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By Mensah, E.A, Sachi, P.J, Greene, R.A, Loglo, F.S, Donkor, D.O & Bempah, S

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An Investigation into Self-Regulated Learning in a Virtual Classroom: A Higher Education Perspective

Mensah, E.A [α], Sachi, P.J [σ], Greene, R.A [ρ], Loglo, F.S [ω], Donkor, D.O [¥] & Bempah, S[§]

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I. Introduction

Information Communication Technology (ICT) has become ubiquitous in the 21st century and revolutionized every aspect of daily living (Oliver 2002; Chen, Cheng & Chew, 2016; Mullan & Wajcman, 2019). From commerce (Harindranath et al., 2008) to health (Chetley et al., 2006), communication (Condie & Munro, 2007) and education (Muilenburg & Berge, 2005; Andrade & Bunker, 2009).

In recent times, advances in e-learning have made education easily accessible, convenient, and student-centred (Ozkan & Koseler, 2009). Further, it has allowed busier people to pursue higher education (Gulati, 2008). Indeed, given the current global COVID-19 situation, several higher education institutions have had to pause face-to-face teaching and learning and turn to e-learning in what is referred to as Emergency Remote Teaching and Learning as solutions (Hodges et al.' 2020; Kerres, 2020). Previous studies also show that e-learning influences student self-direction and productivity (Vrasidas, 2004; Zimmerman, 2008; Means et al., 2009). Consequently, many universities worldwide have adopted web-based pedagogical tools such as learning management systems (LMS) as a way of helping students self-regulate their learning. Popular LMSs include Moodle, Blackboard, and Sakai (Akeroyd, 2005; Cavus & Zabadi, 2014; Boateng, 2015).

However, despite all these benefits of e-learning for both students and universities, it has been argued that technology alone will not produce the desired result just by applying it in the classroom (Gibson, 2001; Cheok et al., 2017). On the contrary, it needs to be introduced and contextualized to make it more meaningful for teachers and students. While technology has advanced and improved the quality of education delivery in many developed countries, universities in developing countries are now exploring its application. To what extent are these ICT tools utilized, and how much impacts will they make on helping students pace their learning? Further, it remains empirically unverified the assertions that e-learning leads to self-regulated learning due to its social constructivist orientation. Based on these, this study was motivated and employed a mixed-method approach to investigate three objectives:

i. To evaluate the influence of the LMS on students' self-regulated learning.
ii. To explore challenges faced with its usage and
iii. To assess the overall levels of satisfaction with the LMS used by a higher education institution in Ghana.

The paper is organized into five parts, with the first addressing the introduction second discussing existing literature and theories underpinning ICT in education and learning. The third part discusses the methodology the study adopted, with the fourth presenting the results and discussions. The conclusion, which is the final part of the paper, highlights key findings and implications for further research. The second part which addresses earlier literature on the subject, is presented in the next section of the paper.

a) Learning Management Systems (LMS) in Higher Education

E-learning enables educators and instructors to actively engage learners at different locations and aid their learning process in a way that would have been impossible to accomplish otherwise (Zimmerman, 2008; Taylor & Parsons, 2011). The e-learning can be applied in many different modes and include virtual, online/ e-

Author σ: e-mail: mysjoep@gmail.com

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learning, blended/ hybrid educational programs, and mobile learning programs.

One of the most popular web-based tools used to carry out e-learning is the Learning Management System (LMS). An LMS is a database that contains information about the teacher or instructor, students, course, and its contents (Kats, 2010). Its features may include discussion forums, quizzes, assignments, audio and video content, and tools that support self-regulated learning and time management. According to Dabbagh and Kitsantas (2013), most LMSs contain web applications that integrate pedagogical and technological tools of the internet and the web to facilitate web-based courses and online learning environments. Dabbagh and Kitsantas (2013) further explain that LMS allows students to collaborate and share ideas with other students, edit course documents, and collectively work on group activities. The learners also get assistance from peers and LMS community members by engaging in effective dialogue regarding course content when they have difficulty; learners can also define and establish goals and hold themselves responsible (Dabbagh, 2002; 2007).

In Ghana, while the idea of e-learning is not new to higher education, its effective incorporation remains a challenge for most universities. Many universities were in the process of at least piloting an online platform to deliver some of their programs and the COVID-19 pandemic has now hastened the process. As indicated in Table 1, most universities in Ghana are adopting different LMSs to utilize this new pedagogy in higher education with varying extent of use.

