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Evaluating the effectiveness of learning management systems for remote assessments during COVID-19

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ABSTRACT

This study investigated the effectiveness of Learning Management Systems (LMS) in accurately assessing students' levels remotely during the COVID-19 pandemic. With the abrupt shift to online learning due to the pandemic, universities heavily depended on LMS for instruction, necessitating remote assessments from students' homes. The study focused on evaluating the efficacy of LMS in this context. Researchers employed a descriptive method, gathering data through questionnaires and interviews with faculty and students at Northern Borders University. The research explored the role of LMS in online examinations, the perceptions of students and faculty towards LMS, and their effectiveness in both summative and formative evaluations. Results indicated that while students generally accepted LMS usage, they required further training for test-taking. LMS enabled faculty to diversify and assess their teaching methods. However, improvements are needed in evaluating practical skills remotely. Challenges remain in preparing students to complete practical assignments effectively, suggesting a need for advanced technical solutions within LMS to support their execution. The study recommends ongoing training for students to enhance their remote learning and testing capabilities, particularly in practical and applied tests.

1. Introduction

Evaluating student learning is crucial for improving educational processes and outcomes. Clear evaluation policies and procedures enhance teaching effectiveness (Almossa and Alzahrani, 2022). This study aims to understand faculty assessment methods during uncertain times and their continued use post-COVID-19. It will explore how academics and students perceive the effectiveness of Learning Management Systems (LMS) in remotely assessing students during COVID-19 and how these practices can be beneficial in the future. The lack of clear definitions and standards complicates understanding of the evaluation processes and the structure of higher education in Saudi Arabia. More information about the Saudi higher education system is needed to contextualize assessment practices and professional development needs. A quantitative approach is used to gather data on faculty members' assessment practices. The research investigates:

- The importance of LMS in evaluating students' actual levels.
- The benefits of LMS for remote assessment during emergencies like the COVID-19 pandemic.
- Faculty members' attitudes toward complete assessment through LMS.
- Students' attitudes at Northern Border University (NBU) towards assessment via LMS (Blackboard).

The COVID-19 pandemic forced institutions to adopt remote teaching and evaluation practices to address challenges in academic and skill development, certification, and social issues. Distance learning assumes students are self-motivated, but many may not be ready for self-learning. Teachers and students must adjust to post-shutdown social life, and certification issues particularly impact low-income students. Formative assessment, a continuous evaluation method, improves student learning by gathering learning

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evidence, while summative assessment evaluates performance after a term, course, or program. Teachers must adapt to new distance learning regulations and assessment measures during COVID-19. Schools may need additional resources, training, and digital expertise. National policymakers must adjust evaluation programs and face-to-face risk assessment, ensuring distance learning programs' reach, accessibility, and impact. Parents and students may demand solutions to evaluation challenges (UNESCO, 2020).

Researchers studied faculty attitudes towards LMS during COVID-19, comparing traditional and pandemic conditions, focusing on teaching potential, test performance, and course evaluation. The study aimed to verify LMS effectiveness in remote student assessment during the pandemic. Despite significant changes in evaluation practices, the study highlighted the need to assess LMS efficacy and faculty attitudes toward remote assessment practices. This study addresses the following questions:

- What is the importance of LMS in evaluating students' actual levels?
- What are the benefits of LMS for remote assessment during emergencies?
- What are NBU students' attitudes towards LMS assessment (Blackboard)?
- What are faculty members' attitudes toward full assessment through LMS?

The research objectives are:

- To highlight the reality of remote electronic evaluation during COVID-19.
- To examine how education systems used the pandemic to transform assessment practices.
- To investigate the importance of establishing policies and procedures for remote evaluation.
- To explore faculty members' attitudes towards full remote assessment through LMS.
- To understand the evaluation patterns used during the pandemic.
- To provide recommendations to improve and support assessment, teaching, and distance learning practices.

2. Review of the literature

Assessment has been the subject of scholarly disputes, with teachers and students needing to be noticed by the psychometrics-influenced educational environment. The role of literacy in the assessment of educators has been widely discussed (Almossa and Alzahrani, 2022; Fulcher, 2012; Inbar-Lourie, 2013; Shohamy et al., 2017), emphasizing the importance of teachers' knowledge and experience in evaluation (Broadfoot and Black, 2004; Shohamy et al., 2017; Vogt and Tsagari, 2014) and student assessment literacy (Smith and Seyfang, 2013).

