Odame, J. & Yalley, C. E. (2023). Flexibility and usability: Focal point of graduate students' knowledge level of the features of SAKAI learning management system. *Journal of Educational Technology Development and Exchange*, *16*(1), 126-146. https://doi.org/10.18785/jetde.1601.07

Flexibility and Usability: Focal Point of Graduate Students' Knowledge Level of The Features of SAKAI Learning Management System

Jonathan Odame
University of Ghana, Ghana
jonathanodame@ug.edu.gh

Clarke Ebow Yalley*
University of Education, Ghana
ceyalley@uew.edu.gh

Abstract: *Coupled with the global pandemic (COVID-19) and technological advancement, the SAKAI learning management system (LMS) was initiated to deliver synchronous, asynchronous, blended instruction to break the artificial boundaries towards delivering quality education. This requires students to acquire the requisite knowledge to develop self-regulated skills to navigate through inbuilt features of SAKAI LMS to ensure usability, flexibility, and accessibility. To ascertain the usability, flexibility and accessibility of the SAKAI LMS, this study sought to examine the knowledge level of graduate students on the features of SAKAI LMS. The cross-sectional survey design was used to gather data. Using the SAKAI LMS, the systematic sampling technique was used to sample 209 students drawn from the six (6) schools within the three colleges of the University of Ghana. A close-ended questionnaire on a three-point Likert Scale was employed to elicit information on respondents' knowledge of the features of the SAKAI LMS. The study's findings revealed that the respondents possessed a low level of knowledge on forum tools, lesson tools, quizzes and assessment tools, resources tools as well as chatroom tools of the SAKAI LMS. However, there was a significant difference between the level of knowledge of the features of SAKAI LMS across genders, but there was no statistically significant difference in the level of knowledge of the SAKAI LMS across the age and college of affiliation of respondents. Based on the study's findings, university management needs to organise some SAKAI LMS training and orientation for at least three days to enable students to acquire the requisite knowledge and understanding of the different inbuilt features of the SAKAI LMS. Through this exercise, respondents will build and develop self-regulatory skills. This is because the SAKAI LMS can become beneficial if respondents possess the mastery of knowledge to control and monitor their traits of metacognition as they engage with the SAKAI LMS.*

Keywords: learning management system (LMS), SAKAI LMS, self-regulatory learning; graduate students, metacognition

Introduction

Educational institutions consistently integrate online educational portals into the curricula for adult learners to gain flexibility in their learning opportunities. Learning management system (LMS) has been the dominantly used online technologies by most tertiary institutions in Ghana to deliver synchronous, asynchronous, blended instruction to meet the delivery of quality education (Xin et al. 2021). According to Ismail (2002), the Learning Management System (LMS), Learning Content Management System (LCMS), Learning Design System (LDS) and Learning Support System (LSS) are the four major e-learning systems adaptable by educational institutions. For this study, the reference point will be the LMS, specifically the SAKAI LMS used by the University of Ghana, Legon. The SAKAI LMS serves as a conduit connecting lectures and university students' academic and social engagement. The usability, flexibility, and accessibility of the SAKAI LMS depend on the inbuilt features that allow users to make good use of the LMS. Students have gotten the chance to experience varied functioning of the LMS concerning student admissions, course registration, notification of lecture schedules, medium for students' assessment intake, assessment feedback and peer communication. Also, LMS supports lecturers in creating and managing instruction through the affordance of features such as the uploading of learning materials, conducting a formative assessment (Assessment as Learning and Assessment for Learning) and summative assessment (Assessment as Learning) and creating an atmosphere for interaction among students or between the facilitator and students (Graf et al., 2009). The LMS affordance extends students' learning frontier beyond the four walls of the classroom, the school and even the teacher.

Based on the functionalities of the LMS, it can be explained as a web-based technology assisting in the planning, disseminating and assessing expected learning outcomes (Ayub et al., 2010). LSM is explained as the learning environment where content delivery is given flexibility and a shift in pedagogical approaches to intensify student interaction and support the provision of timely feedback to users. E-learning platforms must continuously thrive over any personal, local or international crisis that will hinder students' academic progression. Coupled with the global pandemic (COVID-19) and technological advancement, the introduction of SAKAI LMS made students more responsible for their learning, progress and academic performance. The thinking of moving from pedagogy to heutagogy would help university students become more responsible to navigate their learning, addressing the diverse learning styles and fostering the conduct of self or peer assessment. This anchors self-regulated learning as a critical vision for using SAKAI LMS to allow graduate students to engage in meta-cognition to improve their academic goals (Pintrich, 2003). At the university level, the constructivist part of active learning is activated to allow students (s) to explore the environment, interact with peers, and reflect on creating meaning and knowledge for themselves (Knowles et al., 2014). Dube and Scott (2014) carried out a study to understand the various factors influencing the utilisation of the SAKAI LMS by seventy (70) faculty members at the National University of Science and Technology (NUST), Zimbabwe. The study's objective was to establish the reasons for using the SAKAI platform and, again, if the use of the LMS was affected by the level of knowledge of its features. The study's results indicated that the lack of awareness and knowledge of the SAKAI LMS influenced its usage, and only 50% of faculty members were knowledgeable about its features. The

findings from this research reveal that faculty members do not use the LMS for teaching mainly due to a lack of knowledge of the system, thus confirming the assertion made by De Smet et al. (2012) that "users need to acquire a basic factual knowledge level about technology before they can move on" (p. 690). Ssekakubo et al. (2011) believed that the lack of knowledge of the features of the LMS could be attributed to the fact that many LMS initiatives were typically announced from top to bottom. These kinds of initiatives need more support than initiatives started by departments or small units within the institution. As a result, an institution of higher education should not only organise training on the features of the LMS but also create awareness of its advantages in teaching and learning.