Table 1: Use of LMSs in Ghanaian Universities

University	E-Learning platform
University of Ghana (UG)	SAKAI (Obuobi, Adrion, & Watts, 2006).
Kwame Nkrumah University of Science of and Technology (KNUST)	Virtual Classroom (Vclass) (Obiri-Yeboah, Fosu, & Kyere-Djan, 2013).
University of Cape Coast (UCC)	Moodle (started only March 2020)
Ghana Technology University College (GTUC)	Moodle (Antwi-Boampong & Sørensen, 2018)

The KNUST (study institution) introduced the LMS Virtual Classroom (Vclass) in 2005 (Marfo & Okine, 2010; Obiri-Yeboah et al., 2013). In some departments of the University, some programs are entirely run online while most adopt a hybrid module, combining the LMS with the traditional face-to-face approach. The Institute of Distance Learning (IDL) was the first institute in the University to run wholly computerized learning tools with two face-to-face tutorials per semester. For instance, M.Sc. Development Management Programme employs Vclass learning course with occasional face-to-face tutorials. Although the Vclass has been in use since 2005, limited studies are undertaken to assess its effectiveness for student-directed learning. The existing studies; Arkorful and Abaidoo (2015), Budu and Ackah (2016) and Obiri-Yeboah et al. (2013) focused on the advantages of e-learning adoption, challenges of e-learning and ICT infrastructure and not on students' self-regulated learning.

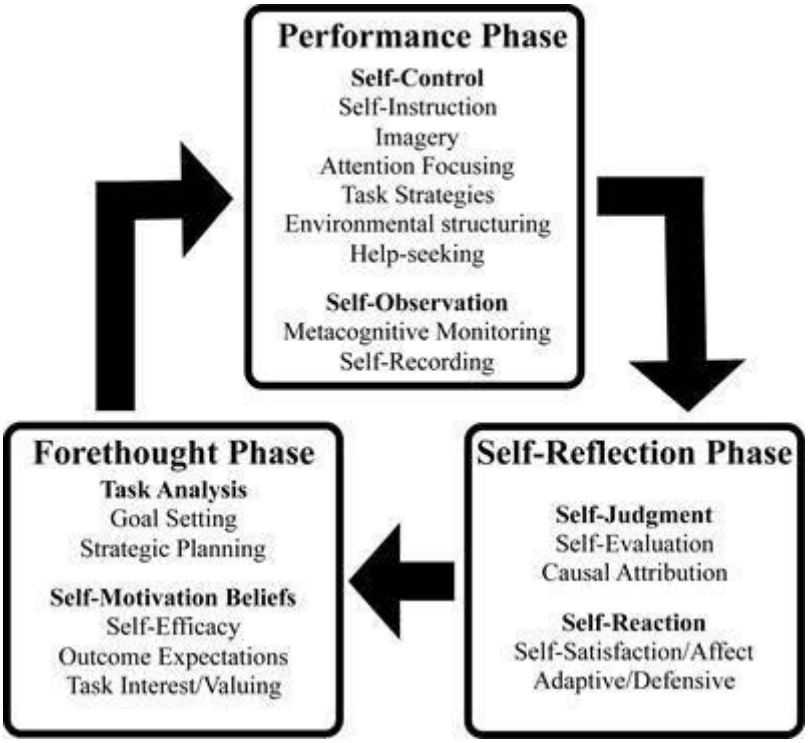
b) *Self-Regulated Learning in Higher Education: A review*

Self-regulated learning (SRL) emphasizes autonomy and control by the individual who monitors, directs, and regulates actions toward goals of information acquisition, expanding expertise, and self-improvement (Paris & Paris, 2001). This form of learning is guided by metacognition (thinking about one's thinking), strategic action (planning, monitoring, and evaluating personal progress against a standard), and motivation to learn (Zimmerman, 2002; Liaw et al., 2010). Student responsibility is emphasized here with students determining where, when, and how long to spend on the LMS (Wang et al., 2013).

According to Zimmerman and Moylan (2009), the impetus for an investigation into SRL among learners' stems from the plethora of distractions students are faced with; from competing activities such as watching television or browsing online to insufficient knowledge about how to proceed, difficulty in judging the quality of one's learning, and limited incentives (Zimmerman & Moylan, 2009; Zimmerman, 2013). Their work introduces other elements such as capabilities within the "self- control" element of SR (see Figure 1).

Based on the thoughts of Zimmerman and Moylan (2009), Nussbaumer et al. (2014) discuss nine SRL strategies under three (3) main categories: *cognitive*, *metacognitive,* and *resource management strategies*. Cognitive strategies are conceptualised as the way students approached learning and included are organisation, elaboration, and rehearsal strategies. Meta-cognitive strategies involved goal setting, self-monitoring, and regulation strategies targeted at managing of one's learning. Finally, resource management strategies included 'time management, help-seeking, and enabling strategies employed by the learners' (Nussbaumer et al., 2014:7) are important for learners to be supported in their meta-cognition for SRL.

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Source: Zimmerman & Moylan (2009).