To successfully enhance their teaching, assist their students, react to their needs, and satisfy the expectations of stakeholder groups, instructors must have a proper understanding of all assessment areas (Herrera Mosquera and Macías, 2015). They are also expected to enhance the literacy of their students' assessments. Research has shown that poor decisions can strongly influence student learning outcomes regarding assessment and assignments (Almossa and Alzahrani, 2022; Umar and Ko, 2022).

Teachers often do not like assessment, leading to improper design of tests that do not adhere to the principles of practical assessment (Herrera Mosquera and Macías, 2015; Popham, 2004). In addition, Coombe et al. (2012) argued that pupils are less likely to benefit from having professors who lack assessment ability. Therefore, there have been requests to educate both aspiring and practicing educators on the concepts of assessment, including their usefulness, validity, authenticity, reversion impact, and fairness (Almossa and Alzahrani, 2022; Green, 2013).

Small-scale studies have been conducted before in the context of English language instruction in Saudi Arabia (Almalki, 2014; Mansory, 2017), a quantitative study of EFL context (Umer et al., 2018), and an assessment of pre-service teachers' perceptions of formative assessment (Alaudan, 2014). This research found that final evaluations, particularly exams, were the norm, focusing on information retrieval questions rather than higher-order critical thinking. More standards and criteria were required to describe the tasks, and instructors required greater autonomy to make assessment judgments in schools where evaluation is standardized. There is still a pressing need for further study in other settings (Birenbaum et al., 2015). Few studies have focused on the higher education context in the Middle East and North Africa (MENA) (Gebril and Brown, 2014), more narrowly, on how assessments are conducted across university disciplines. More studies on literacy evaluation in Saudi Arabia need to be conducted compared to the worldwide environment (Darandari and Murphy, 2013). Since there are discrepancies between teachers' traditional grading methods and the most up-to-date assessment standards, studying university faculty's assessment knowledge and practices is promising (DeLuca et al., 2018; DeLuca et al., 2016; Gebril and Brown, 2014).

Several studies have been performed to examine how the COVID-19 epidemic has affected the lives of college students and teachers (Al-Mohair and Alwahaishi, 2020; Almossa, 2021; Aristovnik et al., 2020; Bisht et al., 2020; Gonzalez et al., 2020; Sasere and Makhasane, 2020). However, while these studies have shed light on how college students manage the problems and possibilities brought on by the crisis, only some have examined teachers and their evaluation techniques across COVID-19 (Almossa and Alzahrani, 2022). During a pandemic, schools must switch to online testing of pupils and instructors (Almossa, 2021; Guangul et al., 2020; Watermeyer et al., 2021). For example, (Sharadgah and Sa'di, 2020) investigate how professors at a

Saudi institution approach grading students' work in a digital setting. García-Peñalvo et al. (2020) conceded that online evaluation is one of the most challenging things to do throughout the school year impacted by the epidemic.

3. Research methodology

The current research aims to study the effectiveness of the LMS in assessing students' actual levels remotely during the COVID-19 era. The study used a mixed-methods approach, combining both quantitative and qualitative data collection techniques for a comprehensive understanding. Quantitative data were collected through structured questionnaires, while qualitative insights were gathered from semi-structured interviews.

The study was conducted at NBU Colleges, focusing on the use of LMS for distance assessment, with approval from the university's Research Ethics Board, dean, and secretary general.

The research population included a sample of faculty members and students from NBU colleges. Both questionnaires and interviews were used to gain clear and useful insights into their experiences, perceptions, and attitudes regarding the use of LMS for distance assessments.

Researchers designed separate questionnaires for teachers and students. Student questionnaires were distributed across all levels and colleges at NBU, including the Preparatory Year, Computer Sciences, and Administrative Sciences, on both male and female campuses. All participants took classes and were assessed remotely through Blackboard. The study included 101 questionnaire respondents (70 males and 31 females). The sample group was selected via convenience sampling, involving available students from the three colleges: Preparatory Year (N=39), Computer Sciences (N=36), and Administrative Sciences (N=26) (Table 1).

The teachers' sample included 32 participants (15 males and 17 females) from various departments and designations (Table 2). The researcher administered the questionnaires during the first semester of the 2022-2023 academic year. In summary, the information gathered from the questionnaires constituted the sample data for this research and helped establish a relationship between statistics and interpretations.