Personalisation and recommendation are the two major sections of the LMS that can be used to improve effective and efficient use. When the adjustment of learning resources and services met the learners' actual needs and expectations, Peter et al. (2010) termed this functionality as personalisation. Students can achieve personalisation when there is content adaption, browsing-dependent interfaces, browsing-centred, customised interfaces, and device-dependent interfaces. Moreover, the ability of the students to exhibit proactiveness depicts the recommendation of content and service to peers to facilitate their use of the LMS (Peter et al. 2010). As software, there are particular features with their corresponding functions. Using these functions effectively depends on the user's knowledge level. In this case, literacy is critical to the effective, efficient and productive use of technological resources. As self-regulated learning is not inherent to graduate students' academic progression, their inability to identify specific features blocks the success of their academic journey. Students are the end users and beneficiaries of these educational and technological resources as a result their knowledge of the features of LSM has a direct impact on the extent of usage, rate of accessibility, psychological attachment, as well as technical, social and pedagogical affordance (Amoako-Atta & Yalley, 2021).

Bond (2020) confirmed that students' LMS usage directly impacted learner engagement, self-directed learning and expected learning outcomes. As a result, graduate students need to know the different built-in features in the SAKAI LMS to build and develop self-regulatory skills. The LMS can become useless or less effective if students lack the knowledge and interest in utilising the system. Graduate students deploy varied techniques and strategies to control and monitor their traits of meta-cognition and knowledge. Scholars (Cavalcanti et al., 2021; Cicchinelli et al., 2018) posited that the higher the knowledge and meta-cognition towards self-regulated learning, the faster students learned and performed. The development of self-regulatory skills requires learners to have a positive learning environment needed to develop the requisite knowledge because students' motivation declines as they encounter challenges in their learning. Students' inability to develop the requisite knowledge leads to a decline in their chances of controlling and continuing their learning. Studies have proven that with the appropriate knowledge, students will actively engage and take control of their learning processes and ensure the development of their cognitive skills. Learners who take control of their online learning can engage with peers, spend productive time in online learning and can utilise LMS features to learn and communicate with peers and instructors (Lee et al., 2019; Kim et al., 2019). This implies that students' knowledge and experiences during online learning influence their engagement and academic performance.

In a study conducted at the Faculty of Communication and Information Science at the National University of Science and Technology by Choga (2015) on the utilisation of the SAKAI LMS by fifty-one (51) undergraduate students, it was found that all the respondents had good knowledge of the features of the SAKAI LMS and had at least used the system once in their studies. The study's findings confirmed the earlier assertion by Mtebe (2015) that knowledge of an information system could affect its continual usage. Also, to identify strategies to enable learners to use e-learning platforms in developing countries effectively, Ssekakubo et al. (2011) conducted a study using an online survey of 144 students from two African universities. The survey findings indicated that most students had a good knowledge of certain features such as the Assignment, Forum, and Chat room tools. This implies that the most frequently used LMS function was uploading course resources and course outlines and chatting with friends and lecturers.

On the other hand, Juhary (2014) posited that most respondents reported needing more knowledge and awareness concerning the features of the SAKAI LMS. Some respondents suggested that more awareness and knowledge creation about the SAKAI LMS was needed before more users could utilise the system to its full potential. Furthermore, in exploring the experiences of Canadian and international students concerning the adoption of the SAKAI LMS, Arhinful (2016) found out that students needed to be more aware of the features. In order to explore how knowledge could be exchanged and shared successfully among distance education students using the SAKAI LMS, Soon and Fraser (2011) carried out a study on 37 graduate students studying on a distance basis. The data collection techniques such as participatory observation, documentation and questionnaire were employed during the investigation. The study's outcome indicated that the calendar tool was the least popular among graduate students. The graduate students again needed to gain more knowledge about the Email tool. Even though online learning is prevalent, there needs to be more research on how knowledge activities happen in online group work when using LMS, especially in distance education. In another study, Derakhshan (2012) was interested in finding out the perceptions of students and faculty members towards the features of a mobile LMS in higher education and used 5,000 respondents comprised of faculty and students. It was revealed that the assignment tools had the highest level of users' knowledge and concluded that lecturers and course instructors engaged students in using the system for their daily activities regarding teaching and learning. In a study to investigate students' perceptions and use of the SAKAI LMS at the University of Ghana, Darko-Adjei (2018) used 230 level 300 distance learning students of the University of Ghana's Accra campus. The survey outcome indicated that distance learning students became aware of the SAKAI LMS mainly through their tutors and the orientation programme. However, some SAKAI tools were not utilised due to a lack of awareness and knowledge, mainly the calendar tool. This implies that the distance education units of universities could provide adequate orientation and training to all distance education students on the features of the SAKAI LMS. The study by Leeder and Lonn (2014) revealed that users and non-users of the SAKAI LMS needed more knowledge of its features and hence experienced numerous difficulties, such as sending and responding to emails, chatting, and downloading learning documents. The perceived lack of knowledge caused several unwarranted agitations, encounters and confrontations between students and lecturers, as students tended to

have problems with:

i. accessibility of notifications and information

ii. accessibility of course content or learning materials

iii. engaging in interactive sessions during instructions

iv. how to voice their questions across such medium

v. downloading of assessment items as well as uploading assessment responses,

vi. downloading of assessment feedback,

vii. using email options

viii. using the Turnitin tool

ix. calendar prompts

Students get frustrated whenever they visit or use the features of SAKAI LMS for academic or social purposes because the capacity of the interactive content and pedagogical purposes have been limited. Asamoah (2020) and Surry et al. (2005) confirmed this assertion that the integration of instructional technologies in the delivery of higher education was plagued with technological dissatisfaction and learners' need for more knowledge of the features of the e-portal, leading to users' incompetence. This phenomenon has created dissatisfaction and disaffection among students towards using SAKAI LMS, perceived as a means to deepen, extend and make the delivery of quality tertiary education more accessible and relevant to 21st Century teaching and learning. Against this backdrop the researchers sought to examine the knowledge level of graduate students on the features of the SAKAI LMS at the University of Ghana, Legon, to provide empirical evidence on graduate students' level of literacy on the SAKAI LMS to enable the Vice-Chancellor, Pro-Vice-Chancellor, Deans of Colleges, Heads of Department and lecturers incorporate timely workshop training on the features of LMS for students. This singular act can lead to the design of the SAKAI LMS brochure or guide to enable students to navigate smoothly to reduce techno-stressors and anxiety among students when using the SAKAI LMS for academic purposes. The findings can highlight the level of knowledge students have on the functionalities of the SAKAI LMS to help the university authorities curb the underutilisation of the SAKAI LMS by students. Inferring from these significances and the need to make the use of LMS easier for students consistently, an empirical study needs to be conducted to ascertain graduate students' knowledge level at the University of Ghana, Legon, on the features of the SAKAI LMS.