Figure 1: The Cyclical Phases Model

Studies on self-regulated learning using LMS have utilised the Technology Acceptance Model (TAM); the Theory of Reasoned Action (TRA), the Theory of Planned Behavior (TPB), and the Unified Theory of Acceptance and Use of Technology (UTAUT) as models in conjunction with the Structural Equation Modeling (SEM). For example, based on the TAM and SEM, Rehman's (2017) study employed a quantitative approach to investigate the influence of LMSs on self-regulated learning among 354 learners at the Virtual University of Pakistan. Even though he expected a high correlation between students' familiarity with LMS and their perception about enhanced self-regulated learning, the study results showed that there was no correlation between the use of LMS at the university and students' self-regulated learning. He suggested that this was because students possessed low self-regulatory skills and exhibited maladaptive behaviour towards the use of the LMS.

Wang *et al*. (2013) study using responses from 256 students sought to establish the relationship among students' characteristics, self-regulated learning, technology self- efficacy, and course outcomes in online learning settings. Their study found students who had taken online courses before tended to have more effective learning SRL strategies. Hood et al. (2015) found that learners who were pursuing a higher degree study programmes (Masters and PhD) tended to be more self-regulated. With socio- demographics such as age and gender, Law *et al*. (2008) reported that there was no significant difference in SRL use between students of different ages. However, their study found that female students used more SRL strategies than their male colleagues.

Similarly, Li (2019) examined the relationships among learners' demographics and their self-regulated learning (SRL) strategy usage, perceived learning, and satisfaction among 4503 learners from 17 Coursera courses. He used structural equation modeling to show that participants' age, gender, highest degree, and the number of online courses previously taken significantly predicted goal setting and environment structuring usage. As discussed by Hood, Littlejohn and Milligan (2015), Li (2019) confirmed that professionals reported a higher level of SRL strategy usage than their novice counterparts.

From an African perspective, Rohleder et al. (2008) study in South Africa utilised qualitative approaches to study student perceptions of e-learning. They found both positive and negative assessments of LMSs by students. The distinguishing positive reports were that e-learning made it easier to communicate between parties and provided easy access to information and learning materials. Conversely, there were technical difficulties including disconnected communications, unequal access to PCs between students from the two colleges and students' preference for more face-to-face interactions.

Annku's (2014) case study on the Faculty of Arts at the Kwame Nkrumah University of Science and

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Technology (KNUST) highlighted the importance of integrating ICT in engaging students. He found that e-learning challenged students with new and interactive methods while improving their skills in digital communication and learning, teamwork, mobile learning, listening, meeting schedule, planning, typing, self- direction, and information search skills. Another Ghanaian study by Arkoful and Abaidoo (2014) indicated that the utilization of technology in education allows flexibility when it comes to considerations of time and place while enhancing the efficacy of knowledge and knowledge and qualifications. The study's limitation was that it failed to assess whether students experienced satisfaction with the learning style and outcomes of using e-learning.

While studies such as those of Sha (2012) and Dabbagh and Kitsantas (2013) argue that tools employed in e-learning can help to acquire metacognitive skills that assist students to self-regulate their learning, other studies such as that of Hollingwort and McLoughin (2001), demonstrated that students lacked metacognitive skills like planning and revising solutions to problems. Their work emphasized the importance of online tutorials in getting students to monitor and evaluate their problem-solving approaches. Further, Kitsantas and Chow (2007) found that students who utilized LMSs to support their studies demonstrated a higher level of confidence in seeking help via online discussion forums than students who only used the traditional classroom system. Thus, there are mixed results on whether and to what extent web-based tools promote self-regulated learning among learners.

II. Conceptual Framework

We assert that SRL begins with the individuals' *Forethought* phase (see Figure 2). This phase typically involves task analysis, planning and activation of learning through self-awareness and control of underlying motivations. Learners are expected to scrutinize the 'components of a task, as well as the level of difficulty and effort required, and decide on outcomes' (Harding, 2018: 8). Here, the student, based on the set goals, must decide on a strategy at the beginning of the learning process.

The performance phase forms the second stage and draws on the planning task from the forethought phase. At this stage, the expectation is for learners to implement their strategies and use self-examination and feedback mechanisms to monitor their success, failures, and motivation. Highly regulated students would articulate, clarify, and think about their choices and defend their preferred approach.

