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Exploring online learning: Virtual teaching quality, student satisfaction, and academic performance among nursing students in Peru – a cross-sectional study

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Abstract

Background: Virtual teaching has become an essential component of nursing education today, but its impact on practical courses remains unexplored. There is a need to understand how the quality of virtual teaching influences both academic performance and student satisfaction.

Objective: This study aims to explore how nursing students' satisfaction and academic performance in practical courses relate to the quality of virtual teaching in a Peruvian university in 2023.

Methods: A descriptive cross-sectional correlational study was conducted by surveying 125 nursing students in northern Peru from March to May 2023. The data were collected using the Online Education Scale and Academic Satisfaction Scale. Academic performance was assessed through documentary analysis of the students' general averages, and Kendall's tau-b test was used to assess the relationship. Additionally, Pearson's Chi-square test and both bivariate and multivariate logistic regression analyses were conducted to obtain more precise relationships.

Results: The study found that 54.4% of nursing students rated virtual teaching quality as low, with the same percentage reporting low satisfaction and 59.2% having low academic performance. Virtual teaching quality was positively correlated with satisfaction ($\tau b = 0.415$, $p < 0.01$) and negatively with academic performance ($\tau b = -0.176$, $p = 0.043$). Pearson's Chi-square and logistic regression showed significant relationships in several virtual teaching dimensions. Virtual collaborative teaching and development of virtual capabilities were rated low by 72.8% and 60.8% of students, respectively. Both had significant odds ratios (COR: 4.1, AOR: 3.8, $p = 0.012$ and COR: 3.8, AOR: 3.5, $p = 0.010$). Virtual resources and accompaniment showed moderate ratings, with significant results for virtual resources (COR: 1.5, AOR: 1.3, $p < 0.001$) and virtual accompaniment (COR: 1.2, AOR: 1.0, $p = 0.040$).

Conclusion: This study revealed that poor-quality virtual teaching negatively impacted nursing students in Peru, leading to reduced satisfaction and academic performance. The positive correlation between teaching quality and satisfaction suggests that improving virtual teaching could enhance student satisfaction. However, the negative correlation with academic performance highlights challenges in adapting practical nursing education to virtual formats. Improving virtual methodologies and exploring innovative strategies, such as hybrid learning models, are essential for improving outcomes in nursing education.

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Background

The 2020 COVID-19 pandemic forced an unprecedented shift in the global educational landscape, transitioning from in-person instruction to virtual online models (Nurumal et al., 2023). Due to uncertainty and public health concerns, the education sector had to rapidly adopt online teaching to ensure the continued delivery of education (Cooper et al., 2019; Díaz, 2020). This paradigm shift reorganizes the conventional dynamics of education and compels training institutions to reconsider and develop teaching techniques utilizing various educational technologies. It is essential to recognize that while some nations possess technological capabilities, others face substantial limitations due to insufficient infrastructure (Jansen et al., 2021; Morin, 2020).

Additionally, this transition highlights the importance of innovation and flexibility in education while simultaneously testing the resilience and adaptability of educational systems. In this context, virtual teaching has proven to be a fundamental—and in many cases, complementary—modality for the future of education. As such, it continues to be integrated into universities, adapting to contemporary digital advances (Camilleri, 2021; Jansen et al., 2021).

However, numerous significant challenges emerged, including technological gaps, inadequate teaching techniques, lack of digital skills, limited resources, connectivity issues, and considerable impacts on mental health (Rahayuwati et al., 2021; Sadeghzadeh et al., 2022). Consequently, virtual education has negatively affected the performance and satisfaction of the academic community (Kumar, 2021). This modality has not only revealed the lack of infrastructure in less developed regions but also the inequality in access to and management of technologies, thereby exacerbating pre-existing disparities that limit educational opportunities for many students (Cho & Steege, 2021; Fernández-Sánchez et al., 2020; Wübbeler et al., 2021).

