



# Peer faculty mentoring mediated by structured rubrics in virtual higher education settings: impact on professional development

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## Abstract

The expansion of online higher education has generated increasing demand for effective strategies to support faculty professional development. Among these, peer mentoring mediated through structured class observation and rubric-based evaluation has emerged as a promising practice to enhance teaching quality in virtual learning environments. This study examines the impact of a formative peer mentoring program with assigned roles implemented at an online university in Spain. A pre-experimental pretest-posttest design was applied with a sample of 90 faculty members from the School of Education. Each participant was observed by an expert mentor through the analysis of recorded synchronous online classes, using a sequential rubric designed to evaluate five key dimensions of online teaching: pedagogical design, communication, on-screen presence, instructional design and facilitation. Descriptive statistics, Wilcoxon signed-rank tests, and qualitative coding of observations were conducted. Results showed statistically significant improvements across all evaluated dimensions, with particularly strong effects in Learning Facilitation ( $r=0.891$ ) and Communication ( $r=0.820$ ). The qualitative analysis revealed a notable reduction in corrections associated with pedagogical weaknesses, as well as increased pedagogical awareness and the adoption of more effective teaching strategies. Structured mentoring supported by professional feedback demonstrates high potential to enhance pedagogical practice in virtual environments. This study provides empirical evidence of its positive impact on faculty development and offers an institutionally feasible approach to fostering a culture of continuous improvement, engagement, and evidence-informed reflection.

**Keywords** Faculty mentoring · Online education · Professional development · Rubrics · Peer observation

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## Introduction

Online higher education has undergone an unprecedented expansion in recent decades, driven by both technological advances and the demands arising from the COVID-19 pandemic. This modality has ceased to be a transitional solution and has consolidated itself as a structural option within the global university system (Toro-Dupouy, 2022). This consolidation also implies new opportunities and challenges regarding student engagement in online and hybrid contexts, as shown by recent systematic reviews using learning analytics (Bergdahl et al., 2024). Furthermore, its advantages include flexible schedules, geographical accessibility, personalized learning, and the development of digital and metacognitive skills, factors that have made it a growing alternative to face-to-face education (Toro-Dupouy, 2023).

This growth has brought with it new challenges related to the training and support of teachers in virtual environments, especially for newly appointed faculty. In this context, peer observation has emerged as a promising strategy for teacher professional development, by promoting pedagogical reflection, continuous improvement, and the creation of learning communities among colleagues (Grainger, 2021; Bolt et al., 2013; Sullivan et al., 2012). Unlike hierarchical models or external evaluations, this practice is based on the principle of horizontality, mutual trust, and constructive feedback, improving the quality of teaching (Yiend et al., 2014). The digitalization of educational practices has expanded the possibilities of peer observation using recorded class videos, shared rubrics, and asynchronous feedback (Kaçmaz, 2016; Swinglehurst et al., 2008; Bennett & Barp, 2008). These tools allow for overcoming the space-time barriers of in-person settings and favor more reflective, unhurried, and evidence-based review processes. Specifically in the case of rubrics, recent research highlights their usefulness in strengthening evaluation coherence, fostering pedagogical awareness, and improving the quality of professional judgment among peers (Jia et al., 2024; Kim et al., 2024; Kurnaz, 2021).

Despite the growing interest, few studies systematically document experiences of evaluation guided by an experienced mentor, applied with methodological rigor and supported by structured instruments. Therefore, this study seeks to provide evidence on the formative impact of structured mentorship for newly appointed faculty in digital contexts, through iterative observation guided by rubrics and professionalized feedback, thereby contributing to the systematization of best practices for professional development in online higher education.

## Conceptual framework

### Peer assessment as a professional development strategy

Peer assessment has become a valuable strategy for professional development among higher education faculty, as it enables teachers to observe, analyze, and reflect on pedagogical practices within a shared professional context. Its theoretical foundations can be linked to Bandura's (1977) social learning theory, which emphasizes learning through the observation of others' actions and their consequences, and to

Wenger's (1998) concept of communities of practice, which highlights the collective construction of knowledge within a shared professional culture. Unlike traditional approaches focused on hierarchical supervision, peer assessment is grounded in horizontality, constructive feedback, and mutual trust. This approach fosters reflective dialogue in which strengths are identified, areas for improvement are discussed, and effective teaching practices are shared, thereby promoting a culture of continuous improvement and professionalization of teaching (Grainger, 2021; Sullivan et al., 2012).

Literature commonly recognizes three models of teacher observation based on the purpose and the profile of the observer: the evaluative model, the developmental model, and the collaborative model (Yiend et al., 2014). Each of these responds to different assumptions about the role of peer review and its influence on power and authority relationships within the academic environment (Sachs & Parsell, 2014). The evaluative model, more hierarchical, is oriented towards supervising teaching performance from management or quality control bodies. The developmental model adopts a more formative and less punitive approach, with a pedagogical expert intervening as the observer. Finally, the collaborative model, also formative, involves mutual observation among colleagues, based on trust and shared learning.

Various studies have shown that this type of evaluation promotes metacognitive learning, self-regulation, and commitment to pedagogical quality (Topping, 2017). It has been documented that voluntary peer review programs lead to practical improvements through processes of critical reflection and the design of shared action plans (Bolt et al., 2013). Along these lines, peer assessment is closely linked to Schön's (1983) ideas about "reflection in action," understood as the professional's capacity to rethink their actions during and after practice.

In virtual environments, this strategy adapts to new conditions and technological mediations. Recent studies show that peer learning practices, including teacher observation and feedback, acquire new relevance in online and hybrid universities, especially when they are clearly structured and properly supported (Mendieta-Aragón et al., 2023; Swinglehurst et al., 2008; Kim et al., 2024). These environments make it possible to overcome spatial and temporal limitations and to introduce asynchronous evaluation modalities that enrich faculty professional development.