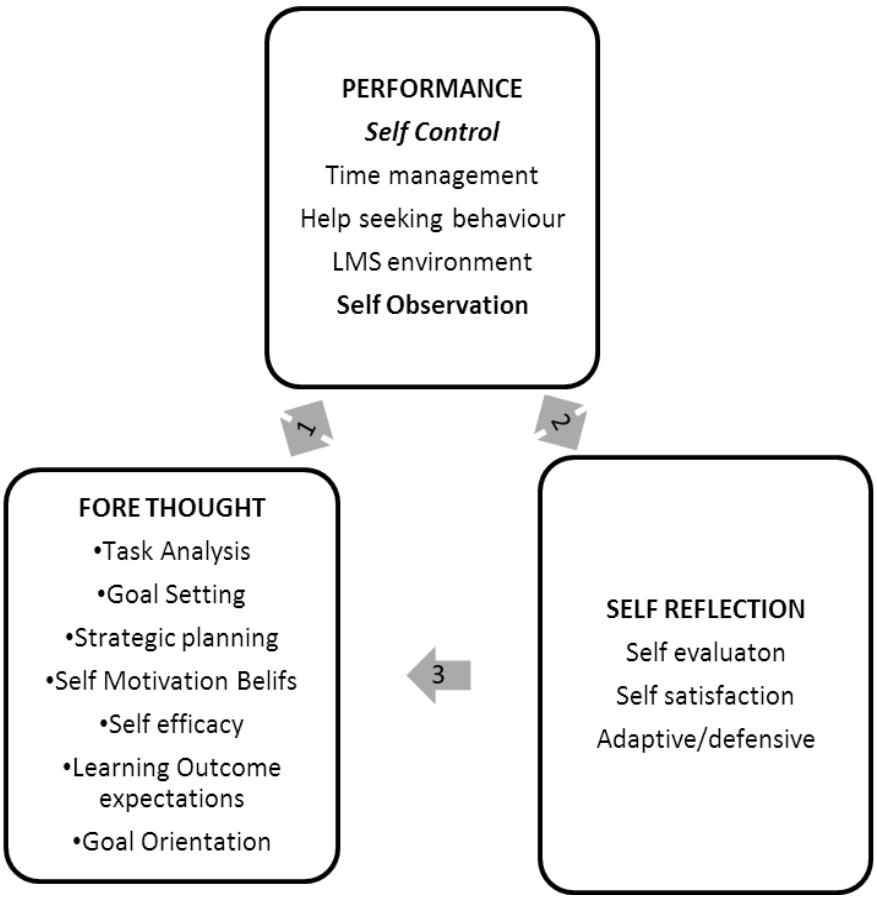


Figure 2: Conceptual Framework Following Zimmerman & Moylan (2009)

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Finally, after the first two phases, self-regulated learning is expected to take place. In this stage, learners will use their observations and feedback to assess and formulate causal attributions (ascribing factors that the student perceives have led to the achievement of the outcome) to their output. These may include their level of effort and competence, their selection and implementation of strategies, and other performance elements that they attribute to the outcome. Perceptions about success have a direct impact on students' ongoing motivation and learning approaches.

III. Methodology

The study adopted a partially mixed concurrent dominant status mixed-methods research. Under this mixed method design typology, the qualitative facet gain attraction across the four components outlined in Leech and Onwuegbuzie (2007) namely research objectives (exploratory rather than prediction); type of data and operations; type of data analysis and type of inference. The study objectives and invariably the data required to address them were qualitative in nature. However, the first objective sought to evaluate the influences of LMS on students' self-regulated learning. This objective required basic quantitative analytical tools as compared to the second and third objectives, which appeared qualitative and interested to explore challenges faced with LMS use and the level of satisfaction among students. The mixed-methods research strategy application in this study was supported by Braneen (2005) based on research questions.

The descriptive design was used and interested in gaining a situational understanding of the relationship between variables of interest at a single point in time using both the qualitative and quantitative data collection instruments (Bryman, 2008). The application of the descriptive design in this study was due to its ability to gather both qualitative and quantitative data using questionnaires and semi-interviews. The descriptive and thematic analytical frameworks were applied in the data analysis.

a) Study Sample and Sampling Methods

Due to the study qualitative orientation, the quantitative requirement for a representative sample was not fulfilled. Additionally, data on the number of students offering academic programmes that are online could not also be obtained from the University and constituted a limitation. For these reasons, a sample size of 116 was intuitively determined based on other considerations including resources as noted by Barker, Pistrang and Elliot (2002) and Cocks and Torgerson (2013) that other factors such as concern for ethics, availability of participants, resources example researcher's time, study type –pilot or confirmatory are important consideration parameters for sample size determination (see Fugard and Potts, 2015).

From the 116 participants, 92 were students, 12 lecturers and 12 administrators. The decision to include lecturers and administrators in the sample was to gain a complete view of the challenges of the LMS system within the university. The sample units were drawn from two faculties (social sciences and business) across Undergraduate and Post- graduate (Masters and Ph.D.) programmes.

The study utilised the non-probability sampling techniques comprising convenience, referrals and accidental methods in selecting the respondents. The research was not intended for prediction and did not follow scientific demands for sample units' selections. The criteria for participation therefore included:

i. being a student of Kwame Nkrumah University of Science Technology.
ii. pursuing/pursued academic programme run on Vclass (KNUST LMS).
iii. the willingness to participate in the study.

The percentiles and analysis of variance were used to analyse the study data for the first objective. In contrast, the qualitative data was analysed using thematic and content analysis. The next part of the study presents the findings.