Research Questions

The study is guided by the following research questions:

1. What is the graduate student's knowledge level of the features of SAKAI LMS?

2. What is the difference in graduate students' knowledge level on the features of SAKAI LMS across gender, age, and college affiliation?

Study in Relevant Context

The SAKAI LMS

SAKAI LMS is a free, public source, educational computer platform designed to enhance teaching, learning, research and collaboration in either fully or partially online environments. The SAKAI LMS was

developed by a community of academic organisations, commercial institutions and individuals. It has been distributed under the Educational Community License (an open-source license) since its development. SAKAI LMS is used by many academic institutions, mainly in the United States of America, Asia, Australia, Europe and Africa. The platform was designed to be accessible and reliable and has over 100,000 online users (Berg & Dolphin, 2011). In December 2012, the SAKAI Foundation merged with Jasig to form the Apereo Foundation, which took over stewardship of SAKAI development. To enhance SAKAI's user experience and make the platform more efficient, developers of the system implemented a program to create a code termed DRY (do not repeat yourself). This code allowed faculty and users to adopt and use the SAKAI LMS. The SAKAI LMS for 2019 was released on Thursday, March 21 2019, to support teaching and learning. Most remarkable in this release is the built-in, flexible grading rubrics. In line with this, faculty members could easily create rubrics for Assignments, Tests, Quizzes, Forums and the Grade book. Further improvements to the rubrics were planned to be released in 2020. Within the next few years, the SAKAI LMS seeks to increase faculty flexibility and enable more significant user learning outcomes (Hodges, 2019).

Commentary on the Features of the SAKAI LMS

Although earlier research has shown that the use of the LMS is increasing in higher educational institutions, the majority of university students only use a few features of the system as a result of a lack of awareness/ knowledge of them (Dutton et al., 2004; Gaba & Sethy, 2010). From accessible literature, there is strong evidence to suggest that most university students only use a few features on the SAKAI LMS out of its numerous features. Some features of the SAKAI LMS are discussed below.

Forum tool: A Forum can be described as a grouping of topics. For example, exciting topics may be created within Forums, where a student could post a comment. Lecturers/ instructors could assign points to students' contributions and interactions. Forums and topics could be released according to specified dates, and instructors/lecturers could choose to moderate messages posted to topics. With the Forum, a graduate student can read his/ her coursemates' posts/comments from the SAKAI LMS. Additionally, the Forum tool allows for the creation of private and public groups and discussion topics. Using the Forum tool, lecturers/instructors could create a limitless number of discussion Forums for graduate students.

Gradebook tool: The Gradebook tool helps lecturers/ instructors calculate and store their students' grades. With this tool, lecturers/instructors can grade assignments or examinations taken by students. The Gradebook tool allows graduate students to view the scores for all their marked assignments and class exercises. Using Gradebook, lecturers could define their course grades based on a 100% scale for their students on the SAKAI LMS.

Lessons tool: The Lessons tool helps a lecturer/instructor to organise learning resources and activities on a single page on the system. For instance, with the Lessons tool, a lecturer at the University of Ghana can organise his/her course by units, modules, weeks, topics, or any other groupings. Every lesson page could be personalised to suit the needs of a particular topic. For example, a graduate student could be instructed to click on the Lessons Page Title (e.g., Unit 3) in the

Tool Menu to display the page by an instructor on the SAKAI LMS.

Tests and quizzes tool: Tests and quizzes online can be done with the tests and quizzes tool on the SAKAI LMS. This tool allows lecturers and instructors to conduct interim assessments (IA), quizzes and end-of-semester examinations. It usually takes the form of "fill in" and multiple-choice questions, thus preventing students from cheating due to the randomisation of exam questions. Additionally, the Tests and quizzes tool offers many background features that could allow lecturers to control their students' layout, delivery, grading and assessment. For instance, student assessments that have passed the due date continue to appear in the list with the due date/time shown. However, assessments not available do not show up in the Take an Assessment list.

Syllabus tool: The Syllabus tool is the place where a lecturer can post a Syllabus for students' accessibility. The lecturer or instructor could add a document (i.e., pdf, docx) as an attachment to the Syllabus tool. With this tool, a graduate student may download, open, and print a needed file at their convenience. In editing an already posted Syllabus on this tool, the lecturer/instructor edits the original document on their laptop or computer, removes the attachment and replaces it with the newly edited document. Again, lecturers or instructors could create a webpage Syllabus using the rich text editor in the Syllabus tool. In this regard, a Lecturer/Instructor could copy and paste the text into the rich text editor to create a webpage version of the file. For instance, a graduate student may read the document in the Syllabus tool and later press the print button to print the Syllabus. Instructors/lecturers can also create a multi-part Syllabus by adding one Syllabus item at a time. When this happens, the lecturer/instructor can re-order or remove individual items from the Syllabus tool. As a result, if a lecturer wants to organise the Syllabus by weeks, the Syllabus tool is a good option. Again, if a lecturer has a Syllabus posted on a webpage, the lecturer may direct the Syllabus tool to that Syllabus. Overall, the Syllabus tool on the SAKAI LMS helps lecturers and instructors post their Syllabus and course outlines for their students.

Chat room tool: The Chat room is the real-time text-only Chat room tool within the SAKAI LMS. The Chat room tool can be used for synchronous and facilitates conversations among students and lecturers who may have logged onto the site at the same time. Only students registered on the same site may chat using the Chat room. For example, a lecturer may create an "online office hours" Chat room for graduate student questions and answers. Chat rooms for graduate student groups can also be set up as a space for collaboration with graduate students in other departments. The Chat room tool may alert a graduate student to another student who has entered the same Chat room. When this happens, the graduate student knows who can chat online. However, a limitation of the Chat room tool is that it does not allow a student to chat privately. Consequently, all chat messages are visible to every student inside the Chat room.

