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Customized Learning Management System for the Students and Teachers of Isabela State University-Ilagan Campus, Philippines

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ABSTRACT
The COVID-19 pandemic causes academic institutions to shift from traditional face-to-face to online teaching and learning processes. Nevertheless, the Commission on Higher Education (CHED) supports the freedom of institutions to choose which Learning Management (LMS) to implement as a learning platform. The study helps determine if the campus is ready to adopt an open-source LMS that enhances the abilities of the faculty, staff, and students in the online learning environment. The need analysis on establishing a customized LMS of ISU-Ilagan aims to assess the readiness in terms of learning resources, human resources, ICT resources and financial resources. The study used meta-synthesis and descriptive research methods to determine the readiness of the campus to adopt an open-source LMS. Conclusions imply that the campus is ready in establishing a customized online learning environment. The customized LMS which is the TelEducation Moodle-Based Learning Management System served as a tool in flexible teaching-learning modality in the new normal. In addition, customized LMS TelEducation is capable of performing better results as compared with other LMS as regards its resources on learning materials, human, ICT and financial aspects.

Keywords: COVID-19, Flexible Teaching-learning Modality, Open-source LMS, New Normal, TelEducation

INTRODUCTION

The starting point of learning is centered on students with the use of conventional ways to learn which is the normal classroom setting. However, due to several innovations and technology, the conventional way of learning was added with the use of information and communications technology, the internet and other online applications which drives personalized learning. (Bradley, V. M. ,2021).

According to (Bray & McClaskey, 2013; Underwood et al., 2007), there is confusion between the words personalized learning, personalizing learning, or personalization in several kinds of literature in a variety of ways with very modest definitional differences. However, the "personalized learning" term that is most frequently used refers to an educational system that emphasizes learning that is adapted to each learner's requirements, attitudes, and interests.

Since the learner is at the center of the process, the corresponding educational system promotes a child's overall development and works to ensure that every student meets the best standards possible (West-Burnham, 2010; Wolf, 2010). The term "high expectations of every kid, given practical form by high-quality teaching based on a strong knowledge and understanding of each child's requirements" is used by Milibrand (2004, p. 8) to describe individualized learning. This term seems to be extensively used (Besley & Sokoloff, 2004; Wilmot, 2006). However, as personalized learning becomes more integrated into practice, Hargreaves (2004) warns educators to be prepared for a changing understanding of the concept.

Teachers and students have access to an online classroom using learning management systems (LMS), which promotes learning procedures. Learning Management Systems (LMS) are used in online classroom settings to support teachers and students in the educational process. With intervening frameworks that encourage online collaborative-groupings, professional training, and an inclusive learning environment for academic success, a standard LMS supports talks and interaction amongst LMS users (Dias & Dinis, 2014; Jung & Huh, 2019; Oakes, 2002).

Academic institutions are switching from conventional face-to-face to online teaching and learning processes as a result of the COVID-19 epidemic. Nevertheless, the Commission on Higher Education (CHED) supports the freedom of institutions to choose which Learning Management (LMS) to implement as a learning platform. However, before starting to spend time establishing which LMS to choose from, consider identifying the current and future needs. Hence, need analysis allows the researcher to streamline her research process and

quickly identify the data, people, hardware, and software requirements for the administration to encourage adopting such. The faculty members and students from the different colleges in the City of Ilagan campus have been adopting different LMS platforms such as google classroom, Edmodo, Schoology, and others before the Covid-19 pandemic. This led the faculty and students to easily adopt other learning platforms. The only apprehension now is what would be the official LMS to establish on the campus that best suits the faculty, staff, students, and the present ICT structure of the campus. The study helps determine if the campus is ready to adopt an open-source LMS that enhances the abilities of the faculty, staff, and students in the online learning environment. The need analysis on establishing a customized LMS of ISU-Ilagan aims to identify the specific needs to comply with CHED, IATF, DOH, and other agencies implementing health and safety protocols to mitigate the spread of COVID-19. The customized LMS will serve as a tool in flexible teaching-learning modality thereby a way of monitoring faculty and students online. Table 1 shows the related studies conducted in relation to the use of Moodle (Modular Object-Oriented Dynamic Learning Environment)-based online learning platform of the different public and private universities around the world starting from the year 2005 to 2021.

