



The Effectiveness and Integrity of Online assessments Using Moodle Learning Management System: Perspectives of a Developing country's university teachers

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Abstract

Learning management systems in higher education contexts attained significance in digital innovations during the COVID-19 pandemic when many universities switched suddenly to online mode of teaching and learning. While many universities continue to use learning management systems to supplement face-to-face teaching and learning, academics are concerned about the efficacy and integrity of the online examination environment. This study uses empirical survey data to investigate the case of a developing country university in Ghana that has been using Moodle learning management system for online assessments since 2019 to supplement in-person assessments. The study examined the university's teachers' use of learning management system tools for assessments, their perceptions of the effectiveness/integrity of these tools for examinations, and the challenges involved. This paper presents the results of the study.

Keywords: online assessment, learning management system, Moodle, e-learning.

1. Introduction

The integration of digital technologies in educational contexts has enabled many universities the world over to innovatively provide online education (Asamoah, 2021; Pavel et al., 2015). Central to digital innovations in higher education contexts are learning management system (LMS) technologies. An LMS is a web-based technology used by instructors to create and deliver learning content for students, monitor student participation, and assess student

performance (Alias & Zainuddin, 2005). Learning management systems (LMSs) are now widely used in higher education as the core technology platforms for online education and to supplement face-to-face teaching and learning (Gamage et al., 2019; Xu & Mahenthiran, 2016).

LMSs attained much significance in innovating the teaching-learning process at the university level during COVID pandemic when many universities suddenly switched to online formats (Nadeem et al., 2021; Nguyen et al., 2020). The sudden shift to online instruction caused many challenges. Among the challenges were creating assessments that accurately evaluate student learning and preventing cheating (Lewis, 2020). An online assessment (or e-assessment) allows students to take examinations from any location using a networked computer (Lewis, 2020). However, there are concerns among academics about the efficacy and integrity of online assessments because of the greater potential for cheating (Chuang et al., 2017; Gamage et al., 2022; Schmidt et al., 2009).

This study investigates the case of UCV's use of LMS for online assessments. UCV (pseudonym for a public university in Ghana) switched fully to its LMS platform when the pandemic broke out in 2019. Since then, UCV has been using online assessments to complement face-to-face assessments. UCV's LMS platform is Moodle (Modular Object-Oriented Dynamic Learning Environment). Moodle is a widely used LMS technology platform (Gamage et al., 2022). Moodle LMS provides an integrated environment for handling all aspects of e-assessment, that is, designing, administering and managing assessments electronically (Koneru, 2017). Moodle LMS includes tools to help maintain the effectiveness and integrity of online assessments. For instance, question banks can be used to randomize multiple-choice questions (MCQs) so that students get to answer different set of questions in an online examination setting.

Study Objectives

The objectives of the study are to explore:

1. the use of the LMS tools by university teachers for online assessments
2. the perception of the UCV teachers on the effectiveness and integrity of the LMS tools for online assessments
3. the challenges associated with the use of the LMS for online assessments

Significance of Study

The significance of this study is that the knowledge gained can inform online assessment design and contribute to improvement of online assessment practices in higher education settings especially in developing countries. It is important that the credibility of online examinations is not undermined because prospective employers will not trust the diplomas and certificates gained through online courses (Chuang et al., 2017).

2. Literature Review

2.1 LMS and Assessments

LMSs support many important functions for effective online education, including facilitating assessment (Xu & Mahenthiran, 2016). Assessment is an ongoing process of evaluating students' performance and providing feedback to improve their learning (Koneru, 2017). Performing assessments online using an LMS has its advantages and drawbacks. The advantages include lower long-term costs (e.g. due to reduction in paper), instant feedback to students, greater flexibility with respect to location and timing, improved reliability with online marking, and enhanced question styles that incorporate interactivity and multimedia (Koneru, 2017).