Globally, nursing students face significant academic challenges, including fatigue, stress, anxiety, lack of motivation, decreased productivity, increased absenteeism, and, in extreme cases, the abandonment of their studies (Alegría-Bernal et al., 2024; Martinez et al., 2021; Pérez-Pérez et al., 2021). In Peru, the transition to virtual education in the field of nursing has been a challenging but necessary process, implemented since 2021. From that year onward, universities adopted the virtual modality, although currently only a few continue to use it. Despite advancements in the quality of virtual theoretical instruction, supported by strategies that address technological and pedagogical needs, concerns persist regarding its practical implementation due to the limited tools available. This impacts both student satisfaction and academic performance (Humpiri, 2021; Salazar & Salazar, 2024).

As a result, virtual teaching negatively influences students' academic satisfaction and performance, affecting their enthusiasm, learning, and acquisition of practical skills (Olmedo-Pérez et al., 2023). Furthermore, the lack of face-to-face interaction with teachers and peers contributes to general dissatisfaction, increasing stress, anxiety, and other mental health issues (Gastelú, 2024).

Despite these findings, a significant gap remains in the literature concerning how the quality of virtual teaching specifically affects the development of practical nursing skills and what strategies could mitigate these adverse effects. While studies such as Abbasi et al. (2020) have explored the general challenges of online education and Alegría-Bernal et al. (2024) have examined digital tools in practice, they have not directly addressed the specific impact on nursing education in middle-income countries like Peru, where disparities in digital access are more pronounced. Furthermore, no studies to date have incorporated all three dimensions within this context.

This study addresses this gap by assessing the relationship between student satisfaction, academic performance, and the quality of virtual teaching among nursing students. The research not only aims to identify factors that negatively affect these aspects but also proposes strategies to optimize virtual teaching in practical disciplines. The novelty of this study lies in its exploration of the relationship between satisfaction, performance, and virtual teaching—an underexamined area in health sciences, which holds implications for the design of educational policies that prepare future health professionals for the demands of the modern labor market. Therefore, this study aims to explore how nursing students' satisfaction and academic performance in practical courses relate to the quality of virtual teaching in Peru.

Methods

Study Design

This study employed a descriptive cross-sectional correlational design. The methodology adhered to the STROBE guidelines (Von Elm et al., 2007). This study was conducted in Peru, a country with notable cultural and social diversity that influences educational experiences and access to learning technologies. Nursing education in Peru is primarily offered through public and private higher education institutions. In recent years, the implementation of online education has posed both challenges and opportunities for students. Cultural, infrastructural, and pedagogical factors specific to the region, such as gaps in internet connectivity, uneven availability of technological devices, and disparities in pedagogical training for virtual teaching, have influenced the adaptation to this modality. In addition, rural and remote communities face greater technological and educational barriers, exacerbated by socioeconomic differences among students. Despite these challenges, some universities continue to offer nursing education through virtual modalities (Humpiri, 2021).

Sample/Participants

A cohort of baccalaureate-level nursing students (n = 161) in their first to fourth years at a public university in northern Peru was studied during the 2023 academic year. The sample size was calculated using Raosoft software, a tool designed for easy calculation using basic parameters, with a 5% margin of error and a 95% confidence level (Raosoft, 2004). The minimum required sample size was 114 students. However, the researchers exceeded this target, collecting responses from 125 students: 29 first-year, 32 second-year, 31 third-year, and 33 fourth-year students. Inclusion criteria were nursing students of both sexes who were enrolled in practical courses

conducted virtually. Students who refused to participate or did not complete the instruments were excluded. Fifth-year students were also excluded as they were engaged in full-time clinical training (six months in a community center and six months in a hospital).

Instruments

Data were collected using the Online Education Scale and the Academic Satisfaction Scale (Sancho, 2022; Valdez, 2018). Academic performance was assessed through documentary analysis. Sociodemographic variables such as age, gender, marital status, occupation, and place of residence were also recorded.

The Online Education Scale, developed by Peruvian authors (Sancho, 2022; Valdez, 2018), was used to evaluate the quality of virtual teaching in practical environments. The scale demonstrated strong validity (Aiken's V = 0.94) and reliability (Cronbach's alpha = 0.86). It consists of four dimensions and 12 items: Virtual Resources (Items 1–3): assesses the availability and usefulness of the university's online resources. Virtual Accompaniment (Items 4–6): evaluates the support and interaction provided by the instructor. Virtual Collaborative Teaching (Items 7–10): examines student collaboration and interaction in the virtual learning environment. Development of Virtual Capabilities (Items 11–12): measures the development of students' digital skills. Responses are rated on a 5-point Likert scale from "strongly disagree" (1) to "strongly agree" (5). Total scores are classified as follows: Overall score: high (44–60), regular (28–43), low (12–27). Virtual Resources & Accompaniment: high (11–15), regular (7–10), low (3–6). Collaborative Teaching: high (16–20), regular (7–15), low (4–9). Virtual Capabilities: high (8–10), regular (5–7), low (2–4).