Table 1. List of Synthesized Literature and Studies Related to ~~on~~ the use of Moodle-based Learning Management system

Year	School and Place	Type	Gist
2005	Granada University, Spain	Public	Moodle and Ilias were the two open-source MLS studied and evaluated and compared **their** advantages and disadvantages. The Moodle was used from 75 countries while Ilias **was** used from 18 countries (Itmazi, J, et.al, 2005).
2011	Univ of Bucharest, Romania	Public	Moodle was recommended for implementation in Romanian's programs because of some benefits such as different types of assignments, chats, forums, databases, glossaries, lessons, multiple types of tests with one or more items, quizzes, wikis, surveys and the SCORM/AICC module (Paragina F., et.al, 2011).
2012	University of Aveiro (UA), Portugal	Public	The students appreciate the utilization of other functionalities of Moodle to further support the success of the online teaching and learning process Moodle was also used as a repository of their learning materials (Costa, C., et.al, 2012).
	Universiti Teknologi, Malaysia	Public	The study compared Caroline with other free open- source LMS like Moodle. Using open-source LMS as a medium for e-learning will save them on the cost but without the loss of quality (Awang, N. & Darus, M. ,2012).
	State University of Campinas, Brazil	Public	Developed a virtual learning environment based on Moodle platform for a pilot course offered by the Faculty of Education (Garbin, M., et.al, 2012).
2013	University of the Philippines Open University Los Banos, Laguna, Philippines	Public	UPOU used the free open-source learning management which is the MOODLE. (Secreto, P. ,2013).
	University of Aveiro, Aveiro, Portugal	Public	Moodle was used to encourage students' participation using its forum functionality (Martinho, M., et.al ,2014).

	College of Nursing, Sultan Qaboos University, Oman	Public	Nursing students at Sultan Qaboos University, College of Nursing as respondents on how they successfully promote Self-Directed Learning using Moodle E-learning platform (Amandu, G., et.al, 2013).
2014	University of Ploiesti, Romania	Public	Moodle and Sakai open-source LMSs are still present and used in the highest number of Higher Education Organizations from the USA aside from proprietary LMSs, Blackboard, Canvas and Desire2Learn Dobre, I. ,2015).
	Near East University, Cyprus	Private	The top two choices of faculty in terms of LMS after comparing the six (6 - ATutor, Claroline, Dokeos, Ilias, Moodle, and Sakai) LMSs in terms of communication tools with user-friendly interface were Moodle and ATutor (Cavus, N. ,2015).
2015	Politehnica University Timisoara, Romania	Public	Students were trained on LMS using Moodle (Gogan, et.al, 2015).
2016	Near East University, Cyprus	Private	Moodle was used in their remote flipped learning so they do not loose connection or face a slow stream when watching educational videos Caliskan, S., & Bicen, H. ,2016).
2017	University of Applied Sciences, Finland	Public	The lecturers implemented 12 features for creating activities and six features for adding resources from Moodle learning management system (Kc, D., 2017).
	1. Polytechnic Institute of Leiria, Portugal 2. University Institute of Lisbon, Portugal 3. Universidad de las Fuerzas Armadas ESPE, Ecuador 4. Universidad de las Palmas de Gran Canaria, Espania	Public	Moodle LMS has a plugin that can analyze forums which provides useful information to teachers that allows them to decide to improve and promote engaging teaching and learning (Muñoz, A., et.al, 2017).
	Kyoto University, Japan	Public	Moodle provides an adaptive online course for learners through the use of the SCORM Adaptive Quiz plugin (Dobashi, K., 2017).
2018	Manipal Institute of Technology, Manipal Academy of Higher Education (MAHE), Karnataka, India	Private	A Felder-Silverman Learning Style Model (FSLSM) developed using Moodle was used to identify the learning styles of learners (Kolekar, et.al , 2018).
2019	School of engineering, RMIT University, Australia	Public	One of the most used commercial and open-source LMSs packages were Moodle, **Blackboard,** Canvas and D2D (Aldiab, A. et.al ,2019)
	University of Colombo School of Computing, Sri Lanka University of Moratuwa, Sri Lanka	Public	The mobile app and PBL plugin of Moodle was implemented to ease the uploading and delivery of PBL lesson plans in engineering education (Peramunugamage, A. et.al, 2019).
2020	1. Université de Paris	Public	The students' satisfaction and