IV. Results and Discussion

a) Demographics

The total number of respondents was 116. They were more males (58.6%), with 42.4% females. More than half (53%) of respondents were between 26-32 years. The respondents below the age of 26 years and above 32 years formed 22% and 25% of the sample, respectively. The respondents below the age of 26 years were more likely to be regular students pursuing first-degree programmes. The respondents above 32 years were likely to be masters (60%) or Ph.D. students (5%). Most students (80%) indicated receiving training on the use of the learning management system by way of workshops (45%) and presentation (39%), with lectures accounting for the difference of 16%, thus 100-45-39%=16%.

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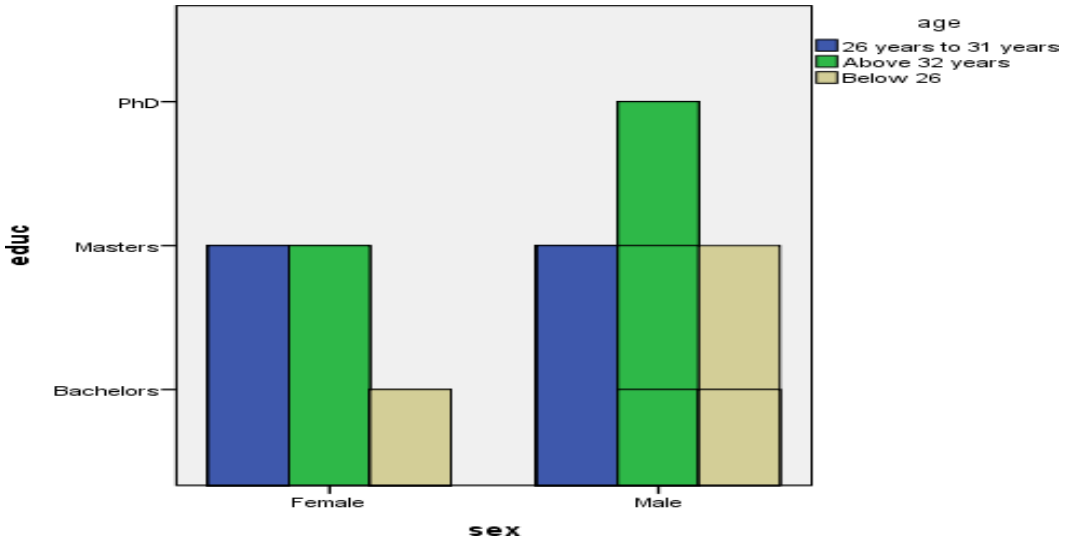


Figure 1: Demographic Profile of Respondents

Most respondents (81%) were distance-learning students, while 19 % were campus- based students. The sample was more non-traditional students who have been identified in previous studies to be inclined to using digital teaching and learning approaches because they afford flexibility (Wyatt, 2011; Zawacki-Richter et al., 2015; Dolch & Zawacki-Richter, 2018).

In terms of the use of LMS, about one-third of the respondents used the discussion forum of the virtual classroom frequently, with an overall 61.2% using the functionality frequently and very frequently (see Table 2). On the other hand, only about 30% (comprising very frequent and frequent) intensively used the virtual classroom to seek help about course content from peers or lecturers. Table 2 presents the data of respondents on LMS use.

Table 2: Use of the LMS (Vclass) by Students

Variables	Frequency (n)	Percentage (%)
Use of discussion forum		
2-3 times	25	21.6
4-5 times	32	27.6
More than six times in a week	39	33.6
Never used the discussion forum	20	17.2
Use of the system for course content help		
One time 2-3 times	3	2.6
4-5 times	37	31.9
More than six times a week	17	14.7
Never used Vclass to seek help	18	15.5
	41	35.3

The frequent use of the discussion forum vis-à-vis the less frequent use to seek content help may suggest a reasonable level of self-efficacy (Alioon & Delialioğlu, 2019) on the part of students. Nonetheless, Dabbagh and Kitsantas (2013) indicate that teachers or instructors can play a substantial role in creating awareness about the system and encourage its use.

b) Influence of the Virtual Classroom on Students' Self-Regulated Learning

From the data on Vclass influences on the self-regulated learning (SRL) abilities of the students, about two-thirds (67.3%) of the respondents did not agree to the statement that "Vclass helps them to plan and set learning objectives." Interestingly, it was observed that there was similar non-agreement regarding the other four statements (see Table 3). Overall, the students reported little influence of Vclass on their self- regulation towards learning despite a known relationship between learning technology and improved self-regulation of learners through student engagement (Bouta, Retalis, & Paraskeva, 2012). Table 3 indicates self-regulated learning items and the respondents' agreements or disagreements of Vclass influence.

