

Online versus paper-based exam: A comparative study of nursing students' satisfaction and achievement during COVID 19 outbreak

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Abstract

Background: The COVID-19 outbreak has made it difficult to assess students using standard approaches. Teachers are compelled to acquire new methods of evaluation and employ alternative forms of performance assessment to prevent the virus from spreading amongst their students. Some educational communities believe that traditional assessment methods are the more effective, while others have different thoughts. **Aim:** the study aims to compare between nursing students' satisfaction and achievement of online and paper-based exam during COVID 19 outbreak. **Research questions:** is there a difference between nursing students' satisfaction of online and paper-based exam? Is there a difference between the nursing students' achievement of online and paper-based exam? **Design:** comparative descriptive research design was used to conduct this study. **Setting:** This study was conducted at Nursing Education Department and Community health Nursing Department, Faculty of Nursing, Alexandria University. **Sample:** A convenience sampling of 200 nursing students comprised the study subjects. **Results:** Statistically significant differences regarding students' satisfaction and achievement were found in the favor of paper-based exam. **Conclusion:** Despite students' overwhelming preference for paper-based exam, online exam can be a viable alternative to traditional evaluation for students' knowledge assessment if special attention is paid to its composition. **Recommendation:** All nursing curricula should be revised to include nursing learning outcomes and competencies that match the new era of online teaching and evaluation. Therefore, the current study recommends a condensed training for the students to use the online exams and online assessment.

Keywords: Paper-based exam, Online exam & Online assessment

Introduction

Student evaluation determines the extent to which educational objectives are achieved as well as the extent to which educational institutions serve the needs of the community and society. It plays a significant role in determining what goes on in the classroom in terms of what and how teachers teach, and how students learn, and it has a great impact on both teaching and learning. The rapid advancement of Information and Communication Technologies (ICT) obligates colleges to shift the assessment paradigm frame from paper-based to computer-based system of examination (Al-Qdah & Ababneh 2017). Moreover, Corona virus has been spreading extremely quickly causing a challenge between traditional and non-traditional evaluation. In such situations, where alternative assessment replaces traditional assessment, teachers are forced to learn new methods of evaluation and use alternative forms of performance assessment for their students which can be very hard and challenging (Ghavifekr & Rosdy 2015).

Tests have many benefits as teachers can analyze and compare student scores, test makers can

categorize questions to determine which areas are easy or difficult and it forces educators to spend time teaching students how to manage tests. Traditional evaluation can be done through three different types of tests which are oral, practical and written exams (Olufemi, 2009). The first category is oral tests which can rank from quick, short questions to more formal-structured questions by a committee. The second category is practical tests which are simply used to assess the clinical skills (Al-Rukban, 2006). The third category is written paper-based exams. They are the average grading of a set of standardized test questions with a limited number of answer choices to be responded to at a given time period. They can include objective tests, in which there is no place for subjective judgment to the score, and essay tests, which are considered open ended questions that can be used to demonstrate problem solving, decision making and critical thinking (Olufemi, 2009). However, these exams also have a few disadvantages such as; lacking real-world context, students answer questions one by one without the need to apply critical reasoning skills, need writing practice skills especially in long essays (Quanash, 2018).

Online exam has been noted as a viable alternative to the traditional paper-based method. It is a valuable tool in higher education in which all the assessment procedures from the start to the end should be carried out electronically. This means that; the design of the test, test implementation, recording the response and providing the feedback are all completed using Information Communication Technology (ICT) (Crisp et al., 2016). Online exam has numerous advantages such as; it is fast and easy to use, has friendly interfaces and test as games and simulations resemble learning environment and recreational-like activities; it provides immediate feedback to improve the learning level and increases the students' motivation to enhance their performance and provide flexibility for the students in remote area. It enables teachers to track the students' performance and make analysis, find the misconceptions and solve them out and reduce the teachers' burden to assess large numbers of students (Fike et al., 2010).

Online exam also helps the Faculty to arrange places for appropriate qualified applicants, decreases the cost for the institution to assess students, checks identification and password verifications to ensure the identities of the students and has its own set of security as it prevents the students from copying the questions (Liberman et al., 2020). Furthermore, it prevents students from cheating by shifting the order of questions. Nonetheless, it has some drawbacks as some students\teachers are inexperienced with computers or with the online assessment process (or in technology in general) and need training at the beginning to be familiar with E-exam. Some other disadvantages are inaccessibility of computer and internet, poor technical infrastructure development and the difficulty in scoring and correcting essay questions (Pulakos et al., 2014).