Table 1: Distribution of the research sample (Students) according to its taxonomic variables

The variables classification	Category		
Gender	Male 70	Female 31	
Scientific department	Preparatory class 25%	Computer science 36%	Administration science 39%

Table 2: Distribution of the research sample (Faculty members) according to its taxonomic variables

The variables classification	Category		
Gender	Male 15	Female 17	
Scientific department	Preparatory class 50%	Computer science %28	Administration science 22%

The responses from the faculty members in the study showed a higher response rate among females compared to males.

Researchers initially created two questionnaires based on the study's topic, objectives, and questions. These preliminary versions were reviewed by a panel of experts with relevant scientific and practical experience to ensure the appropriateness of the items. Following their feedback, some items were deleted or modified, resulting in improved final versions of the questionnaires. The faculty questionnaire included ten statements in one section, while the student questionnaire had 31 statements divided into three sections. Both questionnaires aimed to measure the effectiveness of the LMS in assessing students' actual levels remotely.

The questionnaires used structured items/closed-response questions and one open-ended question to gather in-depth data on key issues regarding the use of LMS for remote assessments. They were piloted with several participants, and some items were replaced with simpler terms or additional explanations in italics. The questionnaires were administered during the first trimester of the 2022-2023 academic year, and the Google Forms links were shared with faculty members and students on different days. A total of 101 students and 32 teachers completed the questionnaires.

Researchers ensured internal consistency and calculated the reliability of the questionnaires using Cronbach's Alpha for each section. The stability coefficient (Alpha) was 0.734, which is considered acceptable (Table 3). The reliability coefficient (Alpha) for another section was 0.757, also acceptable (Table 4). Another section had a reliability coefficient (Alpha) of 0.868, deemed acceptable (Table 5). Lastly, a reliability coefficient (Alpha) of 0.862 was noted, which is also acceptable (Table 6).

Table 3: Reliability analysis for the first section of the students' questionnaire

Cronbach's alpha	Cronbach's alpha based on standardized items	No. of items
.734	.799	7

Table 4: Reliability analysis for the second section of the students' questionnaire

Cronbach's alpha	Cronbach's alpha based on standardized items	No. of items
.757	.768	12

Table 5: Reliability analysis of the third section of the students' questionnaire

Cronbach's alpha	Cronbach's alpha based on standardized items	No. of items
.868	.880	9

Table 6: Reliability analysis for the faculty members' questionnaire

Cronbach's alpha	Cronbach's alpha based on standardized items	No. of items
.862	.885	11

The previous reliability coefficient Alpha values indicate that both questionnaires achieved sufficient reliability, making them suitable for the study. Therefore, their results can be included in the study procedures. The researchers distributed the two questionnaires electronically to all members of the research community. To complement the quantitative data from the structured questionnaires, semi-structured interviews were conducted with a subset of participants. These interviews aimed to provide deeper insights into participants' experiences, perceptions, and attitudes regarding the use of LMS for distance assessments.

A purposive sampling strategy was used to select a diverse subset of participants from NBU colleges for the questionnaires and interviews.

- Faculty members: A total of 32 teachers (15 males and 17 females) from various departments and designations at NBU colleges participated in the study. These teachers represented a range of academic disciplines and experience levels with using LMS for distance assessments.
- Students: A total of 70 students (50 males and 20 females) from different departments and academic levels at NBU colleges participated in the study (Table 7). Students were selected from the Preparatory Year, Computer Sciences, and Administrative Sciences departments, reflecting the diverse student population at NBU.

The semi-structured interview protocol was designed to capture the perspectives and experiences of faculty members and students regarding LMS-based assessments. Separate interview questions were developed for teachers and students to address their unique roles and experiences within the educational context. Interviews were conducted separately for teachers and students to allow for a focused exploration of their respective experiences with LMS-based assessments. Faculty members and students were individually approached and invited to participate in the interview sessions, which were scheduled at mutually convenient times.

3.1. Method of data analysis

The instruments used in the current study helped to gather data, which were quantitatively and qualitatively analyzed. Participants were invited to indicate their willingness to participate in focus group interviews. The Statistical Package for Social Sciences (SPSS) used quantitative analysis with questionnaires, yielding many results depending on the appropriate tests and measures of the obtained data. Questionnaires were reviewed by statistics specialists and specialized professors in the field of study at the NBU to validate the research tool. Categorizations and classifications of the studied aspects qualitatively analyzed open-ended questions.