	2. Université Paris Descartes 3. Paris Descartes University 4. AP–HP, Hôtel-Dieu and Paris Descartes University 5. Université Paris Descartes - France		attendance were improved using Moodle for blended learning **in the** Infectious Diseases and Microbiology course (Lebeaux, D., et.al., 2021).
2021	University of Jordan, Jordan	Public	Most of the students in the university used the Moodle system to get course materials and information. During the Covid19 pandemic lockdown, students spent more time learning online than traditional**ly** (Maqableh, M., & Alia, M., 2021).
	Universidad Peruana Cayetano Heredia, Lima, Peru	Private	Clinical courses were learned through recorded lectures uploaded using Moodle-based LMS (Orellano, C., & Carcamo, C. ,2021).
	1. Cambridge University Hospitals NHS Trust, United Kingdom 2. Aarhus University Hospital, Denmark 3. European Society of Radiotherapy and Oncology (ESTRO), Brussels, Belgium 4. Institute of Oncology, Ljubljana, Slovenia 5. University Medical Centre, Utrecht, the Netherlands 6. McGill University Health Center, Montreal, Canada 7. Tata Memorial Hospital, Mumbai, India 8. Medical University of Vienna, Austria 9. Erasmus MC Cancer Institute, Rotterdam, the Netherlands	Public	All course content has been hosted on a Moodle open-source learning management system. The satisfaction and engagement of participant**s** with online course**s** remained high despite less contact time with faculty (Tan, L, et.al, 2021).
	1. Federal University of Espírito Santo, Vit´oria, Brazil 2. Institute of Medical Education, University Hospital, Ludwig Maximilian University of Munich, Munich, Germany 3. Department of Collective Health, Federal University of Paran´a, Curitiba, Brazil 4. Department of Health Sciences, Catholic University of Mozambique, Beira, Mozambique 5. MSc Program in Healthcare Management, Kolegji AAB, Pristine, Kosovo 6. Department of Sports and Health Sciences, Technical University of Munich, Munich, Germany	Public and Private	Moodle was used to create a platform to enable collaborative learning in One Health: The Joint Initiative for Teaching and Learning on Global Health Challenges and One Health experience (Vicente, C., 2021).
	1. Universidad Francisco de Vitoria (UFV), Madrid, Spain 2. Instituto de Nanociencia y Materiales de Aragón (INMA), CSIC-Universidad de Zaragoza, 50009 Zaragoza, Spain 3. Department of Chemical and Environmental Engineering Universidad de, 50018 Zaragoza, Spain	Private and Public	The university uses Moodle in teaching during emergency remote teaching (Ripoll, V., Godino-Ojer, M., & Calzada, J. ,2021).

Based on the table, over the last decade, many institutions have been implementing a Moodle-based LMS. There were many studies conducted as to their experiences on Moodle from the teacher's and learners' points of view. The type of institutions shows that majority were public universities around the world that were using Moodle-based LMS. As gleaned from the table, almost all the continents in the world have country that implemented Moodle-based LMSs. These continents were Europe, Asia, South America, North America, Australia, and Africa. The most numbered countries that utilize open-source free software LMS were Asia and Europe. Many learning management systems were developed and implemented using Moodle because of the many functionalities and plug-ins such as creating multiple types of assignments/quizzes, creating and uploading resources and others. According to the study conducted, their Moodle-based LMS promotes engaging teaching and learning process, increases students' participation in the discussion via chats and forums and presents a user-friendly environment.