Evaluation is one of the critical components of classroom instructions. However, the COVID-19 outbreak has been making it harder to use paper-based exam to evaluate students which leads educators to the use of online exam in an attempt to stop the virus from spreading amongst their students. Although paper-based evaluation remains the major method for student evaluation data collection in face-to-face courses, the use of the Internet as a primary method for student evaluation has been increasing throughout the pandemic (Jandrić, et., al 2020 & Rapanta, et al., 2020).

Significance of the study:

As a result of the contradicting opinions and different preferences about the two types of exam to determine which evaluation method is more suitable for students and teachers. Some people within the educational community have different ideas

regarding the implementation of evaluation methods. Some of them believe that paper-based exam is more effective, while others believe that online exam is the best. Therefore, this study aims to compare between nursing students' satisfaction and achievement of online and paper-based exam during COVID 19 outbreak.

Operational definition of achievement in this study:

Academic achievement in this study refers to test scores (courses' final grades)

The aim of the study:

Compare between nursing students' satisfaction and achievement of online and paper-based exam during COVID 19 outbreak.

Research objectives

The aim will be achieved through

Assess students' satisfaction of online based exam during COVID 19 outbreak.

Assess students' achievement of online based exam during COVID 19 outbreak.

Assess students' satisfaction of paper-based exam during COVID 19 outbreak.

Assess students' achievement of paper-based exam during COVID 19 outbreak.

Research questions

1. Is there a statistically significant difference between nursing students' satisfaction of online and paper-based exam?
2. Is there a statistically significant difference between the nursing students' achievement of online and paper-based exam?

Materials and Method

Materials

Research design: Comparative descriptive research design was used to conduct this study.

Setting: This study was carried out at Nursing Education department and Community Health Nursing department, Faculty of Nursing- Alexandria University.

Subjects: the subjects of this study comprised 200 nursing students registered in the third academic level who included, firstly, 100 nursing students who were selected randomly from 133 students registered in "Scientific thinking course"(using Epi info 7 program with confidence level 95%, expected frequency 50% and confidence level 5%) . They were recruited in the current study as paper-based exam group who evaluated by this method . Secondly: 100 nursing students who were selected randomly from 135 students registered in "Health Literacy Course" (using Epi info 7 program with confidence level 95%,expected frequency 50% and confidence level 5%) .They were recruited in the current study as online exam group who evaluated by

this method. Those courses were conducted during the second term of the academic year 2019-2020.

Tools: two tools were used for data collection

Tool One: Exam satisfaction assessment questionnaire

This tool was developed by the researchers after reviewing the related literature (Magno 2015 , Dikli 2003, Jones 2002, Al-Qdah 2017, Bodmann , Robinson 2004, Al-Mashaqbeh , Al Hamad 2010, Garrison et al.,2004) to assess the students' satisfaction regarding paper-based and online exams. It involved three parts: first part includes students' personal and academic data such as name, age, gender, marital status, computer skills and last GPA .Second part consisted of five points likert scale, ranged from strongly agree=5 to strongly disagree=1. It included 4 dimensions represented in 45 items as following; administration (7 items), design (5items), implementation (7 items), advantages (17 items) and disadvantages (9items). Third part was two open ended questions related to their feedback about the two types of exams .The total score was180 which interpreted as; from 180 to120 represented high levels of satisfaction, from 119 to 59 represented moderate levels of satisfaction and less than 59 represented low levels of satisfaction. The tool's reliability was calculated using Cronbach's Alpha test, it was reliable and the test coefficient value was 0.83. Attached to it is a sheet that contains

Tool Two: Students' test scores sheet

This tool includes students' final grades in the online exam or paper-based exam which were obtained from the control room of the third academic level.