The Academic Satisfaction Scale, also developed by the same authors (Sancho, 2022; Valdez, 2018), was used to assess student satisfaction. It showed strong validity (Aiken's V = 0.99) and reliability (Cronbach's alpha = 0.87). The scale comprises three dimensions and eleven items: Virtual Academic Quality (Items 1–4): evaluates the quality and relevance of academic content. Student Perspective (Items 5–8): reflects students' views on enjoyment, commitment, and engagement with virtual class services. Teaching Staff (Items 9–11): assesses perceptions of the teaching quality provided by instructors. Responses are given on a 5-point Likert scale, with score ranges as follows: Overall score: high (41–55), regular (26–40), low (11–25). Academic Quality & Collaborative Teaching: high (16–20), regular (7–15), low (4–9). Teaching Staff: high (11–15), regular (7–10), low (3–6)

Academic performance was assessed through documentary analysis based on the students' overall averages for the 2023 academic year (Hernández et al., 2014). In Peru, grades are given on a 0–20 scale: High: 17–20 (outstanding), Fair: 14–16 (good), Low: 11–13 (acceptable/pass), Poor: 0–10 (failing) (Valdez, 2018).

Permission was obtained from the rights holders of the instruments used, ensuring compliance with intellectual property laws.

Data Collection

The study was conducted online over three months, from March to May 2023. Recruitment and data collection were carried out by a team consisting of a professor with a doctorate in education and a nursing student at the undergraduate level. Participants were invited through various channels, including emails sent via the university's official student database. Additionally, the nursing students' WhatsApp group was used to reach those who had not responded. The survey was administered using Google Forms. No financial incentives were provided; however, a thank-you message was sent via email to acknowledge each participant's voluntary contribution. Academic performance data were obtained from the Director of the Professional School of Nursing, with signed confidentiality agreements provided by the registrar responsible for enrollment. To ensure data quality, participants were given sufficient time to respond thoughtfully. Confounding variables such as age, gender, marital status, occupation, and residence were identified. The collected data were reviewed for consistency and accuracy.

Data Analysis

The study was approved by the Institutional Review Board/Ethics Committee of the Faculty Council (Resolution No. 378-2022-FCS-UNC Cajamarca), dated June 1, 2022. Before completing the questionnaires, participants provided written informed consent. All ethical principles were strictly followed throughout the study.

Ethical Consideration

Ethical approval for this study was granted by the Medical and Health Research Ethics Committee of the Faculty of Medicine, Public Health, and Nursing at Gadjah Mada University, Yogyakarta, Indonesia (Approval No: KE/FK/0186/EC/2023). Further permissions were obtained from Panti Rapih Hospital and the Sleman District Health Service. All participants provided formal written informed consent, which had been reviewed and approved by the ethics committee. To protect participant anonymity and confidentiality, identifying information was coded during electronic data entry, and completed questionnaires were stored securely in a locked filing cabinet at the researcher's office.

Results

Table 1 Sociodemographic data of the students (*N* = 125)

Indicator	Categories	f	%	95% CI
Age	18–20	36	28.8	(25.2–33.4)
	21–25	48	38.4	(34.2–41.5)
	26–30	41	32.8	(29.7–34.0)
Gender	Men	55	44.0	(41.3–47.2)
	Women	70	56.0	(54.1–58.4)
Marital status	Single	107	85.6	(82.5–87.8)
	Cohabiting	16	14.4	(10.6–17.0)
Occupation	Only Student	65	52.0	(50.2–55.6)
	Worker and Student	60	48.0	(46.2–50.5)
Residence	Urban	25	20.0	(18.3–22.4)
	Rural	100	80.0	(77.6–83.5)

A total of 28.8% of participants were aged 18–20 (*n* = 36), 38.4% were 21–25 years old (*n* = 48), and 32.8% were 26–30 years old (*n* = 41). A slight female majority was observed, with 56% of participants being women (*n* = 70) and 44% men (*n* = 55). Most participants were single (85.6%, *n* = 107), while

14.4% were cohabiting (*n* = 16). Regarding occupation, 52% (*n* = 65) were solely students, while 48% (*n* = 60) were both working and studying. Furthermore, 80% (*n* = 100) resided in rural areas, and only 20% (*n* = 25) lived in urban areas (see **Table 1**).