Five scholars in the field at the NBU helped review and double-check the instruments' questions. Combining both data analysis procedures was necessary to validate data and produce more reliable results. The analysis of data followed some measures to ensure the validation process and the choice of the appropriate statistical tests. These measures were concluded in three necessary stages: first, the data gathered are arranged and checked according to categories derived from the evaluation framework. Second, assumptions and skewness are checked to choose the convenient statistical measures, and third, the quantitative output is combined with the qualitative results. Finally, the instruments' items were re-arranged and classified in light Coding, and skewness tests were used to check and categorize data. In contrast, nonparametric statistics were used to compare sets of variables.

Nonparametric statistics are divided into one-sample tests, two independent samples, and two related sample tests. Qualitative results supplement percentages, means, and frequencies and allow for justifying and interpreting results. The researchers' observation of the distant assessment through LMS during COVID-19 as teachers at the NBU helped to understand the phenomenon being studied.

3.2. Interview data analysis

Thematic analysis was employed to analyze the interview data separately for faculty members and students. Researchers independently reviewed and coded the interview transcripts to identify common themes, patterns, and insights specific to each participant group. This approach facilitated a nuanced understanding of the perspectives and experiences of faculty members and students regarding using LMS for distance assessments.

The qualitative insights from the interviews were integrated with the quantitative data collected through the questionnaires. This integration allowed for a comprehensive analysis of the effectiveness of LMS-based assessments from multiple perspectives, enriching the overall understanding of the research phenomenon.

4. Results and discussions

The researchers examined the effectiveness of LMS in assessing students' remote learning during the COVID-19 pandemic. They used a questionnaire with nine items on LMS use, 13 on remote testing, and nine on LMS impact on distance study and evaluation.

Table 7: Distribution of the research sample for interviews of faculty members and students

The variables classification	Category	
Gender	Male	Female
faculty members	15	17
students	50	20

Answering the first research question about the importance of using LMS, students' responses indicated that during the pandemic, 45% spent more than three hours per day on distance learning, 39% spent one to three hours, 16% spent only one hour, and almost none spent more than five hours. This shows significant student engagement with the LMS.

For the second question, 66% of students preferred using LMS for electronic tests in all courses, 32% preferred both electronic and traditional paper-based systems, and only 2% preferred traditional paper-based tests. This confirms a strong preference for LMS in exam performance.

The third question revealed that 41% of students primarily used mobile phones for learning and remote tests, followed by 15% using laptops and only 7% using desktops or tablets. Despite the limitations of mobile phones, they were the most relied upon.

The overall mean response for using LMS was 3.31 out of 5, indicating a neutral stance, suggesting that LMS use was generally moderate.

The highest approval ratings were for items 4, 5, and 9, indicating that during the pandemic, learning and exams were mainly electronic and remote. Students were highly satisfied with LMS-based exams (mean 4.47) and wanted more LMS-based distance training (mean 3.73). They liked being able to return to previous questions for review (mean 2.70). There was no significant burden added by LMS use, indicating that the pandemic made learning and exams more accessible and efficient.

Students were satisfied with LMS assessments, though they needed more training on using LMS and appropriate devices for remote exams.

Answering the second research question about the effectiveness of performing remote tests using LMS during COVID-19 or similar emergencies, the mean response for the second section was 3.33 out of 5, indicating a neutral stance, suggesting that remote test performance during COVID-19 was generally moderate. The highest approval ratings were for items 7, 8, 6, and 9, indicating:

- 79.2% of students agreed that LMS was suitable for remote questioning and writing.
- LMS was also ideal for oral exams.
- Formative assessments, like quizzes and assignments, motivated students and improved academic achievement.
- Continuous follow-up and evaluation by faculty during the pandemic were confirmed.

Other findings included:

- Adequate time to answer questions (mean 3.80).
- Internet weakness at home (mean 3.67) affecting remote test evaluation.
- Challenges in completing practical assignments remotely (mean 2.76).
- Consideration of student anxiety and stress during crises (mean 2.74).
- Absence of mental distractions and conflicts with study dates (mean 2.53).
- Weak preference for on-campus tests compared to remote ones (mean 2.39).
- Lack of remote monitoring during electronic exams (mean 2.26), indicating a need for more interest in remote monitoring for objective evaluation.

In item 12, when asked about preferred types of tests through the LMS:

- 16% preferred practical tests,
- 27% preferred theoretical tests,
- 58% preferred both types.