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Table 3: Influence of the Vclass on Students' Self-regulated Learning

No.	Items	Agree (1)	Neutral (3)	Disagree (2)
1	The virtual classroom helps me to plan and set my learning objectives	38 (32.7%)	30 (25.9%)	48 (41.4%)
2	The virtual classroom helps me to monitor and evaluate my progress	39 (33.7%)	33 (28.5%)	44 (37.9%)
3	Monitoring and evaluating personal progress enhanced my skills like planning and time management to achieve better learning	47 (40.5%)	28 (24.1%)	41 (35.3%)
4	The virtual classroom helps me to reflect on my progress and make self-improvements	38 (32.8%)	31 (26.7%)	47 (40.6%)
5	The virtual classroom is effectively utilized to facilitate the learning process	45 (38.7%)	24 (20.7%)	47 (40.5%)

Across the five elements of self-regulated learning in this study, it revealed that almost always, more students disagree that Vclass influenced their abilities to regulate learning. Following the responses in Table 3, we analyse the differences in the mean responses (agreed and disagreed) to the influence of LMS use on students' self-regulated learning across the five domains. Using two-factor Analysis of Variance (ANOVA), we tested the hypothesis.

H0: There are no differences in mean responses across the levels of self-regulated learning of students.

Ha: There are differences in mean responses across the levels of students self-regulated learning.

From the analysis, there was no sufficient evidence in the data to accept the null hypothesis, that is the case of no difference in mean responses across the levels of self-regulated learning. From the results (Table 4), both the rows and columns explain insignificant amounts of variations on self-regulated learning with a P-value >0.05. The confirmation of no differences in average responses of the respondents across the domains means that Vclass e-learning at KNUST does not influence self-regulated learning.

In order to realize self-regulated learning among learners using LMS platforms, Wang et al. (2013) emphasized student responsibility in determining where, when, and how long to spend on the LMS. However, the challenges recognized to be sources of distractions such as watching television, browsing online, limited knowledge to navigate the system as well as insufficient incentives, as noted by Zimmerman and Moylan (2009) and Zimmerman (2013), may have played a role on the participants of the present study.

Table 4a: ANOVA Two-Factor Without Replication

SUMMARY	Count	Sum	Average	Variance
Planning learning Objectives	2	86	43	50
Monitoring & Evaluation Progress	2	83	41.5	12.5
Planning & Time Management skills	2	88	44	18
Reflection & Self-improvement	2	85	42.5	40.5
Facilitation of Learning Process	2	92	46	2
Agreed	5	207	41.4	18.3
Disagreed	5	227	45.4	8.3

Table 4b: ANOVA

Source of Variation	SS	df	MS	F	P-value	F critical
Rows	23.4	4	5.85	0.2819	0.876173	6.388233
Columns	40	1	40	1.9277	0.237327	7.708647
Error	83	4	20.75			
Total	146.4	9				

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Overall, on average, there was no statistical differences across the levels of self- regulated learning with F-test value [f(rows)= 0.2819, P=0.88 >0.05] compared with F-critical=6.39 and between responses (agreed or disagreed) about LMS influences on self-regulated learning [f(columns) = 1.9277, P=0.24 >0.05] and F-critical = 7.71. This means that from the ANOVA analysis, something else could influence self-regulated learning but not the domains considered in this paper at KNUST.

An earlier study based on the TAM and SEM models (Rehman, 2017) involving 354 learners at the Virtual University of Pakistan found no correlation between the use of LMS and students' self-regulated learning. It attributed the reasons to students' low self-regulatory skills and maladaptive behaviour to the use of LMS. Wang et al. (2013) study using 256 students to analyse the relationship among students' characteristics, self- regulated learning, technology self-efficacy, and course outcomes in online learning settings found that students with prior online course experience tended to have more effective learning SRL strategies. Hood et al. (2015) found that learners who were pursuing a higher degree study programmes (masters Ph.D.) tended to be more self- regulated. For socio-demographics such as age and gender, Law et al. (2008) reported that there was no significant difference in SRL use between students of different ages. However, the female students used more SRL strategies than their male colleagues.

In South Africa, Rohleder et al. (2008) analysed based on qualitative approaches student perceptions of e-learning. They found both positive and negative assessments of LMSs by students. The positive reports were that e-learning made it easier to communicate, access information and learning materials between parties like this present study. On the contrary, there were also technical difficulties including disconnected communications, unequal access to PCs between students from the two colleges, and students' preference for more face-to-face interactions.

A thematic analysis of the study data revealed three main factors that support SRL. These factors included effective time management, improved learning outcomes, and provision of credible academic information.

i. *Effective time management*

Unlike the traditional classroom that requires students to meet face-to-face with lecturers at a specific place and time, the Vclass offers more flexibility and removes such restrictions. Additionally, learning materials are uploaded online in advance and affords students and lecturers more time to plan and prepare for the courses. Both the students and lecturers expressed similar assertions during the interviews. For example, a participant had this to say:

> "*…at the start of a course, the lecturers set out the learning objectives and indicate the topics to be discussed in the ensuing weeks. This helps us (students) to plan for the course and make effective use of our time*" (Participant 2, Male, Student).

