Research Square

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Teaching ocular semiology through asynchronous case-based discussion: a forum-based learning experience.

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Abstract

Background

In many healthcare professions, semiology is a core subject that supports the development of clinical reasoning skills, which are essential for patient assessment. However, teaching semiology is challenging, as it requires the integration of foundational knowledge, such as anatomy and physiology, with the clinical manifestations of disease. Furthermore, in many programs, this subject is taught before students have their first clinical experience. This study aimed to evaluate whether a clinical case discussion forum supports learning in ocular semiology and to explore students' perceptions of this educational strategy.

Methods

An observational mixed-methods study was conducted to evaluate the implementation of a forum-based learning activity within an undergraduate ocular semiology course. Quantitative analysis examined the correlation between forum participation and final course grades, while qualitative analysis explored students' perceptions through open-ended questions.

Results

A moderate positive correlation was found between forum participation and final grades ($\rho = 0.36$, $p = 0.048$). Students repeating the course showed notable improvement, suggesting increased motivation and potential benefits from peer learning. Although only a small number of students responded to the open-ended questions, all respondents considered the forum to be a useful learning tool.

Discussion

This study suggests that a virtual discussion forum may be a useful strategy for supporting self-directed and peer-based learning in ocular semiology. While the number of survey respondents was limited, feedback indicated general acceptance of this approach, with recommendations to incorporate grading and increased instructor feedback to enhance student engagement.

Background

Semiology is the study of the signs and symptoms of disease. It is a core subject in many healthcare professions, as it supports the development of clinical reasoning skills that are essential for patient assessment. Despite its relevance, teaching semiology is challenging, particularly in the early stages of training, when students have not been exposed to clinical environments.

In Chile, ocular semiology is taught within the training of *ophthalmic medical technologists*. These professionals, similar to optometrists in other countries, are responsible for correcting refractive errors using optical devices and referring patients when ocular or systemic disorders are detected [1]. Consequently, ocular semiology is a core subject in their curriculum, focusing on the identification and interpretation of signs and symptoms of visual system disorders. This is a highly demanding subject, as it requires the integration of foundational knowledge of normal anatomy and physiology, pathological manifestations, and clinical assessment methods of the visual system. The course includes a relatively limited lecture component, with only four hours of instruction per week during the term and has a high failure rate, reflecting the complexity of its syllabus, and the difficulties that students face in integrating theoretical knowledge into clinical reasoning.

Active learning approaches, including clinical case discussions, problem-based learning and peer discussion have been shown to be effective in strengthening clinical reasoning skills, and help students relate conceptual knowledge to clinical scenarios [2–6]. Motivated by the challenges of teaching this subject, and by the evidence supporting active learning approaches for the development of clinical reasoning skills, the teaching staff implemented a novel strategy in 2025 to support students' self-directed learning in ocular semiology through the introduction of a virtual clinical case discussion forum. The increased use of technology in medical education following the COVID-19 pandemic provided an opportunity to integrate digital tools into the curriculum and to innovate in the delivery of this complex subject. During the pandemic, ophthalmic education worldwide expanded the use of e-learning components as part of training programs [7]. The incorporation of the discussion forum represented an attempt to enhance self-directed learning and promote peer instruction among future ophthalmic medical technologists.

The use of virtual tools to support self-directed learning in medical semiology, though not specifically in ocular semiology, has previously been reported in Chile, demonstrating improvements in students' performance on final examinations [8]. However, there is limited evidence on the use of forum-based case discussions for teaching ocular semiology, particularly in Latin American contexts. Therefore, this study aimed to evaluate whether a clinical case discussion forum supports learning in ocular semiology and to explore students' perceptions of this educational strategy.

Materials and Methods

The present study is an observational mixed-methods study that evaluated the implementation of a forum-based learning activity within an undergraduate ocular semiology course. The study was approved by the "*Comité de Bioética y Bioseguridad de la Pontificia Universidad Católica de Valparaíso*" (BIOEPUCV-H 877–2025). All procedures were conducted in accordance with the Declaration of Helsinki and relevant national regulations. Participants provided informed consent, and data was anonymized to protect confidentiality.