However, studies indicate that the drawbacks of online assessments could undermine the integrity of academic examinations, grades, and the certifications awarded. The drawbacks of online assessments include greater potential to cheat, authentication and security of the online platform, and technology issues, including unreliable internet connectivity and technology proficiency skill gaps (Butler-Henderson & Crawford, 2020; Xu & Mahenthiran, 2016). Measures that have been discussed in the literature to address the effectiveness and integrity of online exams include question and answer randomization, multiple question banks, multiple examination versions, shuffling responses, providing timestamps and logs of multiple quiz attempts with systematic evaluation processes (Butler-Henderson & Crawford, 2020; Chuang et al., 2017; Gamage et al., 2019). With respect to impersonation issues some LMSs have incorporated biometric technologies (e.g. weaver within Moodle) for authentication processes (Butler-Henderson & Crawford, 2020).

2.2 Moodle and Online Assessments

Moodle is a cloud based LMS, rated among the top 20 best LMSs based on user experiences (Gamage et al., 2022). Koneru (2017) identifies four main functionalities of Moodle: 1) *e-Administration* (i.e., ensuring users are authorized to use the LMS); 2) *e-Content Management* (i.e., uploading and delivering learning materials); 3) *e-Learning* (facilitating interaction, and collaboration among users and content); and 4) *e-Assessment* (i.e. assessing, grading and reporting student's performance).

Moodle's integrated environment for online assessments include the following functionalities (Butcher, 2008; Koneru, 2017):

- Creating and administering assessment tasks (assignments (essays, short answers, and quizzes)
- Providing feedback (asynchronous – assignment, and synchronous – quiz)
- Grading using rubrics and marking guide (advanced grading)
- Generating grade reports (user and overview reports)

In reviewing the literature on LMS and specifically on Moodle, we found little on teachers' use of the online assessment tools that help minimize cheating and promote effective online examinations. This study addresses this knowledge gap by assessing teachers'

actual use of Moodle assessment features compared to the stated features. Further, the study examines the teachers' perceptions of the effectiveness and integrity of using the LMS tools for online assessments and the challenges involved.

3. Methodology

3.1 Research Setting

UCV is one of the public universities in Ghana. The university was recently ranked among three top Ghana universities in the 2021 Times Higher Education impact rankings. In response to the Ghana Government's policy to increase access to tertiary education, UCV introduced its Distance Learning School and deployed Moodle in support of distance education students. The COVID-19 pandemic social distancing requirement compelled the university to deploy its Moodle LMS to cover all students. Using the Moodle LMS, the UCV adopted fully online teaching and learning during the lockdown. Post-lockdown, the UCV have adopted a blended learning mode of education, 6 weeks in-person and 6 weeks online.

Following the lockdown, lead lecturers in the UCV upload lecture slides, videos, and reference materials in prescribed weekly formats on the Moodle LMS. Lecturers engage students interactively relating to the content (slides), forum discussions, live or pre-recorded video sessions via Zoom and assignments. UCV's students now have access to online resources, such as course notes, lecture slides and various links to videos on the concepts taught whilst doing tutorials. An Educational and Instructional Technology Team (EIT) provide the training and backstopping support services for teachers and students, while ensuring adherence to UCV's policies on online teaching and learning.

3.2 Data Collection

Survey instrument: We used an online self-administered survey instrument based on Google Forms as the data collection method. The online questionnaire link was sent to UCV's teachers through their WhatsApp groups in November 2022. The data requested in the online questionnaire relate to teacher's use of the Moodle tools for online assessments, their perspectives on the effectiveness and integrity of online assessments and the challenges of using online assessment. The questionnaire is presented in the Appendix. The reliability of the questionnaire was estimated using Cronbach's alpha (α). Using SPSS version 23, the Cronbach's alpha was computed. The reliability statistics showed $\alpha = 0.761$ for 23 questionnaire items. The questionnaire was considered reliable since Cronbach's alpha value greater than 0.70 means that the survey instrument is acceptable (Reynaldo & Santos, 1999).

Sample: The sample for the study were lead lecturers or lecturers who have used the Moodle LMS for online assessments since 2019 when UCV shifted to online learning. The targeted lecturers were from the three main faculties of UCV, namely faculty of management studies, faculty of accounting and finance, and faculty of information technology and communication studies. As at the time of preparing this paper, 36 lecturers had responded.

3.3 Data Analysis

The SPSS version 23 was used to analyze the data. As indicated 36 responses were received as at the time of writing this report. However, three responses were found to be incomplete and therefore excluded from the analysis. Thirty-three (33) complete responses were therefore used for the analysis.