In item 13, students were asked about their preferred types of questions for LMS tests, as shown in Fig. 1.

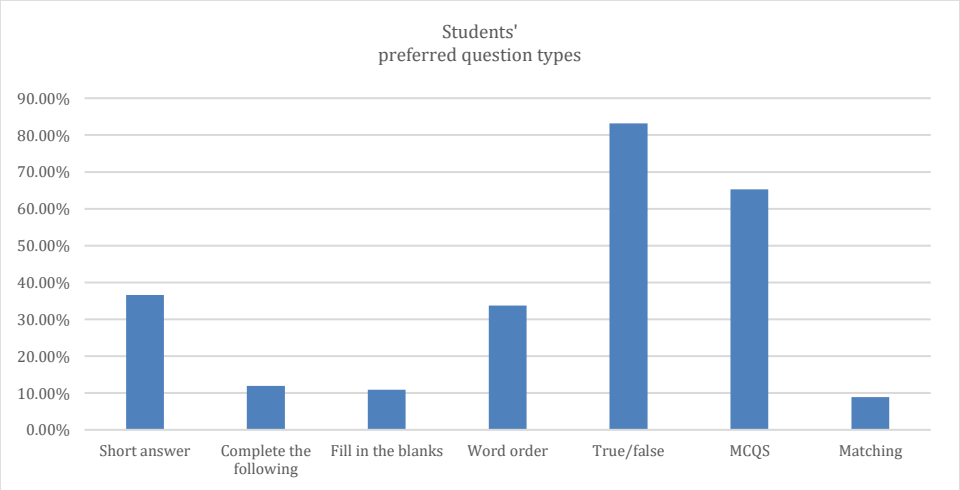

Fig. 1: Preferred question types for students

The highest response rate was for true/false questions, at 84%. The lowest response rates were for sentence completion questions, at 10.9%, and matching questions, at 8.9%. These findings address the second research question: "What is the reality of performing remote tests using the LMS during the COVID-19 pandemic or similar emergencies?"

The researchers highlight the importance of LMS in evaluating students despite some limitations in remote use. LMS is suitable for written and oral tests, enhancing academic achievement, but less effective for practical and applied tests. The study suggests using modern technical solutions for assignments and tests and increasing faculty efforts to train students on various question types. Regular monitoring of procedures during remote exams is also necessary.

The next section addresses the third research question: What are the students' attitudes toward distance learning and assessment through the LMS?

The general mean for the third section (impact of LMS on distance study and evaluation), which included eight items, was 4.51 out of 5.00, indicating a "strongly agree" response. This suggests a very high positive impact of LMS on distance learning and assessment. The researchers aimed to measure this impact, and all items in the section had high means, listed in descending order of agreement:

- Item 8 ranked first with a mean of 4.67, about the students' experience in evaluating their exams through LMS during the COVID-19 pandemic.
- Item 3 ranked second with a mean of 4.63, stating that "taking electronic tests remotely is easier than conducting them in traditional classes using the paper system."
- Item 6 ranked third with a mean of 4.54, highlighting that continuous training on the LMS improves students' exam performance, emphasizing the importance of using electronic systems regularly for skill development.
- Item 4 stated, "The results of the remote electronic tests were better than the results of the tests using the traditional paper-based system," ranked fourth with a mean of 4.53.

Items 1, 7, 2, and 5 also had high agreement means, indicating that the LMS motivated learning and performing remote tests. The evaluation of tests was appropriate for students' abilities and educational levels, contributing to increased academic achievement and better time management during electronic tests.

Based on the analysis of the third section items, the researchers concluded that students' attitudes towards remote learning and assessment through LMS were positive.

4.1. Discussing the results of the faculty members' questionnaire

The discussion of the statistical analysis of the faculty members' questionnaire aims to answer the fourth research question: What are faculty members' attitudes towards distance learning and evaluation through the LMS? This section presents their attitudes in descending order based on agreement means.

The overall mean response from faculty members, for the 10 statements in their questionnaire, was 3.54 out of 5.00. This indicates a general agreement, suggesting a high positive attitude towards distance learning and evaluation through the LMS. The highest agreement ratings from faculty members were for items 1, 2, 4, and 8, in descending order:

- Item 1 ranked first with a mean of 4.19, indicating that faculty members could effectively cover the entire curriculum and link its components to LMS test questions.
- Item 2 ranked second with a mean of 4.00, stating that "The LMS helped me to evaluate teaching and assessment methods."
- Item 4 ranked third with a mean of 3.84, showing that LMS usage helped diversify evaluation methods for student learning outcomes and control the type, number, and timing of test questions.
- Item 8 ranked fourth with a mean of 3.50, confirming that faculty members could conduct formative evaluations during lectures and final assessments remotely through the LMS.