Method

An official permission to conduct the study was obtained from Ethics Research Committee and the dean of the Faculty of Nursing, Alexandria, Egypt. An official permission to get student scores was obtained from Faculty vice dean for students affairs and the head of the third academic level control room after providing explanation of study aim. Exam satisfaction questionnaire was developed by the researchers and its validity was ascertained by a 5 expert jury in the related fields .A pilot study was carried out on 10% of the study sample (20 nursing students who represented by 10 students from each group) to ensure the clarity and feasibility of the tool, and the necessary modifications were done accordingly prior to data collection. Students included in the pilot were excluded from the study. The questionnaire was distributed and received electronically through the university email. Data collection was carried out by the researchers during the second term of the academic year 2019-2020 according to the following groups;

Group I: Online exam group: Students who were evaluated through E-exam

Group II paper-based exam group: Students who were evaluated through paper-based exam

Ethical Considerations

Electronic informed consent was obtained from all nursing students after the explanation of the study aim and the potential benefits from participation in the study. According to the subject's acceptance to participate in the study, the questionnaire was distributed to them to be filled. Confidentiality was assured. The nursing students had the right to withdraw from the study at any time without any penalties.

Results

Table (1): Distribution of the studied students according to their personal and academic characteristics

Variables	Group I Online exam n=100		Group II Paper-based exam n=100		Total		Test of significance
	No.	%	No.	%	No.	%	
Sex							
Male	56	56.0	55	55.0	111	55.5	X^2 : 0.20 P: 0.887
Female	44	44.0	45	45.0	89	44.5	
Age							
19>20	0	0.0	12	12.0	12	6.0	FET: 80.902 P: <0.001*
20>21	45	45.0	88	88.0	133	66.5	
21-22	55	55.0	0	0.0	55	27.5	
GPA							
A	5	5.0	5	5.0	10	5.0	FET: 16.154 P: 0.007*
A-	0	0.0	1	1.0	1	0.5	
B+	6	6.0	0	0.0	6	3.0	
B	39	39.0	31	31.0	70	35.0	
B-	18	18.0	30	30.0	48	24.0	
C+	19	19.0	28	28.0	47	23.5	
C	13	13.0	5	5.0	18	9.0	
Computer skills							
Good	48	48.0	59	59.0	107	53.5	FET: 2.521 P: 0.276
V. good	49	49.0	39	39.0	88	44.0	
Excellent	3	3.0	2	2.0	5	2.5	
English							
Good	51	51.0	57	57.0	108	54.0	FET: 4.646 P: 0.095
V. good	36	36.0	23	23.0	59	29.5	
Excellent	13	13.0	20	20.0	33	16.5	

 X^2 : Chi-square

FET: Fisher's Exact Test

P: P value of test of significance

*: Significance at $P \leq 0.05$

Table (2): Comparisons between the studied groups according to their satisfaction mean score

Exam process	Mean% scores \pm SD	Test of significance
Administration		
Online exam Group	67.2 \pm 9.8	F:808.877 P:<0.001*
Paper-based Group	96.6 \pm 3.3	
Design		
Online exam Group	79.3 \pm 7.8	F:63.988 P:<0.001*
Paper-based Group	87.1 \pm 5.7	
Implementation		
Online exam Group	82.0 \pm 19.1	F:0.027 P:0.869
Paper-based Group	82.4 \pm 2.7	
Advantages		
Online exam Group	67.7 \pm 11.0	F:509.347 P:<0.001*
Paper-based Group	94.5 \pm 4.3	
Disadvantages		
Online exam Group	91.5 \pm 5.0	F:1396.770 P:<0.001*
Paper-based Group	38.5 \pm 13.2	

F: ANOVA test P:

P value of test of significance

*: Significance at $P \leq 0.05$

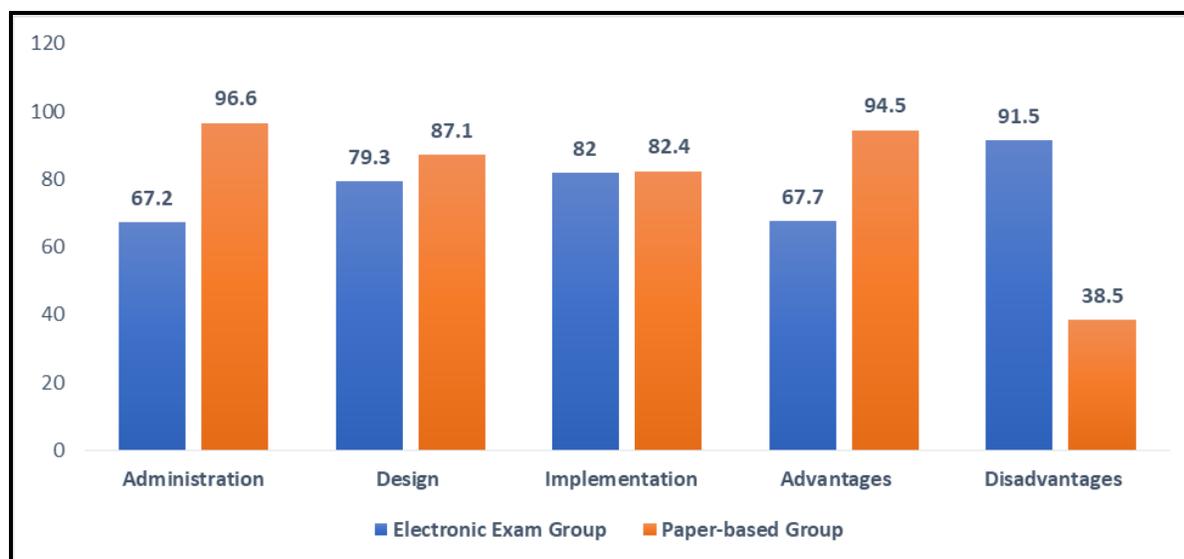


Figure (1): Comparisons between the studied groups according to their satisfaction mean scores

Table (3): Comparison between the studied students according to their satisfaction levels

Exam process satisfaction level	Online exam Group n=100		Paper-based Group n=100		Test of significance
	No.	%	No.	%	
Administration					
Low	2	2.0	0	0.0	<i>FET</i> : 139.589 <i>P</i> :<0.001*
Moderate	71	71.0	0	0.0	
High	27	27.0	100	100.0	
Design					
Moderate	18	18.0	0	0.0	<i>FET</i> : 19.780 <i>P</i> :<0.001*
High	82	82.0	100	100.0	
Implementation					
Low	3	3.0	0	0.0	<i>FET</i> : 54.185 <i>P</i> :<0.001*
Moderate	34	34.0	0	0.0	
High	63	63.0	100	100.0	
Advantages					
Low	4	4.0	0	0.0	<i>FET</i> : 110.824 <i>P</i> :<0.001*
Moderate	59	59.0	0	0.0	
High	37	37.0	100	100.0	
Disadvantages					
Low	0	0.0	77	77.0	<i>FET</i> : 246.794 <i>P</i> :<0.001*
Moderate	0	0.0	21	21.0	
High	100	100.0	2	2.0	
Total satisfaction score					
Moderate	23	23.0	4	4.0	<i>X</i> ² :15.457 <i>P</i> :<0.001*
High	77	77.0	96	96.0	

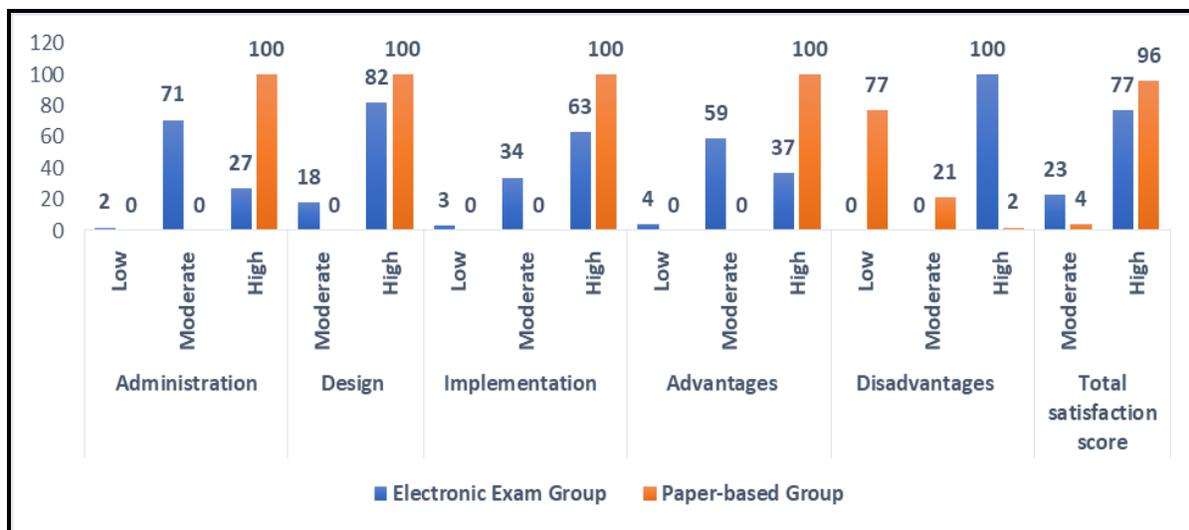


Figure (2): Comparisons between the studied groups according to their satisfaction levels