### **Mentoring as a teaching support strategy**

Teacher mentoring is conceived as a formative, intentional, and sustained process in which a more experienced teacher accompanies a colleague to foster their professional development, promote critical reflection on their practice, and facilitate continuous improvement. In the university setting, and especially in virtual environments, this support takes on a dialogical, horizontal, and evidence-based orientation, thus differing from hierarchical models focused on evaluative supervision (Dillon et al., 2020; Sullivan et al., 2012). In this sense, mentoring can also adopt more vertical (expert–novice), horizontal (peer-to-peer), or combined forms, and is usually structured in formative cycles that include: (1) establishing shared objectives, (2) observing teaching practice, (3) structured feedback, and (4) planning for improvements with successive iterations (Dillon et al., 2020; Fox-Alvarez et al., 2021).

Several recent studies support the value of teacher mentoring as a professional development strategy in higher education, particularly in virtual environments. Moreover, current evidence indicates that faculty's use of emerging technologies, such as artificial intelligence, is strongly mediated by their professional profiles and development needs (Mah & Groß, 2024). In this regard, mentoring emerges as a key strategy to address these differentiated needs. For example, Dillon et al. (2020) highlight that mentoring programs based on formative protocols foster critical reflection and the adoption of more effective pedagogical practices. Fox-Alvarez et al. (2021) present the FARPET model, designed to evaluate online veterinary teaching using rubrics, and demonstrate its usefulness for guiding feedback within mentoring relationships. Likewise, Jia et al. (2024) validated the POET-O instrument, designed for structured observations by mentors, demonstrating its inter-rater reliability. Other works emphasize that effective mentoring requires a clear structure, the use of specific instruments, non-punitive feedback, and sustained support over time (Sullivan et al., 2012; Rohrbacher & McKee, 2019), which reinforces the need to design well-contextualized formative tools.

In digital contexts, mentoring has been enriched by technologies that allow for asynchronous observation (e.g., class recordings), multimodal feedback (written, audiovisual, or through specialized platforms), and the use of shared rubrics as common guides for analysis (Rohrbacher & McKee, 2019). These tools amplify the depth of pedagogical analysis and offer temporal flexibility without compromising the formative quality of the process.

The empirical evidence underscores some critical quality factors in these processes: (a) the use of validated observation instruments, with prior training of observers to ensure the consistency of professional judgment (Jia et al., 2024; Fox-Alvarez et al., 2021); (b) the alignment between the observed criteria and the specific teaching competencies of online education (Albrahim, 2020); and (c) the non-punitive orientation of feedback, which promotes trust and authentic reflection (Sullivan et al., 2012). Furthermore, Hundey et al. (2020) synthesize international evidence on online faculty mentoring and propose eight key recommendations for the design and sustainability of web-based mentoring programs. These recommendations are especially relevant to the present study because they provide an organizational framework for interpreting the mentoring experience analyzed. Table 1 summarizes the alignment between these recommendations and the main organizational principles of the program implemented in this study.

This alignment suggests that the mentoring experience examined in this study reflects several core principles identified in the literature: institutional responsiveness, clearly defined roles, structured interaction, formative feedback, technological mediation, and systematic evaluation. At the same time, it also reveals areas for further development, such as the formalization of conflict-resolution procedures and the consolidation of mechanisms to prepare future mentors. Ultimately, mentoring in virtual higher education is consolidated as an effective strategy for teacher professionalization by coherently articulating the intentional design of the program, specialized training for mentors, structured observation of practice, dialogical feedback, the use of clear criteria, and the shared analysis of teaching evidence.

**Table 1** Alignment between Hundey et al.'s recommendations and the mentoring experience analyzed in this study

Recommendation from Hundey et al. (2020)	Alignment with the mentoring experience analyzed in this study
Conduct a needs assessment and environmental scan to design a responsive and complementary program.	The program responded to the institutional need to support newly appointed faculty in a fully online university context and to strengthen teaching quality in synchronous virtual classes.
Ensure sufficient human and technological resources, including administrative support and coordination.	The mentoring process was coordinated institutionally and supported by recorded class sessions, a shared rubric, the virtual classroom, and trained mentors with experience in online teaching.
Maintain separation between program mentors and individuals responsible for hiring, promotion, or evaluation.	The mentoring process was conceived as formative and non-punitive, focused on professional improvement rather than formal personnel evaluation.
Clearly define and communicate the program's structure, scope, and goals; use tools to ensure accountability.	The process followed a sequential structure with initial contact, three observed class sessions, rubric-based assessment, and written formative feedback after each observation cycle.
Promote early and regular mentor-mentee interaction; use digital tools to foster ongoing collaboration.	Mentor-mentee interaction began before the first observed class and continued through synchronous meetings, asynchronous review of recorded sessions, and feedback shared through the virtual classroom.
Establish formal procedures to address conflicts and encourage multiple supportive faculty relationships.	Although conflict-resolution procedures were not a central focus of the study, the program relied on structured communication channels and institutional coordination to support the mentoring relationship.
Build institutional capacity by encouraging participants to share knowledge and serve as future mentors.	The program contributed to institutional capacity by systematizing criteria for online teaching quality and promoting a shared culture of pedagogical reflection and continuous improvement.
Evaluate the program systematically and use findings to improve and advocate for its institutional value.	The present study constitutes a systematic evaluation of the program through quantitative pretest-posttest analysis and qualitative analysis of mentor feedback.

## Rubrics for evaluating teacher performance in virtual environments

Despite the growing recognition of the benefits of peer evaluation (Sachs & Parsell, 2014), it is limited by barriers such as fear of bias or uncertainty about observation criteria due to the limited use of standardized and validated instruments, such as specific rubrics for teaching contexts (Thomas et al., 2014). Rubrics are fundamental instruments for guaranteeing transparency, coherence, and objectivity in evaluation processes, especially in peer evaluation contexts, where subjectivity and variability of judgment can compromise the validity of the results. In peer evaluation, rubrics act as shared reference frameworks that guide observation, orient feedback, and favor the making of informed pedagogical decisions (Ternus et al., 2007; Grainger, 2021). Furthermore, research on teacher evaluation in initial training also highlights the role of rubrics in improving the consistency of judgment among evaluators. Kurmaz (2021), for example, found that clear rubrics help structure feedback and reduce discrepancies. However, he also identified limitations in validity when evaluating

medium or low performance, which reinforces the need for calibration and expert accompaniment during their application.