The study also found:

- Some students struggled to use the LMS for submitting assignments remotely, with a mean of 3.51.
- Faculty members found it challenging to follow up and test students in practical and applied aspects remotely, with a mean of 3.41.
- The LMS represented students' actual level moderately, with a mean of 3.13.
- There was no significant use of security measures, such as cameras and audio features, for remote monitoring during tests.

The analysis shows that the e-learning system helped faculty members evaluate teaching methods and assessments, including diverse and formative assessments. However, it revealed a deficiency in measuring students' actual levels in practical and applied aspects. This highlights the need for developing innovative ways to perform and evaluate practical tests in different disciplines and the importance of using security measures during remote electronic tests.

4.2. ANOVA and correlation analysis of both instrument items

The ANOVA test aims to answer the question, "Did the LMS help increase student satisfaction with electronic exams?" Item 4 from the faculty members' questionnaire states: "The LMS helped me diversify

the assessment methods for student learning outcomes and control the type and number of questions and the exact time for the test." This was correlated with Item 5 from the student questionnaire, which states: "I am satisfied with the testing method used on the LMS."

By analyzing the variance between the responses to these two items, as shown in Table 8 and Fig. 2, we found that the LMS did help increase students' satisfaction with the electronic exams conducted via Blackboard.

Table 8: ANOVA test between students' questionnaire item 5

Q_5_STUDENT	Sum of squares	df	Mean square	F	Sig.
Between groups	.229	3	.076	.322	.810
Within groups	6.646	28	.237		
Total	6.875	31			

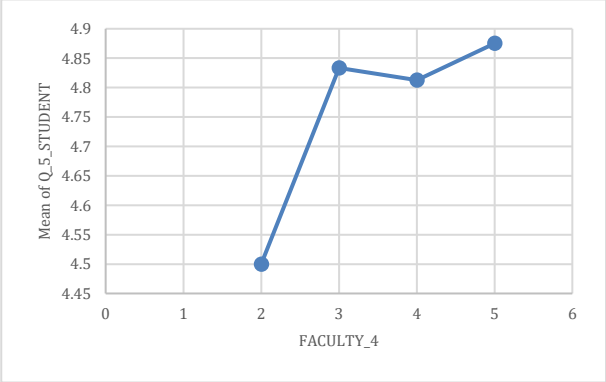

Fig. 2: Correlation test between students' questionnaire item 5 and faculty members' questionnaire item 4

The ANOVA test also aimed to answer the question, "Did the students struggle with various duties and assignments on the LMS?" Item 5 from the faculty members' questionnaire states: "There was difficulty for some students in using the LMS to send assignments remotely." This was correlated with Item 10 from the second section of the students' questionnaire, which asks: "Was there any difficulty completing practical and applied assignments and submitting them to the LMS during the pandemic?"

By analyzing the variance, as shown in Table 9 and Fig. 3, it was found that students did indeed struggle with completing and submitting assignments on the LMS.

Table 9: ANOVA test between students' questionnaire item 10

Q_10_STUDENT	Sum of squares	df	Mean square	F	Sig.
Between groups	.577	4	.144	.290	.882
Within groups	13.423	27	.497		
Total	14.000	31			

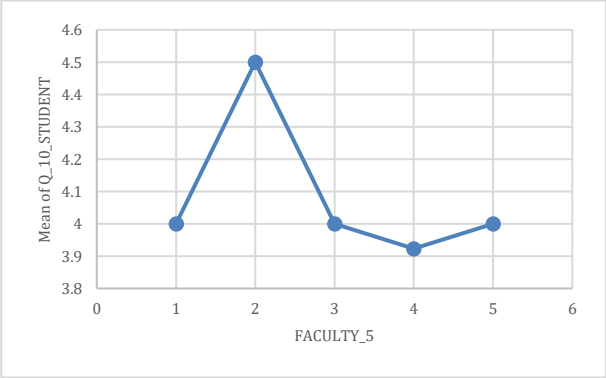

Fig. 3: Correlation test between students' questionnaire item 10 and teachers' questionnaire item 5