The forum was implemented as follows. At the beginning of the term, course lecturers provided students with clear guidelines on how to participate in the clinical case discussion forum, including a few guided examples. Students were expected to post comments based on their interpretation of the clinical findings, either by proposing a possible diagnosis or by discussing the signs and test results that could orient toward one. The uploaded cases varied in completeness and could include the patient's clinical and family history, reported symptoms, observable signs during optometric examination, or findings from diagnostic tests and imaging devices. Figure 1 presents an example of a post from the discussion forum in its original language (Spanish). As can be seen in this figure, posts also included typical abbreviations used in clinical history such as F.O. (similar to DFE in English).

In some instances, no definitive diagnosis was available because the patients were still under evaluation. In these situations, the forum served as an opportunity for students to develop clinical reasoning skills and propose possible next steps in patient assessment. Since in Chile the professional in charge of providing the definitive diagnosis is the ophthalmologist, and ophthalmic medical technologists are not authorized to make a definitive diagnosis, students were encouraged to suggest additional examinations or diagnostic tests that could support the ophthalmologist's conclusions. Importantly, participation in the forum was not graded, but it was strongly encouraged as an integral component of the course activities.

Additionally, at the end of the term, students were invited to complete a brief questionnaire consisting of six open-ended questions aimed at exploring their perceptions of the forum's contribution to their learning. The questions were designed to assess six key domains: the forum's impact on learning ocular semiology, the perceived usefulness of specific cases or resources, students' self-awareness regarding their participation and its relationship to their final grades, suggestions for improving the activity within the course or applying it to other subjects, and any additional comments or reflections.

Data Analysis.

Both quantitative and qualitative data analysis were performed using RStudio [9]. To examine the relationship between forum participation and final course grade, the Spearman rank-order correlation coefficient was calculated, with the level of statistical significance set at $p < 0.05$. The Chilean grading system typically ranges from 1.0 to 7.0, with 4.0 representing the minimum passing grade. In this study, grades were converted to percentages, where 60% corresponded to the passing threshold.

Qualitative analysis consisted of a thematic exploration of student responses to open-ended questions. This analysis included the presentation of selected students' reflections. Table 1 presents the English translation of the six questions used in the study, and the original Spanish version is provided in Supplementary Material S1.

Table 1
Open-ended questions answered at the end of the course by participant students.

Question 1	**In your opinion, how do you think the use of the discussion forum contributed to your learning in this course?**
Question 2	Was there any specific clinical case that helped you better understand the course content? If so, consider sharing an example
Question 3	Do you think your participation in the forum influenced your academic performance? Why?
Question 4	Can you give the lecturers any suggestion to improve the use of the forum in future versions of this course?
Question 5	Would you recommend the use of a discussion forum for other complex subjects in the program? Why?
Question 6	Is there anything else you would like to share with us regarding this experience? It could be a suggestion, compliment, complaint, constructive criticism, or any other comment you consider important.

Results

Of the 43 students enrolled in the course, 30 agreed to participate in this study. Among them, six were repeating the subject for a second time. Figure 2 presents the relationship between forum involvement (measured by the number of posts throughout the term) and the final mark (in percentage). The statistical analysis showed that greater participation in the forum was moderately associated with higher final grades ($\rho = 0.36$, $p = 0.048$). Figure 3 illustrates the change in academic performance of the repeating students between 2024 and 2025, along with their respective number of forum posts. All these students passed the course on this second attempt.

Only six students responded to the open-ended section of the study. In Question 1, all six agreed that the forum was a valuable tool for reinforcing the course content and applying theoretical knowledge to clinical case resolution. Several students highlighted how the forum supported their learning beyond the classroom. For instance, one student emphasized the development of critical thinking skills, stating:

"It helped me with critical thinking when solving clinical cases."

(“me ayudó con el pensamiento crítico al momento de resolver casos clínicos”)

Another student appreciated the diversity of perspectives shared among peers:

"It was useful to see my classmates' different points of view on clinical cases and compare them with my own analysis."