The sustained growth of distance education and the accelerated implementation of online teaching have generated a growing need for standardized tools for evaluating virtual teaching. In these virtual environments, where class observation is usually carried out through asynchronous recordings, rubrics acquire added value. These tools allow for structuring the observer's pedagogical perspective, facilitating the unhurried and repeated review of audiovisual material, which helps to reduce ambiguities and focus attention on previously defined and contextualized dimensions for online teaching (Albrahim, 2020). Along these lines, Jia et al. (2024) argue that evaluating an individual class, and not just complete courses, allows for a more precise capture of teaching effectiveness at specific moments in the teaching-learning process, a crucial aspect for sustained instructional improvement. Therefore, their design must include specific digital environment competencies, such as clarity in planning, efficient time management, promotion of student participation, or the pedagogical use of technological resources. In this sense, Baldwin et al. (2018) conducted a review of six national or state instruments used in higher education to assess the quality of online courses and promote good practices in their design. Although these instruments share certain common criteria and standards, they were not conceived specifically for peer evaluation processes, nor for evaluating individual classes, so they are not closely related to this study. The evaluation of an individual class focuses on specific aspects, such as the teacher's effectiveness in transmitting content, engaging students, and achieving the learning objectives planned for that specific session. This approach allows for a detailed analysis of teaching performance in particular situations, facilitating the collection of specific evidence on instructional practice.

However, recent reviews have indicated that many of the instruments used for observing individual classes lack rigorous psychometric validation, which limits their formative utility and the equity of the evaluation process (Kim et al., 2024). As Jia et al. (2024) point out, online teaching requires specific instruments that respond to its peculiarities, since many of the tools used in face-to-face settings are inadequate for capturing key dimensions of virtual teaching, such as asynchronous interaction or pedagogical design adapted to the digital medium. Faced with this need, structured observation frameworks, such as the one developed by Jia et al. (2024), Peer Observation and Evaluation Tool-Online (POET-O), allow for guiding the evaluative gaze toward relevant aspects, facilitating professionalized feedback, and promoting pedagogical reflection. Thus, rubrics not only contribute to improving the consistency of judgment but also enhance the formative value of observation by structuring dialogue between colleagues and supporting teacher professional development in virtual contexts. Another example is the FARPET model (Formative Assessment Rubric for Peer Evaluation of Teaching), designed for specific online veterinary teaching contexts, which has proven useful both in structuring feedback and in the formative orientation of observations (Fox-Alvarez et al., 2021). These experiences highlight the need for well-designed and validated instruments that not only serve to evaluate but also guide teacher professional development through formative observation processes. In this sense, rubrics should not be understood solely as grading tools, but as pedagogical devices that structure reflection on practice, promote professional

dialogue, and strengthen the quality of teacher judgment. Their application in virtual contexts, especially when accompanied by prior training and constructive feedback, contributes to consolidating a culture of continuous improvement based on evidence.

## Methodology

### Study design

This study employs a pre-experimental design with a mixed-methods approach, combining quantitative and qualitative analysis to assess the impact of a teacher mentoring process at a fully online university, where experienced faculty advise newly appointed faculty. This design was selected because it allowed changes in participants' teaching performance to be examined over time within a real institutional mentoring program, without altering the natural implementation conditions of the intervention. The intervention consisted of asynchronous observation of recorded synchronous online class sessions, the use of an ad hoc rubric, and structured formative feedback.

### Participants

The study sample consisted of 90 newly appointed faculty members in the Faculty of Education at a private Spanish university dedicated exclusively to online teaching. These faculty members were accompanied throughout the 2024/2025 academic year by 25 mentors with accredited experience in online teaching and specialized pedagogical training. The selection of the mentor team was based on their professional background, previous performance evaluations, and demonstrated instructional competencies, with the objective of guaranteeing high-quality formative support. These criteria were considered relevant because effective online faculty mentoring requires mentors who combine pedagogical expertise, experience in digital teaching environments, the ability to provide constructive feedback, and familiarity with institutional quality standards (Hixon et al., 2011; Hundey et al., 2020).

### Procedure

Following a common initial training, each participating faculty member was assigned to a mentor with accredited experience. The complete process was structured to integrate asynchronous observation, formative evaluation, and professional feedback over several weeks. The process followed a weekly sequence. Faculty members submitted the recordings of their second, fourth, and sixth class sessions in weeks 2, 4, and 6, respectively. Mentors provided rubric-based feedback during the following weeks, that is, in weeks 3, 5, and 7. This structure ensured that faculty members had approximately one week to review the feedback, discuss relevant aspects with their mentor, and incorporate suggested improvements before the next observed session.

The mentor's first contact with the faculty member consisted of an initial meeting in which the mentor introduced themselves and provided the faculty member with a

general perspective of their work as a professor at the university, established communication channels, and advised them on how to approach their first classes. The faculty member then sent the recording of their second class session for the mentor to review and share their impressions and suggestions for improvement. The session was evaluated by the mentor using a structured rubric, which was then sent to the training department (pretest), along with qualitative feedback that was shared with the faculty member through the virtual classroom.

The second synchronous contact was aimed at discussing the relevant aspects of the feedback, sharing experiences, and resolving doubts. After the fourth class session, faculty members sent the corresponding recording for the mentor to review and, once again, share their impressions and suggestions for improvement in a second cycle. On the same rubric document, the mentor evaluated this second observed session, which allowed for a comparison and observation of internal evolution. Again, the qualitative comment was sent to the faculty member through the virtual classroom.

The third and final live contact revolved around how to work on learning activities during synchronous sessions, share experiences, and resolve doubts. To conclude, the faculty members sent the recording of their sixth class session. On the same rubric document, the mentor completed the evaluation of the third observed session (post-test), which allowed comparison with the previous ones and observation of overall evolution. As a farewell and closing, a new qualitative comment was sent to the faculty member through the virtual classroom.

Each of these feedback cycles involved the application of common and comparable criteria, which allowed for observing the progression of the faculty members throughout the program, as well as assessing the impact of the individualized pedagogical support. Figure 1 visually illustrates the sequential structure of the process.