4.3. Qualitative results

In the final questionnaire, faculty members were asked for their opinions on using the LMS to assess students' actual levels remotely during the COVID-19 era. Their responses were collected openly:

- The LMS is excellent and essential but needs more attention and strict control laws.
- There is a need to increase the capacity of the LMS to handle high usage during pandemics and crises.
- Some students lack computers and struggle with weak or interrupted internet connections.
- Practical courses are difficult to teach or evaluate on the LMS.
- The system needs development to provide accurate remote evaluations, especially for practical and applied tests.
- Open-book questions are important for theoretical courses.
- There are issues with others opening student accounts during exams.
- There is a need for strict remote monitoring methods to ensure security.
- Remote assessment adds new dimensions to evaluating students and allows them to participate without fear of criticism.
- Remote exams should only be used when necessary.

The interviews provided valuable insights into participants' experiences, perceptions, and attitudes regarding using LMS for distance assessments, helping to validate the questionnaire's findings.

Teachers emphasize the importance of LMS in evaluating students' academic performance. LMS offer a comprehensive assessment platform across various subjects, track progress, and provide personalized feedback. They also generate detailed reports and analytics, identifying areas for support or intervention. Students appreciate the convenience of self-assessment and prompt feedback, identifying strengths and weaknesses. However, some students express concerns about relying solely on LMS-based assessments, suggesting a balanced approach

incorporating various assessment methods to capture learning outcomes accurately. Overall, teachers and students recognize the value of LMS in promoting continuous improvement in academic performance.

Teachers and students have praised LMS for their ability to evaluate students remotely during pandemics or emergencies. Teachers emphasized the flexibility of LMS-based assessments, accommodating diverse learning environments and ensuring security and integrity. Students appreciated the convenience and accessibility of LMS-based assessments, allowing them to engage in evaluations from home without needing in-person exams. LMS also reduce stress and anxiety associated with traditional exam settings, allowing students to focus more effectively on demonstrating their knowledge and skills. Overall, LMS are essential for maintaining academic continuity and supporting student success.

NBU students generally appreciate the convenience and flexibility of LMS-based assessments, particularly the Blackboard platform. They enjoy the ease of accessing materials, submitting assignments, and receiving feedback online. LMS promote self-directed learning and continuous assessment throughout the academic term. However, some students express concerns about the usability and functionality of the LMS interface, suggesting improvements for the overall user experience.

Faculty members have varied opinions on full assessment through LMS, with some valuing their efficiency, flexibility, and accessibility. They appreciate the online platform for creating assessments, tracking progress, and providing feedback. However, others are concerned about the reliability and validity of online evaluations compared to traditional in-person exams. They emphasize the importance of academic rigor and integrity in assessments, especially in practical fields. Despite these concerns, faculty members acknowledge the potential of LMS as a supplement to traditional methods.

5. Discussion

The analysis revealed several key findings regarding the effectiveness of LMS in remote assessment, focusing on specific features within LMS, pedagogical strategies employed by faculty, and the support and limitations of LMS for these strategies.

The study found that certain features of LMS, such as online quizzes and assignment submission portals, were widely appreciated by both faculty and students for their convenience and accessibility. However, concerns were raised about the usability and reliability of some features, particularly during periods of high usage or technical glitches.

Faculty members reported using various pedagogical strategies within the LMS, including multimedia resources, interactive activities, and personalized feedback mechanisms. These strategies were perceived as effective in enhancing student engagement and supporting diverse learning styles, leading to positive student performance and satisfaction outcomes.

The study found that while faculty appreciated LMS support in implementing pedagogical strategies, they faced limitations like customization and technical barriers. Some faculty members expressed frustration with the need for more flexibility in certain features. The analysis emphasized aligning LMS features with pedagogical strategies to optimize remote assessment effectiveness. Recommendations included enhancing usability, reliability, and customization options and providing ongoing training and support to faculty members.

The study reveals that limited broadband infrastructure and unreliable connectivity pose significant challenges for students and faculty, affecting their ability to access online assessments and synchronous interactions. Device availability is also a concern, particularly for students needing access to compatible LMS devices. The usability of certain LMS features for evaluation is also a concern, with students and faculty expressing frustration with navigating the interface and interpreting grading criteria. To address these issues, recommendations include providing alternative assessment options, offering technical support, and improving the usability of LMS features through user-centered design principles and ongoing usability testing. Institutions must address these challenges to ensure equitable access to remote assessment opportunities for all students, ultimately supporting student success in online learning environments.