Table (4): Comparisons between the studied groups according to their academic achievement

Variables	Group I Online exam n=100		Group II Paper-based exam n=100		Total		Test of significance
	No.	%	No.	%	No.	%	
Final grade							
A	20	20	9	9	29	14.5%	FET: 30.358 P: <0.001*
A-	12	12	23	23	35	17.5%	
B+	19	19	38	38	57	28.5%	
B	17	17	20	20	37	18.5%	
B-	19	19	10	10	29	14.5%	
C+	8	8	0	0	8	4.0%	
C	5	5	0	0	5	2.5%	

FET: Fisher's Exact Test

P: P value of test of significance

*: Significance at $P \leq 0.05$

Table (1): Illustrates the distribution of the studied students according to their personal and academic characteristics. It was noticed that more than half (55%,56%) of the students in both groups were male. As regards to age, more than half (55%) of the students in online exam group were aged 21 years while most of paper-based exam group (88%) were aged 20 years. In relation to last GPA, it can be noticed that more than half of both online and paper-based exam groups had B and B+ as last GPA (57%, 61%) respectively. Regarding Computer skills, it was found that about half (49%) of online exam group students and more than half (59%) of paper-based exam students had good computer skills. As for English language, more than half of students in both groups were good. No statistical significant differences were found between online and paper-based exam groups in relation to personal and academic data except in their age and last GPA; this means that both groups were matching.

Table (2) & Figure (1): Illustrated the comparison between the studied students according to their satisfaction mean score. It was found that paper-based exam group had the higher mean score than online exam group regarding exam administration, design, implementation, advantages and less in disadvantages (96.6 ± 3.3 , 87.1 ± 5.7 , 82.4 ± 2.7 , 94.5 ± 4.3 , 38.5 ± 13.2), respectively. There were statistically significant differences in all aspects of exam process satisfaction mean scores in the favor of paper based exam except in implementation ($P < 0.001^*$).

Table (3) & Figure (2): Illustrate the comparison between the studied students according to their satisfaction levels. It was found that the highest satisfaction rate, lowest disadvantages with highest total score were in paper exam group. There were statistically significant differences between both groups regarding all aspects of the paper exam process ($P < 0.001^*$)

Table (4): Illustrates the comparison between both groups' students' achievement (final grades). It was

found that about two thirds of grade A students' were from the online exam group, while most of paper-based exam group had A-, B+, and B grade (23,38, 20) respectively. This means that there are statistically significant differences between the achievements of both groups in favor of paper-based exam group which had the higher grades.

Discussion

Due to the COVID-19 pandemic, educational systems were obligated to change their evaluation methods to prevent infection amongst their students. This led to a lot of arguments regarding the use of paper-based and online evaluation. Some believed it was best to use standard means and others thought the opposite. Because of this, this research was done to compare between the two methods and determine which way helps students achieve higher grades and more satisfactory scores while being comfortable in their surroundings.

In the beginning of this catastrophic event, most schools switched to the non-standard forms, believing it would be a better approach of evaluation for the learners. However, these methods, similar to the standard, encountered a lot of challenges during this era. For example, online examination methods need a system that can establish a server and a management system platform with definite rules of standardization, confidentiality, reliability, collaboration and authenticity. As a result, numerous of nursing colleges tend to apply online and paper-based exams in the assessment process according to the availability and suitability of circumstances in the era of Corona pandemic (Garrison 2004, Cui et al., 2015, Okunji, Hill 2014 & Wallace al., 2021).