The data analysis employed the relative importance index (RII) because it was found to be responsive to the research objectives. The RII is used to assess the relative importance of quality factors associated with phenomenon. Rajgor et al. (2016) define RII as:

$$RII = \frac{\sum W}{A \times N}$$

where 'W' is the weighting given to each *response factor* ranging from 1 to 5. 'A' is the highest response integer (5); and 'N' is the total number of respondents, which is 33 after removing 3 uncompleted responses. The higher the value of RII, the more important is the response factor. Different factors will have different RIIs which is used to rank them. In this study, the factors are the LMS tools, and the challenges involved in online assessments. From the questionnaire results from respondents, the data were analyzed and the value of RII used to rank the LMS tools first in terms of its use by the teachers and then in terms of its effectiveness and integrity for online assessments. The RII was also used to rank the challenges in using the LMS for online assessments.

4. Results and Discussion

This section presents the initial results of the study, which is ongoing. The results are presented under four main headings: 1) demographic characteristics of the respondents; 2) use of Moodle LMS tools for online assessments; 3) effectiveness and integrity of the LMS tools for online assessments, and 4) challenges of using Moodle LMS for online assessments.

4.1 Demographic Characteristics of Respondents

Table 1 shows the demographic characteristics of the 33 teachers who responded completely to the self-administered survey instrument.

Table 1 Demographic characteristics of respondents

Characteristics	Frequency	Percentage
Gender		
Male	25	75.8
Female	8	24.2
<i>Total</i>	<i>33</i>	<i>100.0</i>
Age groupings		
30-39	5	15.2
40-49	17	51.5

Above 50	11	33.3
<i>Total</i>	33	100.0
<i>Years of Teaching</i>		
1-5	7	21.2
6-10	13	39.4
11-15	7	21.2
16-20	3	9.1
Above 20	3	9.1
<i>Total</i>	33	100.0
<i>Faculty</i>		
Accounting & Finance	13	39.4
Management Studies	4	12.1
IT & Comm. Studies	16	48.5
<i>Total</i>	33	100.0

The table shows that 25, representing 75.8%, were male, while 8, representing 24.2%, were female. The age grouping results show that roughly half of the respondents, or 17 teachers, or 51.0%, belonged to the 40-49 age group. Above-50-year-olds make up 11, representing 33% of the respondents. Lastly, the age group 30–39 is 11, representing 15.2 % of the respondents.

With years of teaching, 6–10 years were the most represented, with 13 representing 39.4%, followed by both 1–5 years and 11–15 years of teaching, each with 7 representing 21.2% of respondents. Two other groups tie in the number of years of teaching as less represented – these are 16-20 and above 20 years of teaching, having 3 and representing 9.1% of respondents.

Finally, with respect to the faculty of the respondents, Table 1 shows that most of the respondents were from IT and Communication Studies (16, representing 48.5%), followed by Accounting and Finance (13, representing 39.4%), and then Management Studies (4, representing 12.1%).

4.2 Use of Moodle LMS Tools for Online Assessments

Table 2 shows the frequency rankings of Moodle LMS tools used by the teachers for online assessments.

Table 2. Frequency rankings in use of Moodle LMS tools for online assessments

Use of LMS Assessment Tools	Often	Sometimes	No Idea	Not Suitable	Prefer Face to Face			
	1	2	3	4	5	Weighting	RII	Rank
Discussion Forum	3	17	4	3	6	91	0.552	1

Randomize Questions Using Question Bank	7	10	5	7	4	86	0.545	2
Multiple-Choice Questions	8	12	1	8	4	67	0.527	3
Shuffling of Multiple-Choice Questions	7	12	4	7	3	86	0.521	4
Essay assignments	5	19	1	3	5	83	0.503	5
Marking online	8	17	1	4	3	73	0.461	6
Plagiarism checks on essay assignments	10	15	1	4	3	71	0.448	7
Rubrics for marking	10	15	3	1	4	69	0.442	8
Marking offline	8	18	3	1	2	63	0.419	9