The lecturers also gave their experience with Vclass and how it helps ineffective use of time.

> "*The Vclass helps track participation of students because it records time stamps. It supplements face-to-face meetings with the undergraduate students, as I can interact with students even when I am indisposed. It also helps ensure that students are never idle as there is always a discussion to participate in or an assignment to complete hence their time is not wasted, they have something to do at every point in time*" (Participant 3, Female, Lecturer).

These views support Nussbaumer et al. (2014) assertion that time management is critical resource management strategy for self-regulated learning. That notwithstanding, a high level of motivation derived through a learner agency, improved engagement, and guidance are predictors for achieving success in self-regulated learning (Mahadi and Subramaniam, 2013; Kirmizi, 2014). Similar to the findings of Rehman (2017), most students did not believe in the efficacy of the virtual classroom system to improve their self-regulated learning.

Besides, the lecturers did not share the same thoughts on whether using the Vclass improved students' learning outcomes. The first respondent noted that "*it is difficult to say learning outcome is better with the Vclass platform because it depends largely on the extent to which students use it.*" There was, however, consensus among students and lecturers that the Vclass was not effectively utilized to facilitate students learning. One lecturer indicated that the LMS was under-utilized because other similar platforms have additional features to check plagiarism levels of assignments and that students with poor internet connectivity or no internet access are not benefiting from the system. As indicated by Wandler and Imbriale (2017), there is a need to teach students the necessary self-regulatory processes to remove the maladaptive practices to achieve an optimum level of usage of LMS tools.

ii. *Improved Learning Outcomes*

From the perspective of lecturers, the Vclass improved the learning outcomes of students. A female lecturer intimated that:

> "*Once at the end of the day, the discussion on the subject takes place, and students make contributions and demonstrate understanding, the learning outcome is achieved. Sometimes, only a few people may share positive contributions, but it also shows the learning outcome. Assessments and quiz scores also show the outcome. Therefore, Vclass is effective in helping to improve learning outcomes*" (Participant 4, Female, Lecturer).

iii. *Credible Source of Academic Information*

One major way the V-class influences students' self-regulated learning is through the provision of

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credible sources of academic information. The respondents revealed that learning materials uploaded on the Vclass by lecturers are of enormous benefits to the students and helps them focus on the right subject information. Additionally, lecturers can provide extra guidance for students and emphasize important ideas during discussions on the Vclass.

Below are narrations from a student and a lecturer:

> "Lecturers can assess students' understanding of topics and can guide and set them on track if they feel the students are deviating from the main ideas, they want them to take away from the course. They do this with pointers and leading questions in the discussion forums" (Participant 2, Male, Student).

> "The Vclass is the only place students can get credible information from lecturers. Also, the lecturers attempt to explain the topic for students to understand with lecture videos" (Participant 3, Female, Lecturer).

c) Challenges with Virtual Classroom

The study identified four (4) main challenges with Vclass use. These were: unreliable internet connectivity; lack of key functionalities and features, lack of experience with e-learning pedagogy, and students' dislike of reduced interpersonal contacts with their lecturers and colleagues. The most dominant challenge, however, is related to internet connectivity. The quote below amplifies the internet connectivity concern.

> "*Conditional on students' location, they could have difficulties with internet connectivity which may affect how the Vclass influences their learning outcomes.* (Participant 3, Female, Lecturer).

Additionally, the absence of interpersonal contact and interaction was said to limit the ability to gauge students' emotions in real-time as well as the novelty of learning online in the Ghanaian educational system. The statements below were made by a student and a lecturer, respectively.

> "*Since the system is based solely on the internet, the lecturer cannot gauge the true emotions of students during contributions in the discussion forums as opposed to face-to-face meetings. Discussions with lecturers and students on the platform are also not interactive enough*" (Participant 2, Male, Student).

> *'… the idea of electronic classrooms is foreign to most students in Ghana so they don't interact with peers optimally as they should and miss out on the full benefit of interacting with peers online*". (Participant 3, Female, Lecturer).

The above statements of respondents in this study may appear ironic because previous research (Schneckenberg, Elhers and Adelsberger, 2011; Bernacki, Aguilar & Byrnes, 2011) have highlighted the role of digital technologies in providing learners with alternative learning options, which tend to support the acquisition of self-regulation skills. However, Yot-Dominguez and Marcelo (2017), in their study, found that even students who used digital technologies frequently tended not to use them to regulate their learning.

Further, some lecturers reported concerns about the absence of some functionalities and features, which rendered the system underutilized. Key amongst them was plagiarism-detection software to check plagiarism and academic dishonesty. Another was the 'dumping of materials' online by lecturers without any engagement and the lack of real-time notifications to students anytime new posts and tasks were delivered in the system.

