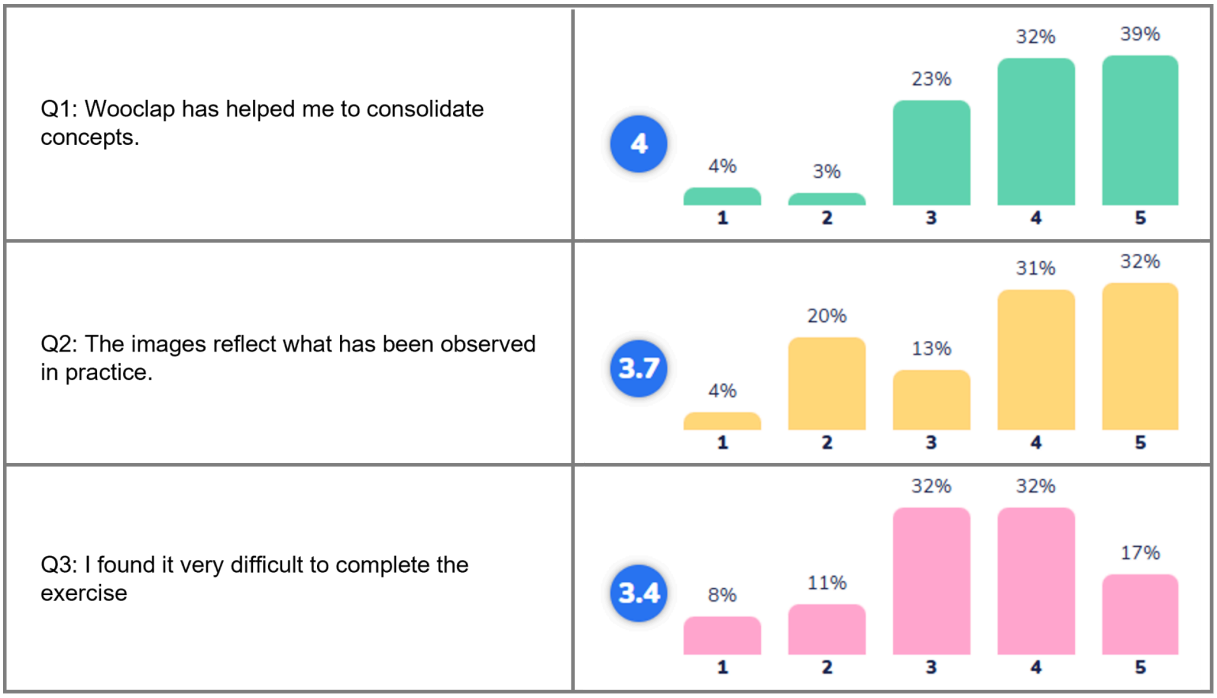

Figure 4 . Appraisals rating Wooclap from responders in a Likert scale (1=Strongly Disagree to 5=Strongly Agree)

4 CONCLUSIONS

In the 2024/2025 academic year, Wooclap activities were integrated into Histology laboratory practices as an asynchronous learning tool for implementing knowledge in higher education. Tailored quizzes were developed for first-year students in the PT Degree (PTD) and Po Degree (PoD) programs. These activities were made available to students in the days leading up to the final practical exam, allowing them to engage with the material at their own pace. The quizzes served as both a formative review and a self-assessment tool, reinforcing key concepts and improving slide interpretation skills.

Our findings are consistent with previous studies developed by our team with dentistry students [9] and with the educational approach described by Boyle [18]. These studies and some others, focused on changing our knowledge systems [19], demonstrate the good results obtained using specific digital tools to help and guide first-year students to assess concepts and, at the same time, to promote their motivation and participation in proposed activities [14], [20]. It is important to underscore the value of the use of Wooclap as a tool in facilitating knowledge generation and providing students with valuable feedback, with demonstrated increases in student participation due to its accessibility and ease of use [21].

The results indicate a clear improvement in academic performance following the implementation of Wooclap. Compared to the 2021/2022 cohort, which did not have access to these activities, students in the 2024/2025 cohort demonstrated significantly higher scores. This improvement was marked among PTD and PoD students, suggesting that asynchronous, interactive review tools may be

especially beneficial in disciplines with less initial exposure to histological analysis and creating a positive experience. These results are consistent with the study conducted by Huang and colleagues [22], which demonstrated that, in a comparative analysis of university groups studying the same subject, students who experienced gamification achieved better academic results than their counterparts in groups where gamification was not implemented. Overall, the integration of Wooclap contributed to enhanced student engagement, better exam preparedness, and a measurable increase in learning outcomes.

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