As shown in Table 1, the discussion forum tool is ranked first. This assessment tool on Moodle LMS allows students to contribute to topical issues. According to the rankings, it is the most used assessment tool by teachers. The nature of discussion forum is that it does not encourage similar work or copying because students' contributions are open to each other. The next highly ranked (rank #2) and used tool for online assessment, as shown in Table 2, is randomization using question banks. Randomization of questions involves presenting different sets of MCQs to students. In this respect, this assessment tool helps to minimize cheating. MCQs are the next-ranked (rank # 3) and used tool. Once set up and administered, MCQs' results are generated automatically. Following the MCQs in rank is shuffling of MCQs and their answers (rank # 4). Shuffling is yet another tool used to minimize cheating by students.

Essay assignments are the fifth-ranked tool. In UCV, essay assignments are administered as take-home assignments and submitted online on the Moodle LMS within a maximum time of 48 hours. Marking online is ranked #6. The Moodle LMS allows teachers to mark and grade online. Thus, the tool facilitates faster marking and grading, especially when used with rubrics. The online marking tool is followed in the ranking by plagiarism checks on essay assignments (ranking # 7). The plagiarism tool flags plagiarized submissions of essays, showing the source of the material and the extent of plagiarism. In UCV, the penalty for plagiarized work is dismissal. The lower ranking indicated in this analysis may be because, on the UCV's Moodle LMS, plagiarism is set up by default by the system administrator. The examiner will then have to decide by examining the plagiarism information on a student's submitted assignment.

The next ranked tool is rubrics for marking (rank #8). Rubrics are marking schemes set up by the examiner for each essay question. It facilitates objective, consistent, and faster marking and grading online. It also minimizes errors in marking. Setting up rubrics on the LMS requires time and effort. The low rank in the results may suggest that teachers find it demanding to use. The last-ranked tool is marking offline (rank #9), indicating it is the least

used tool by the teachers. Making offline entails exporting answer files of students outside the LMS as PDF files. Once off the LMS, the examiner may view the PDF file on the computer to mark and transfer the results to an Excel file. Alternatively, the examiner may print the PDF files and mark them. This tool's low rank suggests that most teachers find it inefficient.

4.2 Effectiveness and Integrity of LMS Tools for Online Assessments

This subsection presents the perceptions of teachers on the effectiveness and integrity of using the LMS tools for online assessments. The results are summarized in Table 2.

Table 2. Frequency rankings of teacher's perception of the effectiveness and integrity of LMS tools for online assessments

Effectiveness/Integrity of LMS tools for assessments	Very effective	Acceptable	Neutral	Not Acceptable	No Integrity			
	1	2	3	4	5	Weighting	RII	Rank
Plagiarism checks on essay assignments	5	15	11	1	1	75	0.467	1
Discussion Forum	6	17	7	2	1	71	0.448	2
Essay assignments	7	17	6	1	2	73	0.442	3
Marking online	7	20	3	2	1	67	0.418	4
Multiple-Choice Questions	15	9	4	2	3	53	0.412	5
Marking offline	8	18	5	1	1	64	0.412	5
Randomize Questions Using Question Bank	12	13	7	0	1	62	0.388	7
Rubrics for marking	10	19	3	1	0	61	0.370	8
Shuffling of Multiple-Choice Questions	16	9	7	0	1	57	0.364	9

This ranking indicates that most teachers believe the plagiarism-checking tool in the LMS is the most effective in ensuring the integrity of online exams. However, comparing its use by teachers, the analysis ranked it as the third lowest. This disparity in ranking suggests a weak relationship between teachers' perceptions and use. Further correlational analysis will be needed. The disparity in ranking may also be explained by the fact that plagiarism checks on assignments are activated by default on the Moodle LMS in line with UCV's policy on plagiarism. Individual teachers are not left on their own to activate it. The default activation allows all submitted essay assignments to be checked for plagiarism and information provided. The decision to allow an assignment to be penalized or not is, however, left to the

teacher. Ranking plagiarism-check as number #1 suggests that the teachers were very satisfied with the plagiarized information provided on an assignment by the Moodle LMS.