Resources tool: TThe Resources tool allows lecturers/instructors and students to share various files with their students. Lecturers/instructors can upload files (for instance, word processing documents, slide presentations, audio and videos) and create and post HTML (web) pages. Likewise, instructors/lecturers could organise their files into folders, making it easier for their students to locate and access them. A lecturer using this tool can automatically notify a graduate student by email that an item, such as reading material, has been added to resources. On the

other hand, students may also have resources within their personal My Workspace area. In short, this tool helps lecturers upload multiple files to the SAKAI LMS.

Announcement tool: The Announcements tool allows the distribution of messages to an entire group (graduate students) on the SAKAI LMS. A graduate student using the tool will see announcement messages displayed in the announcements area of their "My Workspace" tab. On the SAKAI LMS, messages can be made to show instantaneously or at specific dates of interest.

The calendar tool allows instructors/ lecturers to post events in a calendar format on the SAKAI LMS. The calendar has a day, week, month and year. The calendar can post essential dates in the semester, such as start and end dates. With this tool, a graduate student could check dates for assignment submission, including deadlines.

Dropbox tool: This tool facilitates the creation of separate folders for each student in a particular course of study. In this case, graduate students can access their folders. Students and lecturers can place files in the Dropbox folder on the SAKAI LMS.

Email tool: The Email tool allows a graduate student to email other coursemates and lecturers. The tool uses a student's external email address frequently specified in the account details. Characteristically, the email address is the student's institutional email, for instance, jodame003@st.ug.edu.gh.

Assignment tool: The assignments tool enables instructors/lecturers to give, distribute, take and grade students' assignments online. Students' assignments are typically private as they are not visible to other students on the SAKAI LMS. Nevertheless, the instructor/ lecturer can permit peer assessment of assignments if desired. Depending on the preference of the lecturer/instructor, student assignments may be submitted through the file upload or the rich text. With this tool, graduate students can upload and submit assignments to their lecturers and receive feedback from them.

Turnitin tool: This tool helps students to measure the plagiarism index of their research work or article. In 2014, the University of Ghana fused Turnitin into the SAKAI LMS to check for the plagiarism index of assignments and project works submitted by students (Ansong, 2015).

Material and Methods

This study employed the quantitative research approach grounded in the positivist paradigm to ascertain objective, accurate and precise data on the knowledge base of features of SAKAI LMS by graduate students of the University of Ghana, Legon. The researchers adopted that cross-sectional survey design to gather data from many respondents at a single point in time. The graduate students at the University of Ghana for the 2021/2022 academic year served as the target population. The sample size used for the study was based on the total population of six (6) different schools selected within the three colleges of the University of Ghana that were using the SAKAI LMS: Health Sciences, Education, and Humanities. Based on the determination of sample size by Schaeffer et al. (2011), a target population of 552 would use a sample size of 190. However, this sample size was increased to 209 to ensure a high return rate and reduce sampling error. Respondents were included in the study based on their status as graduate students pursuing a regular degree of either Doctor of Philosophy or Master of Philosophy

and have duly registered with the School of Graduate Studies, University of Ghana. The multi-stage sampling was used for the study as graduate students are scattered all over the University of Ghana campus belonging to different colleges, faculties and departments. Three prominent colleges at the university (Health Sciences, Humanities and Education) were selected using simple random sampling. Within the selected Colleges, two schools each were selected using the simple random sampling technique. The lottery method was later used in selecting a department from each of the six schools selected from the Colleges. At this point, the researchers used the systematic sampling technique to select 209 graduate students from the six (6) departments (see Table 1).

Table 1

The Sampling Frame and Sample Size Selection

College	School selected	Department Selected	No. of graduate students	No. of graduate students selected based on the Sample size
Health Sciences	Nursing and Midwifery	Community Health Nursing	88	33
	Public Health	Population, Family and Reproduction Health	159	60
Education	Continuing and Distance Education	Adult Education and Human Resource Studies	24	9
	Communication & Information Studies	Communication Studies	44	18
Humanities	Business	Organisation and Human Resource Management	186	70
	Social Sciences	Social Work	51	19
Total			**552**	**209**

Source: (Field Data, 2022)

The close-ended questionnaire consisted of thirteen items eliciting information on respondents' level of knowledge of the features of the SAKAI LMS. The items on the close-ended questionnaire were measured on a three-point Likert Scale ranging from 1=Low, 2= Moderate and 3=High. The Cronbach alpha reliability yielded 0.76 after piloting testing them on the graduate students at the University of Education, Winneba. Research question 1 was analysed using mean and standard deviation, while research question 2 was analysed using frequency, percentage, and chi-square. Respondents were assured of their animosity and confidentiality.

Results

Research Question 1: What is the level of knowledge of tertiary students on the features of the SAKAI LMS?

An individual's knowledge rate depicts their ability to use any system. This implies that graduate students with adequate knowledge about a phenomenon would have a positive attitude towards the SAKAI LMS; however, the lack of knowledge of the SAKAI LMS may affect the continued use of the same LMS. The level of knowledge was measured on a 3-point Likert scale where the mean weighting of 1.0 -1.9 = Low, 2.0 – 2.9 = Moderate, and 3.0 and above = High. The result presented in Table 2 indicated the tertiary students' level of knowledge.

Table 2

Level of Knowledge on the Features of the SAKAI LMS

Features	Mean	Standard Deviation	Decision
Forum tool	1.79	.79	Low Level
Gradebook tool	1.34	.47	Low Level
Lessons tool	1.50	.50	Low Level
Quizzes and Test tool	1.34	.47	Low Level
Syllabus tool	1.34	.47	Low Level
Chat room tool	1.34	.47	Low Level
Resources tool	1.55	.50	Low Level
Announcement tool	1.44	.61	Low Level
Calendar	1.28	.45	Low Level
Dropbox tool	1.50	.50	Low Level
Email tool	1.43	.48	Low Level
Assignment tool	1.66	.75	Moderate Level
Turnitin tool	1.96	.89	Low Level
Knowledge Subscale (13 items)- MM	***1.49***	***.56***	***Low Level***

Source: (Field Data, 2022). N=209 in all cases across

The result from Table 2 shows that respondent possessed low level of knowledge on the features of the LMS (MM=1.49; SD=.56). Specifically, respondents possessed low knowledge on forum tools (M=1.79; SD=.79), lesson tools (M=1.50; SD=.50), quiz and test tools (M=1.34; SD=.47) as well as resources tools (M=1.55; SD= .50). Respondents possession of superficial knowledge on the features of the LMS signal graduate students inability to navigate through the LMS platform successfully. Graduate students' inability to use the LMS effectively leads to anxiety, stress, and frustration (Klementiev, 2020; Oducado et al. 2021). These negative effects hinder students' effective use of the LMS to collaborate, communicate, download learning materials, undertake assessment tests and submit assessment tests on time.