## Evaluation instrument

A rubric with five key dimensions of online teaching (Pedagogical Design, Communication, On-screen Presence, Instructional Design, and Learning Facilitation),

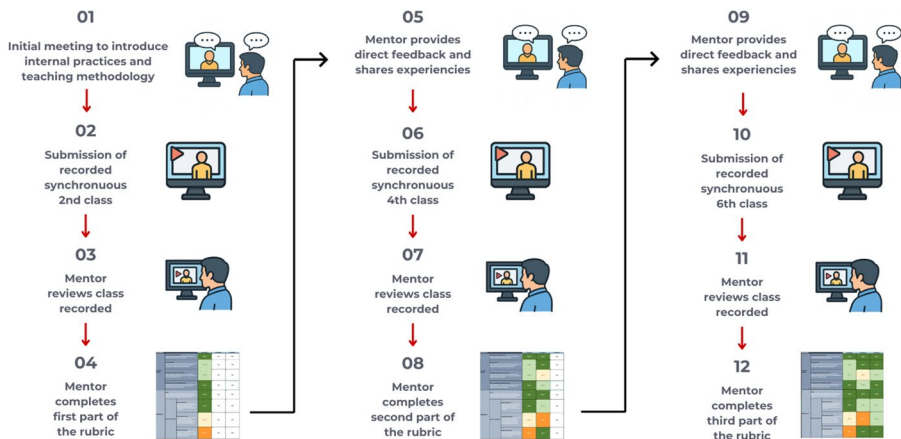


Fig. 1 Sequential structure of the formative mentoring process

adapted and simplified from the model of Albrahim (2020), was used. An ad hoc rubric was developed because the mentoring program focused on the observation of specific synchronous online class sessions rather than on the evaluation of complete online courses. Existing validated instruments were reviewed, but many of them were designed primarily for course-level quality assurance or broader online teaching evaluation, whereas this study required a concise formative tool aligned with the institution's synchronous teaching model and applicable across repeated observation cycles.

1. Pedagogical Design assesses the extent to which the instructor designs and organizes a learning experience that is coherent with the pedagogical structure of the course, ensuring a clear sequence between the initial framing, practical development, product creation, and final presentation. This criterion reflects the instructor's pedagogical intentionality and alignment with the learning objectives.
2. Communication evaluates the clarity, structure, and appeal of the instructor's verbal and non-verbal discourse. It considers whether the message is understandable, well-organized, engaging, and adapted to the students' context.
3. On-screen Presence assesses aspects such as framing, lighting, facial expression, posture, and the instructor's appearance during the online class. This indicator reflects the ability to project a professional and approachable presence in the virtual environment.
4. Instructional Design assesses how the instructor designs and organizes resources, tasks, and timing, fostering active student participation and ensuring a meaningful connection between theory and practice.
5. Learning Facilitation examines whether the instructor uses both asynchronous and synchronous spaces to support, guide, and provide feedback to students throughout the learning process, promoting their participation, autonomy, and engagement.

Each dimension was rated on a 4-point Likert scale. The full version of the rubric used in the mentoring process is provided as Appendix, translated and anonymized for publication.

To establish evidence of content validity, the rubric was reviewed by a panel of experienced online faculty members, who assessed the relevance, clarity, and alignment of the dimensions and descriptors with the institutional teaching model. Their feedback was used to refine the wording and ensure the adequacy of the instrument for its intended formative purpose.

Finally, the internal consistency of the instrument was examined using Cronbach's alpha. The resulting coefficient was acceptable ( $\alpha=0.750$ ), following the conventional criterion proposed by Nunnally (1978).

The information contained in this instrument integrates structured analyses of recorded classes and feedback on each one. The sequential approach allows for the collection of evidence of teaching performance over time, favoring comparative analysis and the making of informed pedagogical decisions. The structure of the rubric was aligned with key online teaching competencies identified in the literature, including pedagogical planning, instructional design, communication, facilitation of interaction, learning support, and the effective use of digital technologies (Albra-

him, 2020; Anderson et al., 2001; Jia et al., 2024; Kim et al., 2024). Specifically, the five dimensions of the rubric reflected competencies related to pedagogical planning, clear communication, professional online presence, instructional organization, and synchronous and asynchronous learning facilitation. Its application promotes professional development through a continuous cycle of reflection, dialogue, and improvement.

## Data analysis

For the quantitative analysis, the Kolmogorov-Smirnov test ( $N > 50$ ,  $p < 0.05$ ) was applied to assess normality, resulting in a non-parametric sample. Since the assumption of  $p < 0.05$  was not met, the Wilcoxon test was used to compare the pretest and posttest scores. The effect size was calculated with Cohen's  $r$ , where  $r$  values from 0.1 to 0.3 were considered small effects, up to 0.5 as medium, and above that value as large effects (Fritz et al., 2012). The established significance level was  $\alpha = 0.05$ . The analysis was performed with SPSS 25.0.

The qualitative analysis was based on the written comments from the mentors during the observation processes. First, an exploratory analysis of the comments was conducted, and only those of a formative nature linked to suggestions for improvement were considered. These were coded into thematic categories using content analysis and labeled with the help of MAXQDA software (Table 2).

## Results

### Quantitative results

The results of the statistical analysis show a significant improvement in teaching performance after the intervention. Table 3 includes the descriptive analysis of the pretest-posttest evaluation, which was conducted with a previously described Likert scale (from 1 to 4). As can be seen, in all cases, an increase in the evaluation of each of the skills/competencies analyzed is observed, with the greatest being "Pedagogical Design," which increased from  $3.09 \pm 0.892$  to  $3.61 \pm 0.682$ .

To determine if these differences are statistically significant, the Wilcoxon signed-rank test was analyzed along with the effect size based on Cohen's  $r$ , whose results are shown in Table 4. In all cases, the impact was statistically significant ( $Z = -8.219$ ;  $p < 0.001$ ) with a large effect ( $r > 0.6$ ), highlighting an improvement in Communication, where the evaluation of 31 teachers increased, with an effect of  $r = 0.820$ . The impact is greater in Learning Facilitation (an increase in 41 cases and an  $r = 0.891$ ) as well as in Pedagogical Design (an increase in 39 cases with an  $r = 0.707$ ).