In this research, the results showed that nursing students who were evaluated by paper-based exam had higher satisfaction mean scores and higher grades than other students who were evaluated by online exam. Also they mentioned that they didn't prefer online exam as it causes more anxiety and fear from internet problems, improper submitting, lack of pages browsing, inadequate time and electricity problems. These findings came in congruence with the study of Gehringer (2013) who concluded that students prefer online exam only for one reason which is simplicity of cheating and answering with one another in hidden groups while prefer paper-exam due to another reason; paper exam is more organized and students can navigate all question with ease. Moreover, Arkorful & Abaidoo (2014) concluded that the biggest problem facing teachers in online exam is the automatic grading of short-answer questions which is difficult, error prone and must be checked manually. Also students may use imaginary network problems as an excuse for their own lack of

preparation which put the teacher in educational dilemma. On the same line, Attia (2014) determined that traditional assessment is the best choice for majority of students but for better result it is needed to be integrated with the online assessment.

Furthermore, Crisp, Guàrdia (2016) concluded that students preferred traditional classroom exams because they were trained on how to answer paper-based exams, were familiar with the layout and design of the test and don't have to worry about technical difficulties that could interrupt them during answering. Also they are unfamiliar with technology, lack computer skills and didn't receive enough instructions. Majdi Al-Qdah & Islam Ababneh's (2017) also indicated that the students preferred to answer on paper rather than type on the computer screen but prefer certain aspects of online exams such as automatic feedback and automatic results. Böhmer & Feldmann (2018) mentioned that paper exams are the most significant exam tools with healthcare students, particularly, in summative assessment.

Moreover, Kolagari et al (2018) found that the nursing students exhibited higher anxiety levels during computer-based tests than students who were tested by paper-based tests. Additionally, Esfijani (2018) reported that two thirds of the study participants had positive perception of paper exams as a constructive experience. On the same line, Fraser (2019) stated that online exam has many difficult issues as time-shifting and location-shifting facilitate cheating; it is difficult to give an exam to a student not registered for the class; some browsers may have trouble with the exam or with certain questions; students may fail to save their work or accidentally exit the exam; network problems may abort exam attempts.

Newton, Woldeab (2019) reported that students do not prefer online exam due to different reasons such as using a computer for writing process especially for students with attention deficit disorders (ADHD). It is also time-consuming to brows electronic pages correctly; system may discard answers that contain arbitrary special characters; equation editors are hard for students and instructors to use; screen layout of questions may be unreadable on some browsers. Moreover, Farrag et al., (2020) documented that the nursing students preferred to pass through paper-based exam rather than any other type of exams, because they can find opportunities to understand the concepts of each question and think carefully with adequate revision before submitting the exam papers. Oducado & Estoque (2021) also mentioned that online testing is very stressful for nursing students and results in irritability and low concentration that influence, unconstructively, on

the nursing students' grades, particularly in the era of COVID-19.

On the other line, **Hassan & Baraka (2021)** found that online teaching, assessment and virtual classes in emergency courses had observable positive effects on nursing students' learning interaction and satisfaction. Also, students' evaluation through synchronized virtual and online interaction helps learners receive immediate feedback and increases students' trust in exam scores. Also **Čandrić et al (2014)** highlighted that the results of paper exam may be lost and provide vague results that depends only on the teacher justification and checking manner.

Conclusion:

Online evaluation is gaining more and more popularity during the ongoing COVID-19 pandemic and every university is looking towards qualitative and cost-effective methods of evaluation. In this competitive era, it has become imperative for universities to adopt the online evaluation system. On the other hand, this study allowed us to conclude that students in our sample have an overwhelming preference for traditional paper-based test, to the point that they tend to resist recognizing the advantages of online tests. We believe this strong preference for traditional test has a significant effect on their satisfaction levels and their grades. However, online exam can be a viable alternative to traditional paper-based exam for student' knowledge assessment if special attention is paid to its composition.

Recommendations and further studies:

On the light of the current study findings, undergraduate nursing students require to be trained well in using online exams and provided with enough orientations about the online evaluation system. Such training and orientation can be strong factors to decreasing nursing students' resistance and anxiety when dealing with online exam. All nursing curricula should be revised to include nursing learning outcomes and competencies that match the new era of online teaching and evaluation. Therefore, the current study recommends a condensed training for the students to use the online exams and online assessment. Fair policies and rules should also be developed for teachers and students for ensuring validity, reliability and feasibility of the online assessment.

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