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Research Question 2: What is the difference in graduate students' knowledge level on the features of SAKAI LMS across their gender, age, and college affiliation?

Cavus and Kanbul (2010) stated that gender differences existed in the knowledge and acceptance of the LMS. In this study, the chi-square test was used to determine whether the difference in observed percentages between males and females across the features of SAKAI LMS was significant. Table 3 shows the level of knowledge on the features of SAKAI LMS and Gender.

Table 3

Level of Knowledge on the Features of the SAKAI LMS and Gender

Features		Gender		Chi-square	DF	P-value	Decision
		Male (%)	Female (%)				
Forum tool				61.185	2	**.000**	**Significant**
	Low	37.8	62.2				
	Moderate	98.4	1.6				
	High	76.2	23.8				
Grade Book				42.72	1	**.000**	**Significant**
	Low	50.4	49.2				
	Moderate	49.6	0.6				
Lesson Tool				87.83	1	**.000**	**Significant**
	Low	34.4	54.6				
	Moderate	98.9	1.1				
Quizzes & Test tool				42.72	1	**.000**	**Significant**
	Low	50.8	49.2				
	Moderate	98.4	0.6				
Syllabus tool				42.72	1	**.000**	**Significant**
	Low	50.8	49.2				
	Moderate	98.4	0.6				
Chatroom tool				42.72	1	**.000**	**Significant**
	Low	50.8	49.2				
	Moderate	98.4	0.6				
Resource tool				19.526	1	**.000**	**Significant**
	Low	50	50				
	Moderate	80.6	19.4				

Announcement Tool				25.364	2	**.000**	**Significant**
	Low	63.2	37.8				
	Moderate	83.9	6.1				
	High	90.9	9.1				
Calendar tool				35.727	1	**.000**	**Significant**
	Low	54.1	45.9				
	Moderate	100	-				
Dropbox tool				41.895	1	**.000**	**Significant**
	Low	44.7	55.3				
	Moderate	89.2	10.8				
email tool				19.526	1	**.000**	**Significant**
	Low	50	50				
	Moderate	80.6	19.4				
Assignment tool				75.570	2	**.000**	**Significant**
	Low	77.7	22.3				
	Moderate	83.9	16.1				
	High	100	0				
Turnitin tool				44.221	2	**.000**	**Significant**
	Low	50	50				
	Moderate	89.2	10.8				
	High	34.4	65.6				

Source: (Field Data, 2022) ** significant at p = 0.05

Evidence from Table 3 depicts a statistically significant difference between the level of knowledge of all the features of SAKAI LMS and gender ($p<0.05$). This means that male and female graduate students have significantly different levels of knowledge concerning the features of the SAKAI LMS, such as the forum tool, chat room tool, and lessons tool. Specifically, the chi-square test showed that at an alpha of 0.05, there was a statistically significant difference between (76%) moderate level of knowledge of males on the forum tool feature as compared to the (62 %) low level of knowledge of females (Chi-square=61.185;df=1;p=.000). Also, 50.8% of the male respondents possessed a low level of knowledge on the chat room tools while the 49.2% of the females possessed insufficient knowledge. The difference in the low level of knowledge between the genders was statistically significant (Chi-square=42.72;df=1;p=.000). On the assessment tool, 77.1% of the males possessed a low level of knowledge as compared to (22.3%) of the female respondents. The percentage difference between genders was statistically significant at Chi-square=75.570; df=1; p=.000.

Level of Knowledge on the Features of the SAKAI LMS and Age

Al Rawashdeh et al. (2021), Anel et al. (2020) and Mayanja (2002) argued that an individual's age influences their level of knowledge of electronic learning platforms. By implication, the age difference among graduate students would determine their level of knowledge of the SAKAI LMS within the University of Ghana, Legon. The chi-square test was used to determine whether the difference in observed percentages among the age differences across the SAKAI LMS features was significant.

Table 4

Level of Knowledge on the Features of the SAKAI LMS and Age

Features	Age				Chi-square	DF	P-value	Decision
	20-29 (%)	30-39 (%)	40-49 (%)	50-59 (%)				
Forum tool					1.613	3	.952	Not significant
Low	25.6	58.5	13.4	2.4				
Middle	28.6	57.1	9.5	4.8				
High	28.6	52.4	14.3	4.8				
Grade book					.921	3	.820	Not significant
Low	26.6	56.5	13.7	3.2				
Moderate	28.6	57.1	9.5	4.8				
Lessons tool					.395	3	.941	Not significant
Low	26.6	56.5	13.7	3.2				
Moderate	28.6	57.1	9.5	4.8				
Quizzes and Test tool					.921	3	.820	Not significant
Low	26.6	56.5	13.7	3.2				
Moderate	28.6	57.1	9.5	4.8				
Syllabus Tool					.921	3	.820	Not significant
Low	26.6	56.5	13.7	3.2				
Moderate	28.6	57.1	9.5	4.8				
Chat room Tool					.921	3	.820	Not significant
Low	26.6	56.5	13.7	3.2				
Moderate	28.6	57.1	9.5	4.8				
Resources Tool					.636	3	.888	Not significant
Low	28.6	54.8	11.9	4.8				
Moderate	26.2	58.3	12.6	2.9				
Announcement Tool					1.764	6	.940	Not significant
Low	26.3	56.1	14	3.5				
Moderate	29	58.1	9.7	3.2				
High	27.3	54.5	9.1	9.1				
Calendar					.502	3	.918	Not significant
Low	26.7	56.3	13.3	3.7				
Moderate	28.8	57.7	9.6	3.8				
Dropbox tool					.636	3	.888	Not significant
Low	28.6	54.8	11.9	4.8				
Moderate	26.2	58.3	12.6	2.9				