### Qualitative results

The content analysis of the written comments by the mentors allowed for the identification of recurring patterns in the observations made. In total, 372 units of meaning

**Table 2** Observation criteria for evaluating online teaching performance

Category	Code	Observed criterion
Pedagogical design	P_Session opening	The session begins without referencing prior content or outlining the topics to be addressed, which may hinder students' orientation and engagement from the start.
	P_Content delivery	A significant amount of time is spent explaining concepts without introducing a practical case to activate student participation.
	P_Proposed learning activities	The instructor offers recommendations or tasks that connect the presented content with learning activities, aiming to promote engagement.
	P_Session closure	The class ends without summarizing the key ideas or announcing the next session or learning objective, which affects continuity and progression across sessions.
Communication	C_Communication style	The instructor uses a colloquial, disorganized, or digressive speaking style that may hinder message clarity and student comprehension.
	C_Non-verbal communication	The instructor avoids eye contact, frequently repeats filler words, or displays signs of insecurity, which can undermine clarity and connection with students.
On-screen presence	V_Visual appearance on screen	Framing, lighting, or the visual background reduces clarity or professionalism, negatively impacting students' perception and attention.
Instructional design	D_Visual design of the presentation	Slides hinder learning due to excessive text, poor layout, disorganized structure, or insufficient visual quality.
	D_Content organization within the presentation	Slide content is not aligned with learning objectives or lacks pedagogical coherence, making it harder for students to follow or understand the session.
Learning facilitation	F_Time management	The session does not adhere to the planned schedule, and suggestions for improvement in timing are needed.
	F_Promotion of synchronous interaction	There is no use of chat or microphone, nor are questions or dynamics posed to foster real-time interaction.
	F_Collaborative strategies	The session lacks proposals for group work or cooperative activities, limiting collaborative engagement among students.
	F_Asynchronous audience engagement	There is no greeting or reference to students who will view the recording, which weakens their connection to the session.
	F_Integration of digital tools	External applications or integrated tools that support classroom engagement are not used effectively.
	F_Management of technical issues	No alternative solutions are provided when technical issues arise, interrupting or preventing the normal development of the session.

**Table 3** Descriptive analysis of quantitative evaluation of teaching skills and competencies before and after individualized mentoring

Category	Pretest Mean	Pretest SD	Posttest Mean	Posttest SD
Pedagogical design	3.09	0.892	3.61	0.682
Communication	3.42	0.687	3.80	0.455
On-screen presence	3.26	0.829	3.67	0.600
Instructional design	3.37	0.726	3.68	0.537
Learning facilitation	3.29	0.623	3.72	0.520

**Table 4** Mean ranks for pretest–posttest comparison in the acquisition of teaching skills and competencies

Category	Group	<i>N</i>	Mean rank	Sum of ranks	<i>Z</i>	Sig	<i>r</i>
Pedagogical design	Negative ranks	8	20.25	162.00	-4.469	0.000	0.707
	Positive ranks	39	24.77	966.00			
	Ties	41					
Communication	Negative ranks	1	14.50	14.50	-5.091	0.000	0.820
	Positive ranks	31	16.56	513.50			
	Ties	58					
On-screen presence	Negative ranks	5	14.00	70.00	-4.471	0.000	0.707
	Positive ranks	32	19.78	633.00			
	Ties	53					
Instructional design	Negative ranks	4	17.88	71.50	-3.890	0.000	0.606
	Positive ranks	28	16.30	456.50			
	Ties	58					
Learning facilitation	Negative ranks	4	22.00	88.00	-5.458	0.000	0.891
	Positive ranks	41	23.10	947.00			
	Ties	45					

were coded, and the preliminary analysis allowed for their classification into three main groups:

1. *Recognition of good practices*: Successful strategies such as the use of interactive resources, clarity in instructions, and a close communicative tone with students were frequently highlighted.
2. *Suggestions for improvement*: Mentors recommended concrete actions to improve class dynamism, deepen feedback, and adjust the instructional design to the profile of the online student. These observations were formulated based on specific evidence taken from the recorded classes.
3. *Pedagogical reflection*: Several comments included open-ended questions aimed at promoting the critical reflection of the observed teacher, pointing out opportunities for improvement from a collaborative and non-punitive perspective.

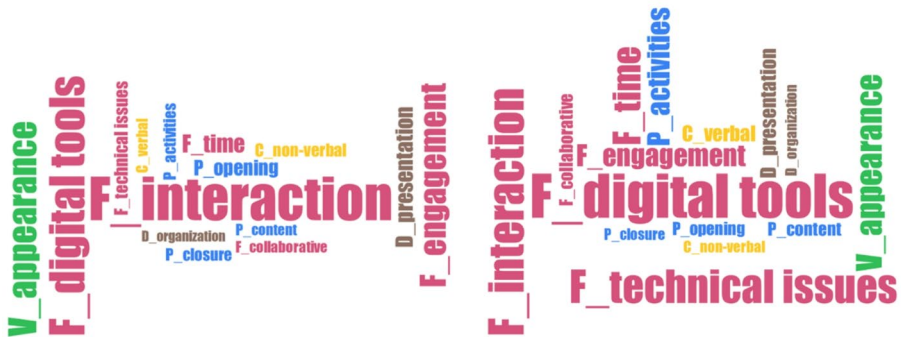
The richness of these comments reinforces the formative nature of the process and demonstrates feedback focused on both recognition and improvement, consistent with the horizontal and evidence-based mentoring framework.

The content analysis focused on the suggestions for improvement (Table 5). The increase in quantitative scores between the pretest and posttest is closely related to the reduction of the comments observed in the qualitative analysis.

A significant reduction was observed in all aspects of improvement mentioned, except for two of them. A slight increase was noted in “P\_activities (+3),” which may be related to the fact that in the third session, the faculty members worked on content related to continuous evaluation activities. Therefore, the reference to these activities increased. Also, we found a significant increase in “F\_technical issues”, which can be interpreted as faculty members using more resources to make their sessions more dynamic, which may have led to minor incidents, something that translated into suggestions from the mentors.