Several limitations may have influenced the study's findings and interpretations. The reliance on self-reported data from questionnaires and interviews may have introduced response bias and social desirability bias, potentially affecting the accuracy and reliability of the data. Using convenience sampling in participant selection may have introduced sampling bias, resulting in a non-representative sample that may not fully capture the diversity of perspectives within the target population. The study's focus on NBU may need more generalizability to other educational settings with distinct institutional contexts, infrastructures, and student demographics. The research design's emphasis on quantitative data collection through structured questionnaires and qualitative insights from semi-structured interviews may have constrained the depth of understanding of participants' experiences and perspectives. Future research could address these limitations by employing more diverse sampling methods, utilizing mixed-methods approaches, and exploring a more comprehensive range of institutional contexts.

The researchers' field study identified several recommendations for improving students' use of LMS for studying and performing tests remotely. They urged faculty members to develop innovative methods for evaluating applied and practical tests and to train students to handle all questions raised. They also encouraged students to use computers for

exams due to the limited capabilities of mobile phones. Faculty members should continue evaluating lectures and final exams remotely, even during pandemics and crises, to enhance students' performance. They also suggested that faculty members consider internet weaknesses or interruptions when remotely evaluating electronic tests. The researchers recommend further research on the study's problem through diverse samples and comprehensive ranges.

The study explores the potential of emerging technologies and innovative assessment methods in transforming remote assessment practices. Key areas of innovation include Artificial Intelligence (AI) and Machine Learning (ML) technologies, which automate assessment processes and provide personalized feedback, and Natural Language Processing (NLP) techniques that automate grading. Gasification and simulation-based assessments offer immersive learning experiences, while blockchain technology provides a secure platform for storing assessment data. Remote proctoring solutions, facilitated by webcam and microphone technologies, maintain exam integrity and deter academic dishonesty. Biometric authentication methods, such as facial recognition or fingerprint scanning, enhance security.

Data analytics and learning analytics tools allow instructors to gain insights into student performance and engagement levels, enabling personalized instruction and intervention strategies. This discussion provides a forward-looking perspective on the evolution of remote assessment practices, enhancing assessment effectiveness, efficiency, and fairness in remote learning environments.

This research highlights the need for further investigation into LMS and their role in assessment. Comparative studies between different LMS platforms are crucial to understanding the effectiveness, usability, and user satisfaction levels of these platforms. Longitudinal studies can provide insights into the long-term effects of LMS-based assessment on critical metrics like learning outcomes, retention rates, and academic success. Training programs and professional development initiatives can be evaluated to support faculty integration of LMS into assessment practices. Innovative assessment methods within LMS environments can enhance student engagement, motivation, and learning outcomes.

Equity issues in LMS-based assessment are crucial for promoting inclusivity and fairness. Researchers can identify barriers to equitable participation in LMS-based assessment by examining disparities in access to technology, internet connectivity, and digital literacy skills. These recommendations offer promising avenues for advancing knowledge and practice in LMS-based assessment, improving assessment practices in online learning environments, and enhancing the quality and effectiveness of educational experiences for students and faculty.

6. Conclusion

This study explores the importance of LMS in evaluating students' actual levels and facilitating remote assessments, especially during the COVID-19 pandemic. The research, conducted through structured questionnaires and semi-structured interviews, revealed that LMS are versatile platforms for conducting assessments across various academic disciplines and levels. They provide flexibility, accessibility, and efficiency in assessment processes, promoting continuous learning and academic continuity. However, the study also identified areas for improvement, such as technical challenges, usability issues, and the need for ongoing support and training. It also stressed the importance of maintaining academic rigor and integrity in online assessments and incorporating diverse assessment methods. The findings contribute to the growing body of knowledge on the effective use of LMS in higher education settings, enabling institutions like NBU to harness the full potential of LMS to enhance teaching and learning experiences, promote student engagement, and adapt to the evolving landscape of education in the digital age.

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Compliance with ethical standards

Ethical considerations

Ethical guidelines were followed throughout the research process to ensure the confidentiality and privacy of participants. Informed consent was obtained from all participants, and measures were taken to anonymize their identities in the reporting of findings. Researchers also adhered to ethical principles of respect, beneficence, and justice in their participant interactions.

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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