(“fue útil para observar distintos puntos de vista de mis compañeros frente a los casos clínicos y compararlos con mi propio análisis.”).

The second open-ended question asked students whether there was a particular clinical case that helped them better understand the course content. Three students explicitly mentioned that the cases involving retinal diseases (predominantly diabetic retinopathy) were the most useful to support their learning.

The third question asked students whether the discussion forum had influenced their academic performance. In general, all participants acknowledged that the forum was beneficial for their learning. For example, one student commented:

“I don’t think the forum directly influenced my performance, but it served as a complementary support tool to review concepts and improve my ability to identify clinical signs”. (“No creo que haya influido directamente en mi rendimiento académico, pero sí funcionó como una fuente de apoyo complementaria que me ayudó a repasar conceptos y a mejorar la identificación de signos clínicos.”)

Other notable responses included:

“The forum allowed me to complement theoretical content with practical examples, which facilitated a deeper understanding of the topics”. (“[…] el foro me permitió complementar los contenidos teóricos con ejemplos prácticos, lo que facilitó una comprensión más profunda de los temas.”)

In the fourth open-ended question, students were invited to suggest improvements for the use of the forum in future editions of the course. For this question, a recurrent answer related to the necessity of feedback on their performance. Several students expressed that structured feedback would enhance the learning experience and increase the educational value of the forum. Some comments included:

“It would be useful if, at the end of each clinical case and after a set period for student responses, written feedback were provided”. (“Sería útil, que al final de cada caso y luego de un tiempo específico para responder, se incluyera una retroalimentación (escrita)”.)

“I would like to receive feedback from a trained lecturer”. (“Mejoraría que hubiera una retroalimentación del foro por un profesor capacitado”.)

“Perhaps reviewing the cases with the lecturers occasionally would be beneficial”. (“Quizás revisarlo con los profes de vez en cuando”.)

“One possibility is to post a clinical case each week, followed by a brief feedback session the next week”. (“Se podría implementar la publicación de un caso clínico por semana, seguido de una breve retroalimentación la semana siguiente”.)

Additionally, one student suggested that assigning a small portion of the final grade to forum participation could increase engagement:

“I would make the posts formative or assign a percentage of the final grade, so that participation would increase”. (“Haría que fueran formativas, o aportaran un porcentaje final para la nota final del curso. Esto

lo haría para que la participación sea más alta".)

The fifth open-ended question asked students whether they would recommend the use of a forum in other complex courses within the degree program. Overall, responses were positive, with students indicating that the forum would be especially beneficial in subjects that include clinical case discussions, considering the suggestions they made in the previous questions. Some illustrative comments included:

"The forum allows students to analyze real or simulated situations, share and debate opinions, and learn from peers, fostering a collaborative learning environment." ("El foro permite poder analizar situaciones reales o simuladas, compartir y/o debatir opiniones y también aprender de otros compañeros, creando un ambiente de aprendizaje colaborativo".)

"I would apply it to all courses that include clinical cases as a requirement, with the improvements I mentioned earlier." ("La aplicaría en todas las asignaturas q tengan casos clínicos como requisito con la mejoría que comenté anteriormente".)

"I would recommend it, as it is a very useful tool to apply clinical content in a more practical context. However, I believe that some adjustments are needed to improve its effectiveness." ("La recomendaría, ya que es una herramienta muy útil para aplicar contenidos clínicos en un contexto más práctico. Sin embargo, creo que es necesario hacer algunos ajustes para mejorar su efectividad".)

"Yes, especially when identifying something from an image is required." ("Sí, especialmente si hay que reconocer algo a través de una imagen".)

In response to the final open-ended question, students expressed overall satisfaction with the course design, highlighting the diversity of clinical cases presented, and the effective integration of contents. Several comments emphasized the importance of maintaining the current pedagogical strategy, while also suggesting refinements to further enhance its impact on learning outcomes. One student suggested that assigning a percentage of the final grade to forum participation could serve as a meaningful incentive to encourage greater student engagement.