**Table 5** Frequency of codes in pretest and posttest observations in relation to improvement feedback

Category	Code (Short Label)	Pretest	Posttest
Pedagogical design	P_activities	14	17
	P_opening	20	6
	P_content	12	7
	P_closure	14	4
Communication	C_verbal	12	9
	C_non-verbal	15	4
On-screen presence	V_appearance	47	20
Instructional design	D_presentation	24	9
	D_organization	11	4
Learning facilitation	F_time	26	23
	F_interaction	77	32
	F_collaborative	12	7
	F_engagement	42	16
	F_digital tools	61	41
	F_technical issues	16	30

**Fig. 2** Comparative word clouds of improvement-oriented feedback codes in the pretest and posttest observations. Word size represents the relative frequency of each code within each observation phase. The word clouds are intended as a complementary visualization of the coded feedback patterns, while the main comparative evidence is provided by the frequency data in Table 5

To complement the frequency analysis presented in Table 5; Fig. 2 provides a visual summary of the relative prominence of improvement-oriented feedback codes in the pretest and posttest observations. The pretest and posttest qualitative analysis code clouds showed a change in the pattern of mentors' comments. In the pretest, comments related to student interaction, use of digital tools, on-screen appearance, and asynchronous audience engagement were more prominent. In the posttest, these codes decreased in relative prominence, consistent with the frequency reductions reported in Table 5. In contrast, recommendations related to technical incidents became more prominent in the posttest, which may reflect the increased use of digital tools during later sessions.

## Discussion

The findings of this study confirm that structured teacher mentoring, mediated by rubric and developed in virtual environments, can have a significant impact on improving pedagogical competencies in online higher education. These findings resonate with recent reviews on student engagement in online higher education (Bergdahl et al., 2024) and with research that highlights faculty development needs for adopting digital technologies in teaching (Mah & Groß, 2024). In line with previous research, the study showed a statistically significant improvement in all dimensions evaluated, with particularly high effects on Learning Facilitation ( $r=0.891$ ) and Communication ( $r=0.820$ ). This evidence reinforces the idea that evidence-based professional feedback drives the adoption of more effective and student-centered practices (Mendieta-Aragón et al., 2023; Grainger, 2021; Hundey et al., 2020).

One of the most notable elements was the use of a sequential rubric as a shared guide to structure both observation and feedback. As Jia et al. (2024) and Kim et al. (2024) point out, rubrics aligned with online teaching not only improve inter-rater reliability but also foster metacognitive reflection and professional development. In our case, their systematic application made it possible to show concrete improvements in dimensions such as content organization, non-verbal communication, and session dynamism, in coherence with what was reported by Albrahim (2020) and Fox-Alvarez et al. (2021).

Qualitative analysis reinforces the formative nature of the process. The comments made by the mentors focused on constructive suggestions for improvement, demonstrating a non-punitive approach based on trust and horizontality, which is key in adult learning (Sullivan et al., 2012; Rohrbacher & McKee, 2019). This relational dimension aligns with the principles of communities of practice (Wenger, 1998) and with Schön's (1983) ideas about "reflection in action" as a driver of professional development. The decrease in codes linked to didactic weaknesses between the pre-test and posttest suggests a critical awareness on the part of the faculty. This change can be interpreted as the result of a process of professional reconstruction activated by reflective observation of one's practice and the reception of well-founded feedback. By analyzing their sessions, faculty members appear to have internalized new frameworks for pedagogical interpretation, which favored the revision of strategies and the adjustment of their didactic decisions.

An unexpected finding was the increase in observations related to technical incidents in the final phase. This result, rather than regression, may reflect an increase in the use of digital tools by faculty, with the consequent exposure to new technical challenges. This phenomenon has also been documented by Yu et al. (2025), who emphasize that the integration of technology in online teaching requires not only technical competence but also pedagogical support and sustained reflection.

The results are consistent with reviews that highlight the transformative potential of structured teacher mentoring for professional development in digital environments. Hundey et al. (2020) synthesize international evidence demonstrating that these programs strengthen professional identity, consolidate collaborative networks, and improve the quality of teaching when they are clearly structured, supported by appropriate technologies, and promote non-hierarchical formative relationships. The

experience described in this study includes several of these recommendations, which may explain both its effectiveness and its potential for institutional replicability.

Finally, it is important to note that the benefits of mentoring are not limited to the mentored faculty. Although not an object of direct measurement in this study, it is plausible that the very act of mentoring has also contributed to the development of the mentors themselves, favoring a greater systematization of their professional judgment and a deeper awareness of quality frameworks in university teaching. This bidirectional impact reinforces mentoring as a sustainable and mutually enriching formative strategy, with the capacity to transform teaching culture towards more collaborative, reflective, and continuous improvement-focused models.

## Conclusions

The findings of this study provide evidence for the formative value of structured observation conducted by experienced mentors in fully online higher education contexts. The significant improvement in teaching competencies following the mentoring process indicates that this approach can generate real transformations in both pedagogical practice and professional self-awareness among faculty. Beyond the quantitative advances in the evaluated dimensions, the intervention fostered the consolidation of a culture of pedagogical reflection supported by evidence, professional feedback, and the use of clear instruments such as the rubric. These conditions enabled a safe, non-punitive, and continuous improvement-oriented environment, aligned with the principles of situated learning and teacher professionalization.

The analyzed experience aligns with contemporary models of teacher evaluation and development that prioritize participation, professional trust, and evidence-based improvement. It reinforces the idea that professional development in digital environments is possible and desirable if it is based on well-designed instruments, accompanied by formative processes, and an institutional framework that promotes continuous improvement.

This study not only provides empirical evidence on the effectiveness of online mentoring but also offers a replicable and scalable proposal for institutions committed to strengthening teaching quality. At a time when higher education faces challenges of scale, fragmentation, and digital transformation, betting on structured mentoring practices means betting on a more reflective, collaborative, and professionalized teaching staff.

Ultimately, mentoring not only transforms the practice of the mentored teacher but also constitutes a significant learning opportunity for the mentor, as it stimulates the systematization of quality criteria and the consolidation of expert pedagogical thinking. In this dual effect lies its true value as a sustainable professional development strategy in digital higher education.