Discussion forums are ranked as the next most effective tool (rank #2). The ranking is consistent with its use by teachers, where it is ranked first among the LMS tools (see Table 1). This significant ranking suggests that most teachers consider discussion forums effective for assessing students and use them the most. Essay assignments come next in ranking as the most effective for online assessment using the Moodle LMS (rank #3). In Table 2, which ranks tools usage for online assessment, essay assignment is ranked # 5. This ranking suggests that while most teachers find essay assignments relatively effective for online assessments, they choose not to use them often because of challenges with online assessments (see Subsection 4.3 on challenges).

The next ranked LMS tool in effectiveness and integrity is marking online (rank # 4). Marking online is however ranked # 6 in terms of use, suggesting some level of correlation which can be well ascertained using correlational analysis. MCQs are ranked next (rank # 5). However, it is ranked higher (rank # 3) in usage in Table 1. This comparative ranking suggests teachers find MCQs easier to administer online but consider them less effective for assessment. Moreover, MCQs rank lower in effectiveness than essay assignments (rank # 3). This finding is consistent with the general notion that essays are more effective than MCQs in assessments. However, marking offline, which relates to essay assignments, is ranked the same as MCQs (rank #5) in terms of effectiveness and integrity. In terms of usage, marking offline is ranked the lowest (ranking # 9), indicating another weak correlation between use and perception. This result on marking offline will need further statistical analysis to clarify the meaning.

Randomizing questions using question banks is ranked #7 in terms of effectiveness and integrity, contrary to its higher significance in usage (ranking #2). This apparent weak correlation between usage and perception will require further interrogation, as the aim of randomizing questions is to make cheating difficult. The lowest rankings of 8 and 9 for rubrics for marking and shuffling multiple questions, respectively, in terms of effectiveness and integrity, are not consistent with the aim of these LMS tools designed to improve the effectiveness and integrity of online assessments. More respondents and further analysis will be required.

4.3 Challenges of Online Assessments

The challenges of using Moodle LMS for online assessments are summarized in Table 3. As shown in the table, plagiarism is the most significant challenge in using LMS for online assessments. This result is consistent with the ranking of plagiarism as the most significant LMS tool in terms of effectiveness and integrity for online assessments. In order of decreasing significance, the challenges are cheating, copying, similar works by students, and internet- and computer-related issues.

Table 3. Frequency rankings in challenges in using Moodle LMS for online assessments

Challenges	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree			
	1	2	3	4	5	Weighting	RII	Rank
Plagiarism	9	19	4	1	0	63	0.382	1
Cheating	11	15	6	0	0	59	0.369	2
Copying	12	17	3	1	0	59	0.358	3
Similar works by students	15	13	3	2	0	58	0.352	4
Internet /computer related issues	15	18	0	0	0	51	0.309	5

In addition to plagiarism checks, the Moodle LMS tools that can be used to minimize cheating, copying, and similar works by students are discussion forums, randomizing questions using question banks, and shuffling MCQ questions. In Table 1, discussion forums and randomizing questions were found to be significant LMS tools used by the teachers, ranking 1 and 2, respectively. In terms of significance relating to effectiveness and integrity of online assessments, discussion forums were ranked second to plagiarism. However, randomizing questions was ranked the third lowest.

5. Conclusion

This study's motivation was to contribute to the discourse on the credibility of online examinations in the face of the worldwide adoption of LMS when the COVID-19 pandemic broke out. The study measured the use of LMS tools by university teachers for online assessments, their perceptions on the effectiveness and integrity of the LMS tools for assessments, and the challenges involved.

Results from the study using the RII as the data analysis tool suggest plagiarism checking, discussion forums, and essay assignments as the most effective LMS tools for maintaining the integrity of online examinations. The study also suggests that discussion forums, randomizing questions using question banks and multiple-choice questions are the topmost LMS tools used by teachers to conduct online assessments.

However, a comparative analysis of the rankings between LMS tools usage and teachers' perceptions of the LMS tools showed weak relationships. For instance, randomizing questions was significant in terms of its use by the teachers (i.e., ranked #2). However, with respect to effectiveness in maintaining integrity of online examinations, the analysis ranked randomizing questions as #7. The apparent weak relationships between perception and use will require further analysis using correlational statistics and recruiting more respondents for the study.

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