Table 2 Level of virtual teaching (*N* = 125)

Quality level of virtual teaching	f	%
Low	68	54.4
Regular	54	43.2
High	3	2.4
Total	125	100.0

Regarding the level of virtual teaching, the majority of students (54.4%, *n* = 68) reported a low level. Another 43.2% (*n* = 54) reported a regular level, while only 2.4% (*n* = 3) reported a high level (**Table 2**).

When examining the various dimensions of Virtual Collaborative Teaching, the highest level of dissatisfaction was found in the area of virtual collaborative teaching itself, with 72.8% of participants rating it as low (*n* = 91), accompanied by a COR of 4.1 (95% CI: 3.8–5.6), an AOR of 3.8 (95% CI: 3.6–4.0), and a p-value of 0.012. Similarly, 60.8% of participants rated the development of virtual capabilities as low (*n* = 76), with a COR of 3.8 (95% CI: 3.0–4.2), an AOR of 3.5 (95% CI: 2.8–4.0), and a *p*-value of 0.010. In contrast, moderate levels were more commonly reported for virtual resources (44%, *n* = 55), which showed a COR of 1.5 (95% CI: 0.8–2.8), an AOR of 1.3 (95% CI: 0.7–2.4), and a *p*-value of < 0.001, as well as for virtual accompaniment (49.6%, *n* = 62), with a COR of 1.2 (95% CI: 0.7–2.4), an AOR of 1.0 (95% CI: 0.7–1.3), and a *p*-value of 0.040 (**Table 3**).

Table 3 Level of the dimensions of virtual teaching (*N* = 125)

Dimensions	Level	f	%	COR (95% CI)	AOR (95% CI)	*p*
Virtual resources	Low	59	47.2	1.5 (0.8–2.8)	1.3 (0.7–2.4)	<0.001
	Regular	55	44.0			
	High	11	8.8			
Virtual accompaniment	Low	57	45.6	1.2 (0.7–2.4)	1.0 (0.7–1.3)	0.040
	Regular	62	49.6			
	High	6	4.8			
Virtual collaborative teaching	Low	91	72.8	4.1 (3.8–5.6)	3.8 (3.6–4.0)	0.012
	Regular	30	24.0			
	High	4	3.2			
Development of virtual capabilities	Low	76	60.8	3.8 (3.0–4.2)	3.5 (2.8–4.0)	0.010
	Regular	34	27.2			
	High	15	12.0			

Note. COR = Crude Odds Ratio; AOR = Adjusted Odds Ratio; CI = Confidence Interval; *p* <0.05 indicates a significant relationship (Pearson's Chi-square)

Table 4 Level of satisfaction with virtual classes (*N* = 125)

Satisfaction level	f	%
Low	68	54.4
Regular	53	42.4
High	4	3.2
Total	125	100.0

Regarding satisfaction with virtual practical classes, most students (54.4%, *n* = 68) reported low satisfaction. Another 42.4% (*n* = 53) reported regular satisfaction, and only 3.2% (*n* = 4) reported high satisfaction (**Table 4**).