Email tool						.636	3	.888	Not significant
	Low	28.6	54.8	11.9	4.8				
	Moderate	26.2	58.3	12.6	2.9				
Assignment tool						1.439	6	.963	Not significant
	Low	25.5	55.3	14.9	4.3				
	Moderate	29	58.1	9.7	3.2				
	High	29	58.1	9.7	3.2				
Turnitin tool						1.138	6	.980	Not significant
	Low	29	54.8	12.9	3.2				
	Moderate	25.8	58.1	12.9	3.2				
	High	28.1	56.3	9.4	6.4				

Source: (Field Data, 2022) ** significant at p = 0.05

For the age bracket of 30-39, the results from Table 4 showed that (52.4%) possessed a high level of knowledge of the forum tool of the SAKAI LMS, (54.5%) possessed a high level of knowledge of the announcement tool. Further, 58.1% possessed a high level of knowledge on assignment tool as well as 57.1% possessed a moderate level of knowledge on the chat room tool. In addition, 57.1% possessed a moderate level of knowledge on the quizzes and test tool, and 58.3% possessed a moderate level of knowledge on email tool. These results indicated a different level of knowledge on the features of the SAKAI LMS across the age groupings of respondents. However, respondents between the ages of 30-39 possessed a high and moderate level of knowledge concerning the features of the SAKAI LMS. Statistically, these observed differences were not statistically significant. Specifically, the difference in the level of knowledge across ages with forum tool, announcement tool, assignment tool, chat room tool, quizzes and test tool, and email were not statistically significant as the p-value was above 0.05. This implied that irrespective of a graduate student's age; they had equal knowledge about the features of SAKAI LMS, such as the Forum tool, Chat room tool, Email tool, Lessons tool and others at the University of Ghana.

Level of Knowledge on the Features of the SAKAI LMS and College of Affiliation.

An area of interest was whether the College of Affiliation of the graduate students could influence the level of knowledge on the features of SAKAI LMS at the University of Ghana. As a result, the chi-square test of independence to test was used in determining whether a statistical significance existed. The results of the analysis are presented in Table 5.

Table 5

Level of Knowledge on the Features of the SAKAI LMS and College of Affiliation.

Features	Colleges			Chi-square	df	P-value	Decision
	Health (%)	Humanities (%)	Education (%)				
Forum tool				.019	2	1.000	Not significant
Low	45.1	42.7	12.2				
Moderate	44.4	42.9	12.7				
High	45.2	42.9	11.9				
Grade book				.017	2	.991	Not significant
Low	45.2	42.7	12.1				
Moderate	44	42.9	12.7				
Lessons tool				.395	3	.941	Not significant
Low	45.2	43	11.8				
Moderate	44.7	42.6	12.8				
Quizzes and test tool				.921	3	.820	Not significant
Low	26.6	56.5	13.7				
Moderate	28.6	57.1	9.5				
Syllabus tool				.921	3	.820	Not significant
Low	26.6	56.5	13.7				
Moderate	28.6	57.1	9.5				
Chat room tool				.921	3	.820	Not significant
Low	26.6	56.5	13.7				
Moderate	28.6	57.1	9.5				
Resource tool				.636	3	.888	Not significant
Low	28.6	54.8	11.9				
Moderate	26.2	58.3	12.6				
Announcement Tool				1.764	6	.940	Not significant
Moderate	29	58.1	9.7				
High	27.3	54.5	9.1				
Calendar tool				.502	3	.918	Not significant
Low	26.7	56.3	13.3				
Moderate	28.8	57.7	9.6				
Dropbox tool				.636	3	.888	Not significant
Low	28.6	54.8	11.9				
Moderate	26.2	58.3	12.6				
Email tool				.636	3	.888	Not significant
Low	28.6	54.8	11.9				
Moderate	26.2	58.3	12.6				

Assignment tool				1.439	6	.963	Not significant
	Low	25.5	55.3	14.9			
	Moderate	29	58.1	9.7			
	High	29	58.1	9.7			
Turnitin tool				1.138	6	.980	Not significant
	Low	29	54.8	12.9			
	Moderate	25.8	58.1	12.9			
	High	28.1	56.3	9.4			

Source: Field Data, 2018 ** significant at p = 0.05

The result from Table 5 indicated a variation in graduate students' knowledge levels. Of the respondents from the College of Health, 45/1% possessed a moderate level of knowledge of that forum tool, and 44.7% of the respondents possessed moderate knowledge of the lessons tool. Forty-two point nine percent of graduate students from the College of Humanities indicated they possessed a high level of knowledge of the forum tool, and 57.1% of the respondents possessed moderate knowledge of quizzes, test tools and chat room tools, respectively. The result from Table 5 indicated that irrespective of the difference in graduate students' knowledge level on the features of SAKAI LMS across their college of affiliation, differences in the knowledge were not statistically significant ($p>0.05$).

Discussion

These findings confirm Issifu's (2018) position that distance education nursing students needed better knowledge of the SAKAI LMS. As a result, they could have made better use of the LSM. A similar finding was established by Leeder and Lonn (2014) that users and non-users of the SAKAI LMS needed more knowledge of its features and hence experienced numerous difficulties, such as sending email, chatting, and downloading learning materials. The low level of knowledge expressed by the study respondents aligned with the findings of Juhary (2014) that most respondents reported needing more knowledge and awareness concerning the features of the SAKAI LMS. Students' inability to use the LMS was not intentional. However, students were not utilising the SAKAI LMS partly because they needed to be made aware of the features (Arhinful, 2016). Specifically, Soon and Fraser (2011) asserted that the calendar tool was least prevalent among graduate students, who needed more knowledge of using the email tool. The findings of this study confirmed the assertion by Rogers (2003) that knowledge was a requisite ingredient for the successful adaptation of technologies because a lack of knowledge about a particular technology could hinder the utilisation of the technology. The finding supported that of Dube and Scott (2014) and Ssekabubu et al. (2011), who found that respondents hardly utilised the SAKAI LMS as a result of a lack of knowledge of its features and that students had a low level of utilisation of the features on the SAKAI LMS.