## Limitations of the study

This study presents some limitations that should be considered when interpreting the results. First, although a structured individual mentoring approach based on rubrics was used, the design did not include a control group, which limits the possibility of attributing direct causality to the observed changes. The improvement in teaching competencies could be influenced by other institutional or personal factors not controlled during the process. In addition, because mentors were aware of the formative purpose of the program and evaluated the same faculty members across successive sessions, their expectations regarding mentees' improvement may have influenced progressive ratings. Although the use of a structured rubric helped standardize the observation criteria, future studies should incorporate additional strategies to reduce potential expectancy bias.

Second, while the feedback was systematic and guided by observers with specific training, the subjective perceptions of the participating faculty were not explored in depth, which prevents a full understanding of the emotional, motivational, or identity impact of the mentoring process. Finally, the instruments used were internally designed and validated in an exploratory way. Although the rubric showed acceptable internal consistency and formative utility, future studies should further examine its validity through expert review, inter-rater reliability analysis, and comparison with validated instruments for online teaching observation.

Although mentors' written feedback was analyzed as part of the qualitative component of the study, the research did not directly examine mentors' own perceptions of the mentoring process or its potential impact on their professional development. Exploring how mentoring influences mentors' pedagogical awareness, feedback literacy, and professional identity would be a valuable line for future research.

The study was conducted in a single private, fully online university, which may limit the transferability of the findings to other higher education contexts. Institutional culture is particularly relevant in peer mentoring processes, as the acceptance of peer observation, feedback, and pedagogical critique may vary across institutions based on their history, governance structures, and professional norms. In contexts where faculty autonomy and independence are more strongly embedded, the implementation and effects of structured peer mentoring may differ. Future research should therefore examine how institutional culture shapes the reception, sustainability, and outcomes of mentoring programs in diverse online, hybrid, and face-to-face higher education settings. Because the study focused on synchronous online teaching, the findings may not be directly transferable to asynchronous online courses or blended learning contexts where teaching presence, interaction, and feedback operate through different temporal and technological dynamics.

## Appendix: Rubric for formative observation of synchronous online teaching

This appendix presents the rubric used by mentors to assess recorded synchronous online class sessions. The rubric was originally developed in Spanish for internal formative purposes and has been translated, condensed, and anonymized for publication. Institutional references were removed, and the original institutional “4P” sequence was renamed as “problem-based teaching sequence” to improve clarity and transferability.

Level 1 = Does not apply the methodology or does not meet minimum expectations.

Level 2 = Applies the methodology with important deficiencies.

Level 3 = Applies the methodology adequately, with room for improvement.

Level 4 = Applies the methodology excellently.

Study dimension	Operational indicator	Level 1	Level 2	Level 3	Level 4
On-screen Presence	On-screen Presence	The instructor does not maintain an appropriate gaze toward the camera; the framing is inadequate; the background includes distracting personal elements; lighting is insufficient; and clothing does not convey a professional teaching image.	The instructor attempts to maintain eye contact with the camera, but inconsistently; framing is functional but includes minor errors; the background is acceptable but may include some distractions; lighting allows the instructor to be seen but is uneven; clothing is neutral but not clearly professional.	The instructor generally maintains appropriate eye contact with the camera; framing is mostly correct; the background is mostly neutral and professional; lighting is adequate, with minor possible improvements; clothing is professional and appropriate, although presentation details may be inconsistent.	The instructor uses appropriate framing, with the gaze parallel to the camera; appears from mid-chest to head with adequate lateral and upper space; uses a neutral or professional background; ensures clear lighting without facial shadows; and wears professional clothing.

Study dimension	Operational indicator	Level 1	Level 2	Level 3	Level 4
Communication	Effective communication	The discourse is unclear and disorganized; pronunciation and vocabulary are inadequate for the academic context; tone, volume, and pace hinder comprehension; posture and gestures do not support the message; and student contributions in the chat are largely ignored.	The discourse is understandable but sometimes disorganized; pronunciation is sufficient but imprecise; vocabulary is basic; tone and volume are acceptable but lack consistency; posture is functional but rigid; gestures are limited; and chat contributions are addressed only occasionally.	The discourse is clear and organized, with minor interruptions or less engaging moments; pronunciation and vocabulary are adequate; tone, volume, and pace are generally appropriate; posture and gestures usually support the message; and most student contributions in the chat are addressed.	The instructor delivers an engaging, clear, and well-structured discourse; uses precise pronunciation and rich, formal, and appropriate vocabulary; manages tone, volume, rhythm, and pauses effectively; uses posture, hand gestures, and facial expressions to reinforce the message; and consistently attends to student contributions in the chat.
Instructional Design	Use of presentations in live classes	The presentation is overloaded with text; includes unnecessary decorative elements; shows poor visual design, typographic, color, layout, spelling, or grammar problems; does not consider viewing across devices; and does not use multimedia or alternative ways of presenting content.	The presentation summarizes basic information but still includes excessive text; contains some distracting elements; has functional but inconsistent visual design; includes minor spelling or layout issues; partially considers device display; and uses multimedia resources only in a limited way.	The presentation summarizes information clearly, with occasional textual overload; focuses on the main topics; has generally careful visual design; contains no evident spelling or grammar errors; considers different devices to some extent; and includes some multimedia resources to enrich the session.	The presentation conveys information visually and immediately, avoiding text overload; remains aligned with the session content; demonstrates careful visual communication through color, layout, typography, and language accuracy; considers different devices and formats; and uses multimedia resources to explain content effectively.