Discussion

This study found a positive association between participation in a clinical case discussion forum and final course grades in ocular semiology, suggesting that active engagement in case-based discussion may support student learning. However, these findings should be interpreted with caution, as correlation does not imply direct causation. It is possible that individuals who were more motivated or academically stronger were also more likely to participate actively in the forum.

One possible explanation for our findings is that forum participation promotes active learning and deeper cognitive processing. Through the forum, students engaged with clinical cases that encouraged the integration of theoretical knowledge with practical reasoning. This process may facilitate the

recognition and interpretation of signs and symptoms of ocular diseases. In addition, repeated exposure to clinical scenarios may contribute to the development of pattern recognition and diagnostic reasoning, particularly among students with limited clinical experience. Our findings are consistent with previous research showing that case-based learning, and problem-based approaches enhance academic performance and clinical reasoning in ophthalmology education [10, 11]. Previous studies have also shown that active participation in discussion forums is associated with improved academic outcomes [12, 13]. Importantly, Voghoei et al. (2019) [13] highlighted that consistency of participation, rather than the absolute number of posts, may be a more relevant factor in achieving better learning outcomes.

The greater academic improvement observed among students repeating the course may be explained by increased motivation and prior exposure to the subject content. Because these students had previously struggled with the course, they may have been more motivated to engage with supplementary learning tools. This interpretation is supported by previous work [14], which suggested that peer-based learning can enhance motivation and confidence among repeating students. In fact, our findings showed that those students who demonstrated the greatest improvement compared with the previous year also had higher levels of forum participation.

In the context of healthcare training, semiology plays a central role in developing the ability to identify and interpret clinical signs and symptoms. In the case of ophthalmic medical technologists in Chile, although these professionals are not authorized to provide formal diagnoses, a comprehensive understanding of visual disorders is essential for appropriate patient assessment and referral. Evidence suggests that these professionals demonstrate high competency in disease screening, particularly in conditions such as diabetic retinopathy [15]. In their training, the teaching of ocular semiology often relies on textbooks and journal articles, which tend to present signs and symptoms as isolated features, making it difficult for early-stage students to link them to specific diseases. In this context, the incorporation of active learning methodologies, such as case-based discussions and problem-based learning has been recommended to strengthen clinical reasoning [16].

The implementation of a discussion forum in this study provided an opportunity to support self-directed learning and peer interaction, two critical skills for healthcare professionals. In terms of self-directed learning, students must identify their educational needs and actively seek resources that allow them to adapt to a clinical environment that is constantly evolving due to scientific and technological advancements [17]. Regarding peer interaction, online forums have been shown to be effective tools for promoting dialogue and collaboration, both of which are essential for meaningful learning [18]. In this sense, the use of the forum may support learning as a process of knowledge co-construction through interaction with others.

With respect to students' perceptions of the discussion forum, although the response rate to the open-ended questionnaire was low, all respondents recognized the forum as a valuable complementary learning tool. Notably, several students suggested that forum participation should be graded, and that greater instructor involvement would enhance engagement. These findings suggest that, despite the

intention to promote self-directed learning, students may still rely on external structures such as assessment and feedback to guide their engagement. This contrasts with previous work suggesting that ungraded activities may encourage participation[19], and may reflect a broader tendency among students to prefer structured, instructor-led learning environments. Similar barriers to engagement with innovative teaching strategies have been reported in the literature, including perceived workload, lack of incentives, and unfamiliarity with the learning approach[20].

Several limitations of this study should be acknowledged. First, the sample size was small and drawn from a single institution, which may limit the generalizability of the findings. Second, the qualitative component was based on a low response rate and therefore may not fully represent the perspectives of the entire cohort. Third, as noted above, it is possible that students who were more motivated or academically stronger were also more likely to engage with the forum, which may partly explain the observed association. Despite these limitations, the findings of this study suggest that forum-based case discussions may represent a useful and scalable strategy to support the teaching of ocular semiology, particularly in preclinical stages where students have limited clinical exposure. Such approaches may be especially relevant in resource-constrained educational settings, where opportunities for direct patient interaction are limited. Future research should explore the impact of structured feedback, grading strategies, and different levels of instructor involvement on student engagement and learning outcomes, ideally using larger samples and controlled study designs.