METHODS

The study utilized the meta-synthesis and descriptive type of research which enables the researcher to present the information on the need assessment in implementing TelEducation LMS, a Moodle-based Learning Management System in the campus as a tool in teaching and learning modality in the new normal caused by Covid19 pandemic. A total of 33 respondents which is composed of 4 Directors, 4 Deans, 11 Program Chairs, 4 College Secretaries, 10 IT experts participated in the initial evaluation. The reliability of the evaluation results was taken into consideration in choosing the respondents to answer if the TelEducation conforms with the university policies on flexible teaching-learning modality. The criteria for the evaluation **were** adopted from Surjono (2014) in his study Adaptive E-Learning Systems. Moreover, the researcher conducted **a** review of previous studies conducted related to the study. Synthesize the related studies **with** regard to their concepts, interpretation, summary, and conclusion. The researcher systematically synthesizes **the** body of knowledge on open source LMS that is suited for the campus considering its present ICT infrastructure, manpower - faculty, staff and students' skills, and financial capabilities.

RESULTS AND DISCUSSIONS

A. The Tel Education Learning Management System

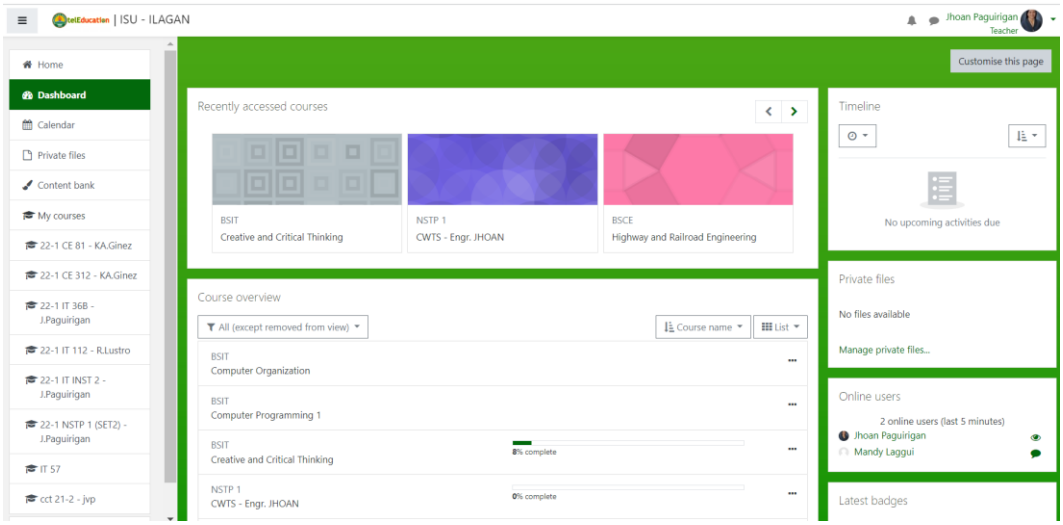

Figure 1. The Tel Education Learning Management System

The Isabela State University (ISU) – City of Ilagan campus is a public institution and one of the nine campuses of the university system. The campus conceptualized and customized a Moodle-based LMS called TelEducation LMS as a tool for flexible teaching and learning modality in the new normal. The TelEducation learning management system is a customized learning management system using Moodle. Moodle is one of the most popular LMSs used because it is open-source software, free, highly customizable, user-friendly interface, provides cohort management, integrates collaborative communication tools, notifications for both students and faculty, easy uploading and downloading of lecture notes, and provides teachers and students' track progress. The TelEducation LMS comes with an android mobile application since many students are android users which enables them to learn anytime and anywhere using their cellular phones.

To provide quick and responsive access both locally and online, the LMS was installed on a Linux server that is locally hosted on the campus and connected to the school domain name. Only authenticated users can access the LMS, and security policies were inherited by the server's security settings utilizing a local network firewall. The campus uses its uninterruptible power supply (UPS) for at least two hours in the event of a power outage while

putting up a backup power supply. In case of hard disk failure, the telEducation LMS is replicated in real-time on a different hard drive.