These findings highlight important issues within the system that can influence instructional and learning strategies because technology self-efficacy is a predictor of self-regulated learning in online learning settings (Wang et al., 2013). Additionally, self- regulated teachers have been identified as proactive agents and promoters of self- regulated learning by students (Yang, 2006). Therefore, teachers' satisfaction with the Vclass will most likely lead to supporting students' self-regulated learning.

d) Level of Satisfaction with Virtual Classroom

The third objective sought to examine the levels of satisfaction or otherwise of students with the Vclass. From Table 4, most students indicated disaffection (42.3%) while 26.6% were indifferent. Only 31.1% expressed satisfaction with the learning style the Vclass offered. However, nearly 45% of respondents were satisfied with its potential use for self-regulated learning and about 37% were pleased with the rich system content information given (metadata). The present findings suggest that LMS potential for self- regulated learning is still not harnessed within the study context (KNUST).

Table 4: Level of Satisfaction with Virtual Classroom

No.	Items	Satisfied n (%)	Neutral n (%)	Dissatisfied n (%)
1	Satisfaction with the learning style the Vclass provides	36 (31.1)	31 (26.6)	49 (42.3)
2	Satisfaction with the usefulness of the self-regulated learning	52 (44.8)	33 (28.5)	31 (26.7)
3	Satisfaction with the rich system content information given (metadata)	43 (37.1)	33 (28.4)	40 (34.5)

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From the interview transcripts, four reasons were identified to be determinants of satisfaction. These were flexibility in terms of time, reduction of travelling expenses, risk and credible source of information for students. Some participants comments read as:

"*I'm satisfied with the use of the Vclass and, as lecturers, we are not constrained with time and can use it optimally. The system supports nocturnal people who work best at night and vice versa*" (Participant 4, Male, Lecturer).

"It *reduces the cost of education while helping people achieve their objectives of attaining a master's degree* (Participant 2, Male, Student).

The general assertion of the dissatisfaction stemmed from some loopholes and challenges regarding its use as well as constraints of time spent for modules to run their course as well as issues with outdated content. Particularly, clarity, presentation, and delivery of videos uploaded by tutors on the LMS were points of dissatisfaction. Two students expressed the following views:

'…the *system does not give much time for both students and lecturers to assess their level of understanding on a topic…A topic may not have been fully exhausted, but because the forum closes at a specific time, the thread may no longer be available…*" (Participant 2, Male, Student).

"*Some video contents are old and fetched from other sources online without proper references.… some lecturers do not provide good explanations to the topics and only resort to reading the texts on their presentation slides. The videos should be revised regularly or changed completely where necessary*" (Participant 1, Female, Student).

On the other hand, one lecturer also expressed dissatisfaction with the teaching style and lack of administrative support by intimating that:

"I *am not very satisfied with the teaching style the system provides. Because most students contribute to discussion forums at night as they are mostly workers during the day. By the time, the lecturer is ready to respond or react to a post; there would have been several other incoherent reactions from other students changing the direction of discussions altogether sometimes. There is also no communication to lecturers on upgrades to the technology or the platform*" (Participant 3, Female, Lecturer).

The study findings indicate that irrespective of using the Vclass, most students did not report a better satisfaction level in terms of their learning effectiveness due to the inexperience with the LMS as well as gaps from the instructors' perspectives. As indicated by Rehman (2017), students who do not engage the LMS for setting their goals and for monitoring and evaluating their progress experience lower levels of satisfaction.

V. Conclusions and Implications

We conclude that although LMS has enormous potential in higher education settings, it does not necessarily lead to self-regulated learning without a conscious system in place to support students and lecturers to do so. The absence of such support such as administrative and training on effective utilisation of LMS appears to lead to under-utilization by most important actors, students and lecturers.

In terms of the content, it appears that students are dissatisfied with the content posted by lecturers. The is a perception that some lecturers are in the habit of recycling lecture videos year after year, and they tend to be outdated and obsolete. Since e-learning is a relatively new concept of education to most students in Ghana, there is the need for orientation and sensitization to enable students learn how to effectively use the discussion forums and maximize their benefits. Therefore, prior experience with other e- learning platforms is a plus for the use of LMS.

Further, the LMS user-interface could be improved to make it more users friendly. The instructors should emphasize training students on how to use easily digital content on the platform. Finally, there should be a regular review of lecture videos by lecturers to reflect current or contemporary trends on the subject matter as it enhances the quality of discussions by students in the discussion forums.

Future studies on the subject must focus on examining LMSs use in other universities in Ghana and their impact on students' self-regulated learning, given the findings of this study and the current focus on online teaching and learning. In the light of the COVID-19 pandemic and the lessons, these findings can inform universities how best to utilize their respective LMSs and address the inherent challenges associated with internet connectivity and lack of experience with the e-learning pedagogy.

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