Declarations

Author contribution.

J.A.S: Conceptualization, Methodology, Formal Analysis, Investigation, Writing – Original Draft, Writing – Review & Editing, Visualization, Supervision, Project administration.

A.L.A.: Conceptualization, Methodology, Formal Analysis, Investigation, Writing – Original Draft, Writing – Review & Editing, Visualization.

Human ethics

This study was approved by the university ethics committee: "*Comité de Bioética y Bioseguridad de la Pontificia Universidad Católica de Valparaíso (*https://www.pucv.cl/uuaa/vicerrectoria-de-investigacion-creacion-e-innovacion/comite-de-bioetica-y-bioseguridad)". The ethical reference number is BIOEPUCV-H 877–2025. All procedures were conducted in accordance with the Declaration of Helsinki and relevant national regulations. Participants provided informed consent, and data was anonymized to protect confidentiality.

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Data Availability

The datasets generated during the current study are available from the corresponding author on reasonable request.

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Figures

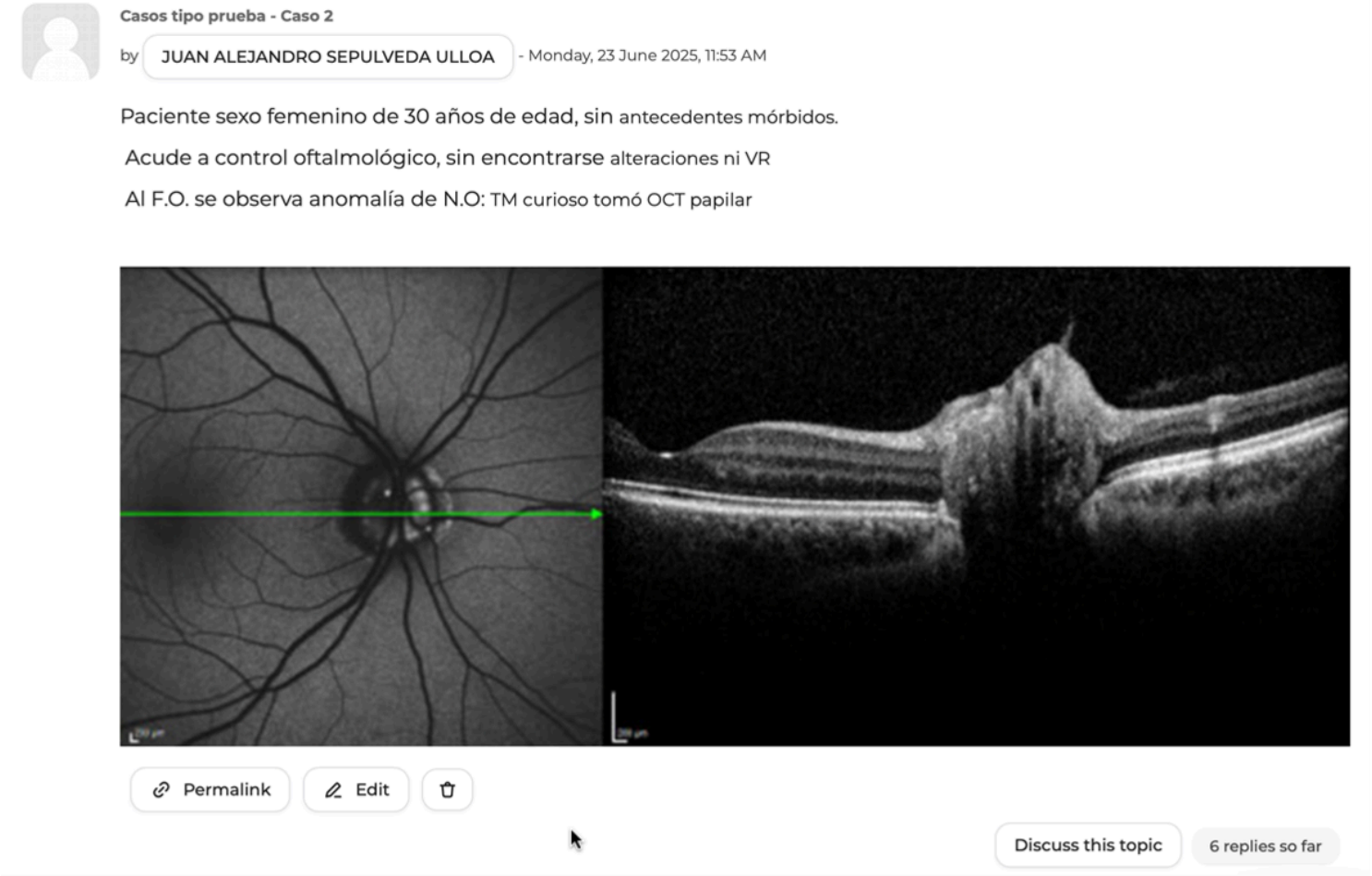


Figure 1

Example of a clinical case presented at the forum.