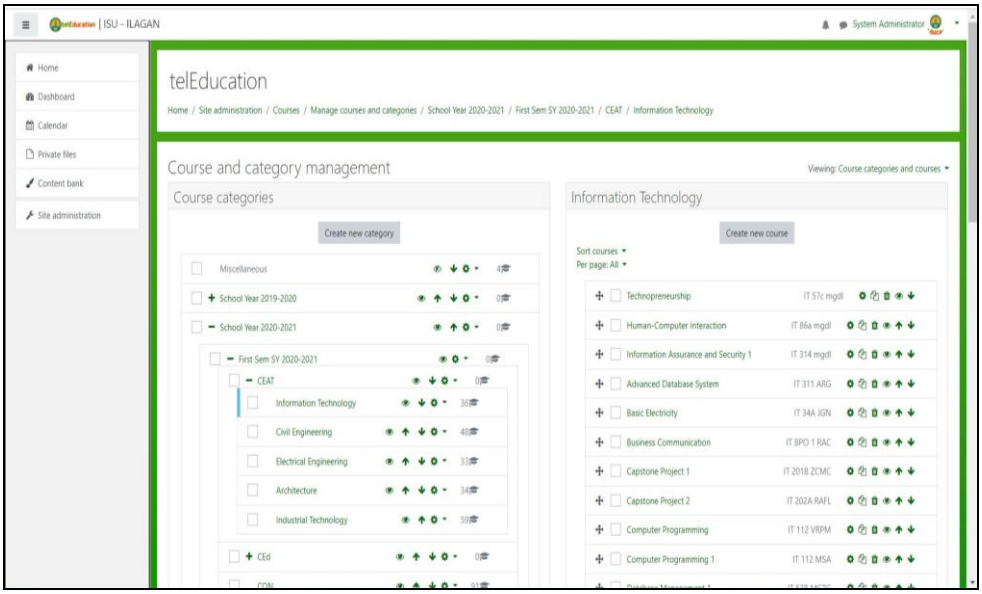

Figure 2. Tel Education Course Creator's Page

The module for managing courses and categories is also presented. This section includes details about the academic year, the semester, the colleges, the departments and programs, and the courses offered. Using this module's hide/unhide functionality, users can prevent courses from being seen by students when the current semester has already concluded.