Table 5 Level of satisfaction dimensions (*N* = 125)

Dimensions	Level	f	%	COR (95% CI)	AOR (95% CI)	*p*
Virtual academic quality	Low	97	77.6	4.5 (4.0–5.8)	4.3 (3.6–4.7)	0.010
	Regular	28	22.4			
University perspective	Low	59	47.2	2.2 (1.7–2.9)	1.8 (1.4–2.2)	0.021
	Regular	65	52.0			
	High	1	0.8			
Teaching plan	Low	44	35.2	3.1 (2.6–4.5)	2.8 (2.0–3.5)	0.002
	Regular	75	60.0			
	High	6	4.8			

Note. COR = Crude Odds Ratio; AOR = Adjusted Odds Ratio; CI = Confidence Interval; *p* <0.05 indicates a significant relationship (Pearson's Chi-square)

The most significant dissatisfaction was in virtual academic quality, with 77.6% (*n* = 97) rating it low (COR: 4.5; AOR: 4.3; *p* = 0.010). The university perspective was rated regular by 52% (*n* = 65), while 47.2% rated it low (COR: 2.2; AOR: 1.8; p = 0.021). The teaching plan dimension also showed 60% regular (*n* = 75) and 35.2% low (*n* = 44) ratings (*p* = 0.002) (**Table 5**).

Academic performance followed a similar pattern, with 59.2% (*n* = 74) reporting low performance, 36% (*n* = 45) regular performance, and only 4.8% (*n* = 6) high performance (**Table 6**).

Table 6 Academic performance level

Level	f	%
Low	74	59.2
Regular	45	36.0
High	6	4.8
Total	125	100.0

Table 7 Kendall's tau-b test for virtual teaching, academic satisfaction, and performance

	Satisfaction	Academic Performance
Kendall's tau_b	0.415 **	-0.176 *
Sig. (two-tailed)	0.000	0.043
N	125	125

Note. *p <0.05; *p <0.01 (two-tailed significance).

The perceived quality of virtual teaching in practical subjects was generally rated as low (54.4%, n = 68). Additionally, 43.2% (n = 54) rated it regular, while only 2.4% (n = 3) rated it high. There was a significant positive correlation between the quality of virtual teaching and student satisfaction (τb = 0.415, p <0.01), and a significant negative correlation between virtual teaching quality and academic performance (τb = -0.176, p = 0.043). These results suggest that while better virtual teaching is linked with higher satisfaction, it is associated with slightly lower academic performance (see **Table 7**).

Discussion

Principal Findings

This study aimed to explore the relationship between satisfaction, academic performance, and the quality of virtual teaching among nursing students, particularly in practical subjects. The findings revealed that low-quality virtual teaching is significantly associated with lower satisfaction and is modestly associated with decreased academic performance.

More than half of the participants reported low levels of satisfaction with their virtual education, academic performance, and the quality of virtual teaching. These findings align with prior research, including studies by Sadeghzadeh et al. (2022) and Oducado and Estoque (2021), which demonstrated that technical issues and poor-quality online instruction negatively impacted both student satisfaction and academic outcomes. Similarly, Diab and Elgahsh (2020) and Hassan et al. (2021) emphasized the importance of effective virtual teaching design, reliable infrastructure, and robust technical support in enhancing student experiences and performance. These studies underline the need for well-structured systems that address the specific challenges of virtual education.

Moreover, the significant positive correlation between the quality of virtual teaching and student satisfaction suggests that improvements in virtual instruction can directly enhance students' perceptions of their educational experience. However, the negative correlation with academic performance indicates that, despite increased satisfaction, academic outcomes may still be hindered, likely due to the lack of hands-on experience and limited development of practical skills in a virtual format. In this study, dimensions such as virtual collaborative teaching and the development of virtual capabilities received the lowest ratings, while virtual mentoring and access to online resources received more mixed evaluations. These observations are consistent with the findings of Langegård et al. (2021) and Koç and Arkan (2022), who pointed out the detrimental impact of reduced social interaction and practical engagement in online learning environments.

Interestingly, studies by Farsi et al. (2022) and Humpiri (2021) suggest that hybrid learning models, which integrate both online and in-person components, may offer a more effective solution to the limitations of fully virtual learning. Although hybrid models were not examined in the present study, existing literature supports their effectiveness in addressing the challenges posed by remote education, especially in hands-on disciplines like nursing. For example, Ruiz-Grao et al. (2022) found that hybrid models, which combine theoretical virtual instruction with in-person practical sessions, yield better academic performance and higher satisfaction levels. Given the dissatisfaction with virtual collaborative teaching identified in this study, these findings highlight the critical need to enhance interaction and collaboration in online learning environments.