Study dimension	Operational indicator	Level 1	Level 2	Level 3	Level 4
Learning Facilitation	Student interaction techniques	The instructor does not greet or close the session appropriately; does not explain participation options; uses a distant or unmotivating tone; does not respond adequately to student questions or contributions; and does not adapt discourse to students attending live or viewing the recording later.	The instructor greets and closes the session functionally but with limited energy; mentions participation options without clearly explaining or encouraging them; shows some closeness but inconsistently; responds generically to student questions; and only partially addresses students who will view the recording later.	The instructor greets and closes the session appropriately; explains participation options clearly, although not always throughout the session; uses a friendly and approachable tone; responds with interest and respect to most student contributions; and adapts discourse to both live and recorded audiences, although not consistently.	The instructor opens the session with energy, clarity, and positive expectations; explains participation options such as chat, raising hands, microphone, or camera; creates a natural, optimistic, and welcoming atmosphere; maintains active listening and responds with tact and respect; and explicitly addresses both students attending live and those who will view the recording later.
	Pre-class forum	The instructor does not use the forum to introduce the class dynamic or present problems to be solved. The instructor does not encourage student participation or share additional support materials.	The instructor uses the forum in a limited way, mentioning it occasionally but without a clear or consistent purpose. Participation is encouraged only generally, and few or no additional resources are provided.	The instructor uses the forum to introduce problems or class dynamics, although not always in a detailed or structured way. Basic additional resources, such as links or articles, are shared occasionally.	The instructor uses and explicitly refers to the forum to introduce the class dynamic and present the problems to be solved. The instructor encourages participation and adds value by sharing support materials such as news items, websites, articles, videos, or digital tools.

Study dimension	Operational indicator	Level 1	Level 2	Level 3	Level 4
Pedagogical Design	Problem solving in the live session	The session does not begin with a clear outline or structure. The session lacks organization, includes long or unclear theoretical explanations, and offers limited or irrelevant examples. The instructor does not ask motivating questions or connect the problem to real situations or professional practice. The problem is too abstract or not adapted to the topic or available time.	The instructor briefly introduces the main problem but does not present a detailed session structure. Theoretical explanations are functional but somewhat lengthy, with limited examples. Basic questions are asked, but they do not consistently motivate students to participate in solving the problem. The problem is relevant but not fully adapted to professional practice or the available time.	The instructor begins with a clear outline and mentions the main problem to be solved, although the session development is not fully detailed. Theoretical concepts are explained clearly, although sometimes at length, and examples are generally appropriate. Motivating questions are used, although their impact on problem solving is limited. The problem is appropriate and connected to professional situations, but could be more concrete or better adapted to the available time.	The instructor begins with a clear outline of the session and the main problem to be solved. The session follows a coherent sequence: review of key points from the previous session, explanation of core ideas with examples, presentation and resolution of the problem, and conclusions. The instructor explains theoretical concepts concisely and clearly, asks questions that motivate students to solve the problem, and adapts the real-world problem to the topic, subject area, and available time.

Study dimension	Operational indicator	Level 1	Level 2	Level 3	Level 4
	Activity presentation	The instructor does not explain the objectives or rubric of the activity, making it difficult for students to understand its purpose and assessment criteria. The activity is not connected to real contexts, theoretical concepts, or assessment. No real examples, common errors, or good practices are shown.	The instructor briefly mentions the objectives and rubric but does not explain them in depth. The connection between the activity, theoretical concepts, real contexts, or assessment is superficial. Real examples are shown only in a limited way, without analyzing errors or reinforcing associated concepts.	The instructor explains the objectives and rubric clearly, although the assessment criteria could be developed further. A reasonable connection is established between the activity, theoretical concepts, and assessment, with some practical examples. Real examples are shown, and main strengths or errors are identified, although not exhaustively.	The instructor explains the objectives, description, and rubric of the activity and links them to key concepts and assessment. The activity is connected to real contexts, showing how acquired knowledge and skills can be applied in practice. Whenever possible, the instructor presents real examples, identifies main strengths and good practices, highlights possible errors, reinforces associated theoretical concepts, and proposes similar situations.

Study dimension	Operational indicator	Level 1	Level 2	Level 3	Level 4
	Activity resolution	The instructor does not encourage students to participate actively in solving the activity and does not promote questions or discussion. No tools or applications are used to make the session more dynamic. The session ends without reflection on the problem solved or preview of the next class dynamic.	The instructor encourages participation only to a limited extent, with little interaction or few opportunities for questions and discussion. Basic tools or applications are used inconsistently or without clear impact on the session dynamic. The session concludes with a brief mention of the problem solved, but without deeper reflection or preview of the next session.	The instructor encourages active participation, although interaction could be more dynamic or fluid. Appropriate support tools are used to resolve the activity, although with limited innovation. The session ends with some reflection on the problem solved and a general preview of the next problem or class dynamic.	The instructor motivates students to participate actively by solving similar situations, asking questions, or engaging in discussion. Applications or tools are used to make the session more dynamic and increase student participation. The instructor uses support tools to solve the problem, either collaboratively with students or individually when there is no live participation. The session concludes with a brief reflection on the practical usefulness of the problem solved and a preview of the next class dynamic and problem.

The operational indicators in the original rubric were organized according to the five analytical dimensions used in the study: Pedagogical Design, Communication, On-screen Presence, Instructional Design, and Learning Facilitation. Because some indicators may relate to more than one dimension, they were assigned according to their primary pedagogical function and the coding framework used in the qualitative analysis

**General assessment.** Mentors also provided an overall assessment of each faculty member's development in online teaching and didactic performance, including dedication, compliance with deadlines, use of the teaching method, and degree of assimilation or learning. In addition, mentors provided written formative feedback to the faculty member after each observation cycle

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**Author contributions** GG contributed to the conception and design of the study, participated in the analysis and interpretation of the data, drafted the first version of the manuscript, and collaborated in its subsequent revision. IS contributed to the conception and design of the study, conducted the qualitative methodological analysis, participated in the interpretation of the data, collaborated in drafting and revising the manuscript, and handled correspondence. AA contributed to the conception and design of the study, carried out the quantitative analysis, participated in the interpretation of the data, and collaborated in drafting and revising the manuscript. LM designed the assessment instrument and contributed to the critical revision of the manuscript. JT contributed to the conception and design of the study, organized the data collection, and participated in the critical revision of the manuscript. All authors approved the final version submitted and accept responsibility for their own contributions, committing to ensure that any issues related to the accuracy or integrity of any part of the work, even in areas in which they were not personally involved, are properly investigated, resolved, and documented in the scientific literature.

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## Declarations

**Conflict of interest** We declare that this manuscript is original and unpublished, and it has not been submitted to any other journal for consideration. None of the authors have any conflict of interest to disclose.

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