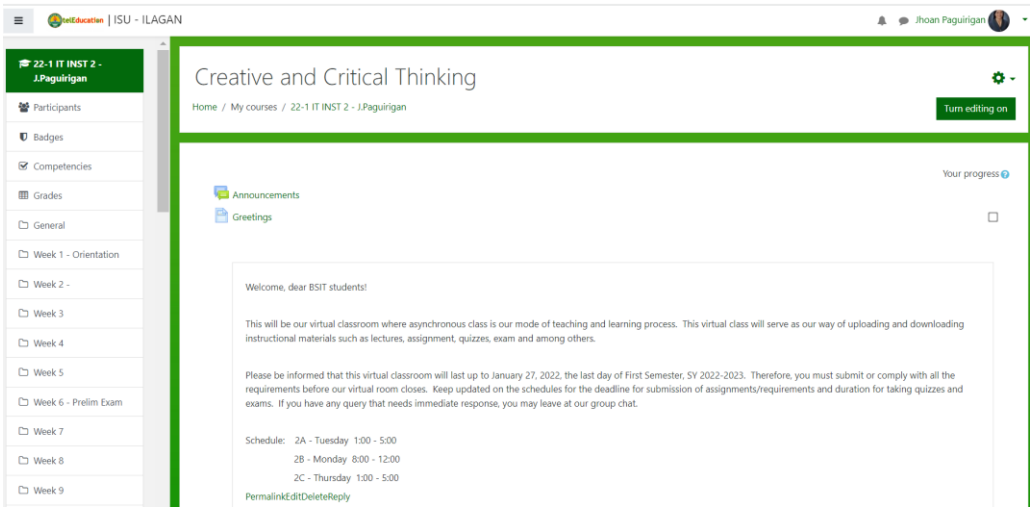

Figure 3. Teacher's Course Page

Teachers can manage their learning resources on the teacher's course website, which is depicted in figure 3 above, which serves as a virtual classroom for them. Only the current courses that each teacher has been assigned to can be accessed in telEducation. Through cohort sync, which was previously uploaded by the course makers, their students were automatically registered in their course once it was created. All they need to do now is upload the resources and activities they want their students to complete. According to university policy, classes shall be held synchronously or asynchronously every week as indicated in the curriculum and course handbook. Due to this, the teacher's course page is separated into 18 weeks using the semester/start term's and end dates. For monitoring purposes, a student's weekly accomplishments based on the assignments/quizzes are regarded as his or her participation or attendance.

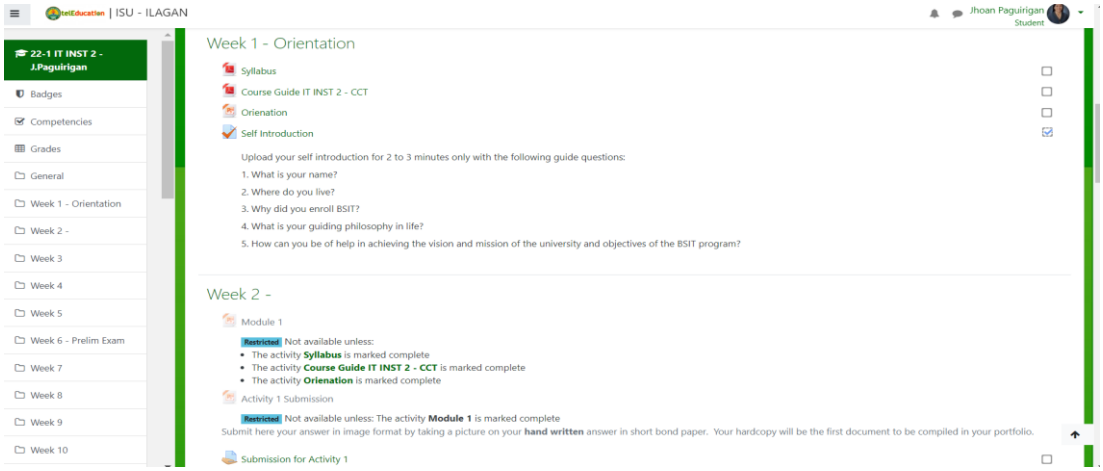

Figure 4. Student's course page.

The student's course website, as illustrated in figure 4, will serve as their learning environment, where they can connect and colaborate with their teacher and classmates. The telEducation LMS is only accessible to students who are currently enrolled within the semester and dsiplay their enrolled courses/subjects . While returning students simply log in to their accounts, new students will receive information on how to activate their accounts. Synchronous classes can be held using embedded plugins like Skype, Zoom, Google Meet, or BigblueButton. Asynchronous classrooms, on the other hand, let students download modules that the teacher has posted for self-paced learning even without an internet connection. You can complete the exercises and quizzes according to predetermined deadlines. For users to engage in interactive virtual learning, several telEducation elements, including notifications, messaging, a calendar, and a dashboard, were also included.

B. Assessment of the resources in the establishment of Moodle-based LMS

Qualitative Assessment

Learning resources

The learning resources were designed, created, uploaded, and managed by the faculty. These learning resources were not limited to lectures notes, these also include activities, assignments, quiz, and other learning activities. Each subject taught by the faculty was supported with Instructional Material (IM). The IMs contain a syllabus, course guide, compilation of lectures or activities for a semester. These learning resources were constantly updated by the faculty each time he/she teaches the subject. All faculty are required to produce IMs for each of their subject/course and therefore the learning resources for the establishment of LMS is readily available.