Implications

To enhance the effectiveness of virtual education, several key areas require attention: First, improving technological access is essential, particularly for students in rural areas, who accounted for 80% of the study population. These students often face significant barriers in terms of internet connectivity and device availability, which may contribute to their dissatisfaction with virtual learning. Ensuring equitable access to technology is crucial to creating a more inclusive and effective virtual learning environment (Li et al., 2021).

Second, both students and faculty must develop stronger digital competencies. Faculty should be offered ongoing professional development programs aimed at improving their ability to teach effectively in virtual settings. The fact that 72.8% of students rated virtual collaborative teaching as low-quality suggests that instructors may need more support in designing engaging and interactive online experiences that replicate the collaborative nature of in-person learning.

Third, the adoption of hybrid learning models could offer a more balanced and effective approach. As demonstrated in studies by Farsi et al. (2022) and Ruiz-Grao et al. (2022), hybrid models can help overcome many of the shortcomings of entirely virtual education. They allow for the flexibility of online learning while preserving the hands-on experience essential for nursing education. These strategies are likely to enhance both satisfaction and academic performance, ultimately better preparing students for the dynamic healthcare environment.

Limitations and Future Research

This study has several limitations. The sample size was relatively small and limited to a single university that offers virtual nursing education, which may affect the generalizability of the findings. Future research should aim to include larger and more diverse samples from multiple educational institutions and geographic regions, although it is essential to note that not all institutions implement this type of teaching modality. Broader representation would improve the reliability and applicability of the findings. Additionally, future studies should consider longitudinal designs to examine the long-term impact of virtual learning on student satisfaction and academic performance. This would provide deeper insight into how sustained exposure to virtual education affects learning outcomes, particularly in practical subjects. This research did not explore certain variables, such as socioeconomic status,

due to cultural sensitivities in the region. Moreover, internet accessibility was not directly addressed, as all participants were required to have adequate access given the fully virtual nature of the university. Lastly, the study focused solely on students and did not include faculty perspectives, which limits insight into the instructors' training and competencies in virtual teaching environments.

Policy and Practical Recommendations

The findings of this study highlight the urgent need for educational institutions and policymakers to support the development and implementation of hybrid teaching models. Ensuring equitable access to technology for all students, particularly those in rural or economically disadvantaged communities—should be a top priority. Policymakers must establish infrastructure and policies supporting virtual and in-person learning formats to foster a more inclusive educational landscape. Furthermore, institutions must invest in continuous professional development for faculty, equipping them with the digital and pedagogical skills necessary for effective virtual instruction. Teaching in an online environment requires more than technical knowledge—it demands innovative strategies to engage students and facilitate interaction. Enhancing these areas will likely lead to improved academic performance and satisfaction, better preparing nursing students to thrive in a technology-driven healthcare setting.

Conclusion

There is a clear correlation between nursing students' academic performance and their satisfaction with online education. These findings emphasize the need to enhance the quality of interactive online teaching to improve both satisfaction and learning outcomes. In Peru, although digital education has progressed significantly since 2020, many challenges remain. These persistent issues continue to undermine the effectiveness of virtual education across the country, indicating that existing advancements are not yet sufficient to meet the demands of the educational sector. To address these challenges, Peruvian educational institutions should prioritize strategic investments in technology and ongoing digital skills training to improve the quality and effectiveness of virtual teaching. Additionally, policymakers should enforce higher quality standards and establish accurate evaluation mechanisms for virtual education to ensure that the needs of students and educators are met.

Declaration of Conflicting Interest

The authors declare that they have no conflict of interest in this study.

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Authors' Contributions

Concept: J.F., E.A., H.F., W.R., Design: J.F., E.A., H.F., W.R., Literature search: J.F., E.A., H.F., W.R., A.M., M.B., and L.S., Data Acquisition: J.F., E.A., H.F., W.R., Data Analysis: A.M., M.B., and L.S, Statistical Analysis: J.F., E.A., H.F., W.R., Manuscript Preparation: J.F., E.A., H.F., W.R., A.M., M.B., and L.S., Manuscript Editing and Manuscript Review: A.M., M.B., and L.S., Final Approval: All authors.

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Data Availability

The dataset generated during and analyzed during the current study is available from the corresponding author upon reasonable request.

Declaration of Use of AI in Scientific Writing

Nothing to declare.

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