On the other hand, the findings did not correspond to those of Juhary (2014), Lonn et al. (2009) and Rafi et al. (2015) that university students often visited the SAKAI platform on their own for their academic studies and, as a result, the extent of use of the platform was great. However, the study's

findings contradicted the findings of Choga (2015), who examined the use of the SAKAI LMS at the Faculty of Communication and Information Science at the National University of Science and Technology (NUST) among undergraduate students. He found out that the respondents had a high level of knowledge of the features of the SAKAI LMS as it was obligatory for them to use it.

From this explanation, a graduate student with little knowledge of the features of the SAKAI LMS may be unwilling to use it. The low level of knowledge of the features of the SAKAI LMS may affect its continuous utilisation by students. The affordances of the SAKAI LMS are not explained to students who might have missed essential assessment dates, and attending schedules of seminars or workshops not because they were unwilling to attend. Again, students may need help accessing their learning resources or reading materials, leading to their inability to engage in further reading or research for in-depth understanding and meaningful learning to thrive. Whether the mode of instruction is synchronous or asynchronous, learners will not be able to obtain access to the uploaded reading material needed for class discussion. This hinder students understanding, contribution to class discussion and the construction of knowledge. The interaction between students and lecturers becomes inactive and unproductive as students need more knowledge of using chat room and email tool options provided by the SAKAI LMS to initiate engagement. Even in the assignment feature for this study, respondents have indicated moderate knowledge of using. This brings the starter of instruction through using SAKAI LMS ineffective to reviewing students' relevant previous knowledge to stimulate understanding.

Moreover, these research findings have indicated why students continuously complained that they could not see their results, yet, these results have been published on the SAKAI LMS. This undermines the fundamental purpose of assessment feedback to students. The level of SAKAI LMS illiteracy hinders smooth navigation, which causes discomfort, frustration and intolerance, among students. In turn, frustration hinders the provision of quality education using an online learning management system—students' insufficient knowledge of the calendar and announcement tools. Students perceived importance of engagement strategies in online learning environments revealed that using LMS features such as discussion forums, chats, blogs and wikis if utilised well, can promote student-to-student engagements. At the same time, instructor feedback can help learners become more engaged in learning (Martin & Bolliger, 2018).

Conclusion and Recommendation

The ultimate goal for university authorities is to ensure that students' engagement with the LMS increases student satisfaction, stimulates learning, reduces study isolation and anxieties and fosters cooperative learning. This reality can manifest if students possess the requisite knowledge of the LMS. Based on the study's findings, respondents possessed a low level of knowledge of the features of the SAKAI LMS. It was further revealed that a significant difference between the level of knowledge of the features of SAKAI LMS across genders and a non-significant difference in the level of knowledge of the SAKAI LMS across the age and college of affiliation of respondents exist. Gauging from the study's conclusions, graduate students need to know the different inbuilt features of the SAKAI LMS to enable them build and develop self-regulatory skills. The LMS can become useless or less effective if students lack the knowledge of the LMS.

The development of self-regulatory skills is external to the learners, which requires the university management to organise some LMS training and orientation for at least three days to enable students to acquire the requisite knowledge and understanding of the features of the SAKAI LMS. This will help create awareness of the system's various features and empower them with the necessary knowledge to use the SAKAI LMS properly. Acquiring techniques and strategies to control and monitor their meta-cognition traits and knowledge is critical as students engage in self-regulated learning.

Disclosure Statement: No potential conflict of interest was reported or encountered by the authors.

Funding: There was no external funding.

Authors:

Jonathan Odame
Department of Distance Education, University of Ghana, Ghana
jonathanodame@ug.edu.gh
https://orcid.org/0000-0002-9522-3869

Clarke Ebow Yalley*
Department of Social Studies Education, University of Education, Winneba, Ghana
ceyalley@uew.edu.gh
https://orcid.org/0000-0002-6462-1194

References

Al Rawashdeh, A. Z., Mohammed, E. Y., Al Arab, A. R., Alara, M., & Al-Rawashdeh, B. (2021). Advantages and disadvantages of using e-learning in university education: Analyzing students' perspectives. *Electronic Journal of E-learning, 19*(3), 107-117.

Andel, S. A., de Vreede, T., Spector, P. E., Padmanabhan, B., Singh, V. K., & De Vreede, G. J. (2020). Do social features help in video-centric online learning platforms? A social presence perspective. *Computers in Human Behavior, 113*, 106505

Ansong, E. (2015). *Determinants of e-learning adoption in universities: Evidence from a developing country*. Published MPhil Thesis. Department of Operations and Management Information Systems, University of Ghana. http://ugspace.ug.edu.gh/handle/123456789/8052

Arhinful, L. (2016). *Learning management system adoption in the university: Exploring the experiences of Canadian and international students*. Published MA dissertation. Brock University. http:// hdl. handle. net/10464/10415.

Asamoah, M. K. (2020). Reflections and refractions on Sakai/Moodle learning management system in developing countries: A case of Ghanaian universities' demand and supply perspective analyses. *African Journal of Science, Technology, Innovation and Development, 12*(2), 243-259.

Bond, M. (2020). Facilitating student engagement through the flipped learning approach in K-12: A systematic review. *Computers & Education, 151*, 103819.

Berg, A., & Dolphin, I. (2011). *Sakai CLE courseware management: The Official Guide.* Packt Publishing Ltd.

Cavus, N., & Kanbul, S. (2010). Designation of web 2.0 tools expected by the

students in a technology-based learning environment. *Procedia-Social and Behavioral Sciences,2*(2), 5824-5829. doi:org/10.1016/j.sbspro.2010.03.950

Cavalcanti, A. P., Barbosa, A., Carvalho, R., Freitas, F., Tsai, Y. S., Gašević, D., & Mello, R. F. (2021). Automatic feedback in online learning environments: A systematic literature review. *Computers and Education: Artificial Intelligence, 2,* 100027. http://dx.doi.org/10.1016/j.caeai.2021.100027

Cavus, N., & Zabadi, T. (2014). A comparison of open source learning management systems. *Procedia-Social and Behavioral Sciences, 143,* 521-526. https://doi.org/10.1016/j.sbspro.2014.07.430

Choga, E. (2015). *The use of SAKAI e-learning platform by undergraduate students in the faculty of communication and information science at NUST.* Published Bachelor Dissertation. National University of Science and Technology.