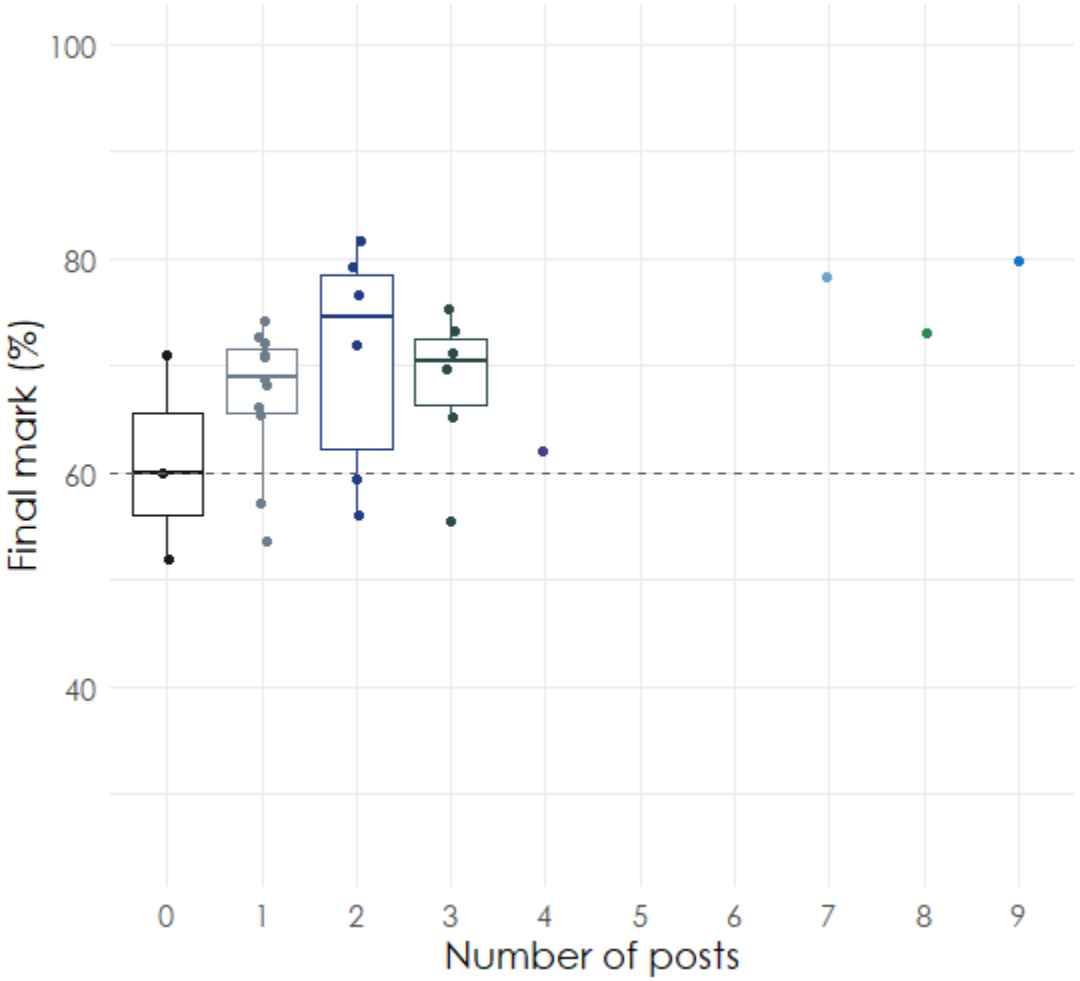


Figure 2

Relationship between forum participation and final mark. Segmented line represents the passing threshold score of 60%.

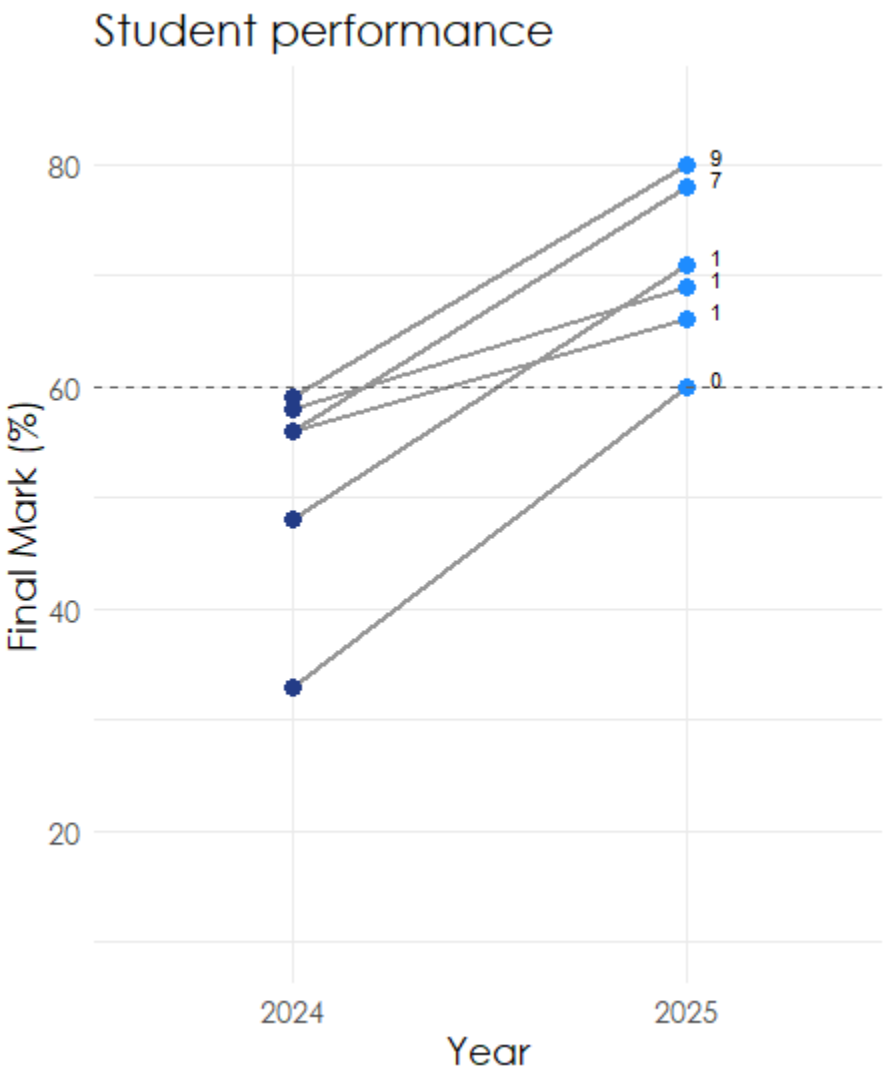


Figure 3

Change in student's performance from 2024 to 2025. Small numbers on the side are the number of posts by each student.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- SupplementaryMaterialS1.docx