Cicchinelli, A., Veas, E., Pardo, A., Pammer-Schindler, V., Fessl, A., Barreiros, C., & Lindstädt, S. (2018, March). Finding traces of self-regulated learning in activity streams. In *Proceedings of the 8th international conference on learning analytics and knowledge* (pp. 191-200).

Darko-Adjei, N. (2018). *Students' perceptions and use of the SAKAI learning management system in the University of Ghana.* Published MPhil dissertation. University of Ghana.

Derakhshan, N. (2012). *Student and faculty perceptions of the features of mobile learning management systems in the context of higher education.* Published Doctoral dissertation. Oklahoma State University.

Dube, S., & Scott, E. (2014). An empirical study on using the SAKAI learning management system (LMS). *Proceedings of the E-Skills for Knowledge Production and Innovation*,101-107.

Dutton, W. H., Cheong, P. & Park, N. (2004). The social shaping of a virtual learning environment. *Electronic Journal of e-learning, 2*(2), 1-12.

Dutton, W. H., Cheong, P. H., & Park, N. (2004). The social shaping of a virtual learning environment: The case of a university-wide course management system. *Electronic Journal of e-learning, 2*(1), 69-80.

Gaba, A. K., & Sethy, S. S. (2010). Learners' perception towards information and communications technologies: A case study of Indira Gandhi National Open University. *Indian Journal of Open Learning, 19*(3), 143-157.

Graf, S., Liu, T. C., Chen, N. S., & Yang, S. J. (2009). Learning styles and cognitive traits, their relationship, and their benefits in web-based educational systems. *Computers in Human Behaviour, 25*(6), 1280-1289. https://doi.org/10.1016/j.chb.2009.06.005

Hodges, W. (2019). Sakai 19 release notes. https:// confluence.sakaiproject.org/display/DOC/Sakai19 Release Notes

Ismail, S. (2010). International students' acceptance of using social networking sites to support learning activities. *International Journal for the Advancement of Science & Arts, 1*(2), 81-90.

Issifu, S. J. (2018). *Satisfaction with e-learning resources: A study among distance education nursing students at the University of Ghana.* Unpublished MPhil Thesis. University of Ghana.

Juhary, J. (2014). Perceived usefulness and ease of use of the learning management system as a learning tool. *International Education Studies, 7*(8), 23-34. http://dx.doi.org/10.5539/ies.v7n8p23

Klementiev, A. A. (2020). Using predictive methods for assessing academic performance of Graduate students based

on LMS platform data. *Общество: Социология, Психология, Педагогика,* (12), 105–110. https://doi.org/10.24158/spp.2020.12.19

Knowles, S. M. (1980). *The modern practice of adult education: Andragogy versus pedagogy.* Prentice Hall, Cambridge Adult Education.

Knowles, M. S., Holton III, E. F., & Swanson, R. A. (2014). *The adult learner: The definitive classic in adult education and human resource development.* Routledge.

Lee, J., Song, H. D., & Hong, A. J. (2019). Exploring factors and indicators for measuring students' sustainable engagement in e-learning. *Sustainability, 11*(4), 985. https://doi.org/10.3390/su11040985

Pintrich, P. R. (2003). A motivational science perspective on the role of student motivation in learning and teaching contexts. *Journal of Educational Psychology, 95*(4), 667. https://psycnet.apa.org/doi/10.1037/0022-0663.95.4.667

Martin, F., & Bolliger, D. U. (2018). Engagement matters: Student perceptions on the importance of engagement strategies in the online learning environment. *Online learning, 22*(1), 205-222. https://doi.org/10.24059/olj.v22i1.1092

Mayanja M. (2002) *Uganda school-based telecenters: An approach to rural access to ICTs.* Knowledge Enterprise, Inc. http://www. wougnet.org/Events/IARW/SchoolBasedTelecenter_Mayanja.pdf.

Mtebe, J. (2015). Learning management system success: Increasing learning management system usage in higher education in sub-Saharan Africa. *International Journal of Education and Development using ICT, 11*(2).

Oducado, R. M., Parreño-Lachica, G., & Rabacal, J. (2021). P Personal resilience and its influence on COVID-19 stress, anxiety and fear among graduate students. *SSRN Electronic Journal.* https://doi.org/10.2139/ssrn.3774615

Lonn, S., Teasley, S. D., & Krumm, A. E. (2009). Investigating undergraduates' perceptions and use of a learning management system: A tale of two campuses. In *Annual Meeting of the American Educational Research Association,* San Diego, California. https://ctools. umich.edu/access/content/group/research/papers/Survey_Final Paper_AERA09. Pdf.

Lee, Y. H., Hsieh, Y. C., & Hsu, C. N. (2011). Adding innovation diffusion theory to the technology acceptance model: Supporting employees' intentions to use e-learning systems. *Journal of Educational Technology & Society, 14*(4), 124-137.

Leeder, C., & Lonn. S (2014). Faculty usage of library tools in a learning management system. *College & Research Libraries, 75*(5), 641-663. https://doi.org/10.5860/crl.75.5.641

Scheaffer, R. L., Mendenhall III, W., Ott, R. L., & Gerow, K. G. (2011). *Elementary survey sampling.* Cengage Learning.

Soon, L., & Fraser, C. (2011). Knowledge sharing and knowledge exchange in distance education online group work. *International Journal of Information and Education Technology, 1*(2), 156. http://dx.doi.org/10.7763/IJIET.2011.V1.26

Ssekakubo, G., Suleman, H., & Marsden, G. (2011). Issues of adoption: have e-learning management systems fulfilled their potential in developing countries? In *Proceedings of the South African Institute of Computer Scientists and Information Technologists Conference on Knowledge, Innovation and Leadership in a diverse, Multidisciplinary Environment* (pp. 231-238). ACM. doi:10.1145/2072221.2072248

Surry, P. D., & Radcliffe, N. J. (2005, June).

Inoculation to initialise evolutionary search. In *Evolutionary Computing: AISB Workshop Brighton*, *UK, April 1–2, 1996 Selected Papers* (pp. 269-285). Berlin, Heidelberg: Springer Berlin Heidelberg.

Xin, N. S., Shibghatullah, A. S., & Abd Wahab, M. H. (2021, May). A systematic review for online learning management system. In *Journal of Physics: Conference Series, 1874*(1), 12-30. IOP Publishing.