Human resources

The human resources include students, faculty, staff and administration of the institution. The Human resource that will mean the establishment of Tel Education LMS was under the Office on the Academic Related Affairs (ARA) Director. The office is in charge on the supervision and maintenance of the LMS in support of the Office of the Management Information System (MIS) Director. The designated official from the two offices, facilitate the technical support during the implementation of the LMS. The faculty could use the customized LMS since most of them were all computer literate, were already using other LMS such as Edmodo, Google Classroom, Schoology, and attending training related to the use of Tel education LMS. Likewise, students were considered "generation z" that means they are tech savvy and computer literate. ICT resources. The campus has readily available ICT infrastructure for the hardware and software requirements in implementing a Moodle-based Tel Education LMS. The campus has existing servers, web hosting, and network infrastructure as well as a high-speed Internet subscription to host the said LMS.

System Requirements

Table 2. System Requirements

System Hardware	Minimum Requirement	Recommended	ISU Existing ICT Resources
Storage	5 GB	plus, as much as you need to store content	1 TB
Processor	1 GHz Dual Core	2 GHz dual core	2.4 GHz 12 core
Memory	512 MB	1 GB	32 GB
Domain name	n/a	n/a	isu-ilagan.edu.ph
Internet	5 Mbps	10 Mbs	200 Mbps

Subscription			

Based on the table, ISU-Ilagan has exceeded the minimum and recommended requirement for Moodle-based LMS.

Financial Resources

Being a public state university, the first thing to consider in implementing any undertaking is its financial capability. Aside from Moodle is a free open-source software, it means there is no financial aspect involve as to the software acquisition, another thing is that Moodle is highly customizable, it means anyone knowledgeable in customizing the software can do it. Since our Academic and Related Affairs Director who manage the LMS is an Information Technology expert, he was able to customize the Moodle LMS according to the need of the university and to the faculty and students' level of computer literacy.

Quantitative Assessment

The Tel Education LMS was evaluated by the participants. This section also presents the result of the evaluation conducted on the adaptability of the LMS in terms of perceived ease-of-use using the modified criteria used by Surjono (2014).

Table 3. Result of Evaluation in Terms of Ease-of-Use

Item	Perceived ease-of-use	Number of Response	
		Yes	No
1	Teacher can set an adaptive course format.	33	0
2	Teacher can create multi learning resources in accordance with their respective learning modality. (e.g. video, page, file)	33	0
3	Teacher can compose questionnaire and its setting.	33	0
4	Teacher can make multiple activities or assessments in accordance with their respective learning modality. (e.g. assignments and quizzes)	30	3
5	Teacher can change the setting of student's learning mode.	33	0
6	Teacher can change the setting of learning materials, assignments, quizzes to any other learning mode.	29	4
7	Student can only see the learning materials in courses they are enrolled.	33	0
8	Student can only see activities/assessments in accordance with his/her learning modality.	33	0
9	Student obtains immediate feedbacks from activities/quizzes.	33	0
10	Student can see his/her learning progress.	33	0
11	Student can see recent and upcoming activities in the calendar in accordance with his/her learning styles.	33	0

Table 3 shows the evaluation of the respondents on TelEducation LMS based on the modified criteria in terms of perceived ease-of-use developed by Surjono (2014). Results of the evaluation show that the teachers can easily perform course configuration such as course formatting, creating multiple learning resources and composing varied assessments in accordance with flexible teaching-learning modality as evidence that unanimously the respondents agreed that items 1, 2, 3, 5, 7, 8, 9, 10, and 11 are performed well. It is also revealed that students can also easily access the enrolled courses and see their modules and quizzes. The TelEducation LMS provides immediate feedback right after taking the activities/quizzes. Students can easily determine his/her learning progress and view recent and upcoming activities by simply clicking the dashboard from the TelEducation menu. However, a need for a much longer time for practice in using the TelEducation LMS so that teachers and students eventually adopt the new learning environment specifically on creating assignment and quizzes using varied type of questions and setting up restriction for accessing learning materials in accordance to student's learning mode. In addition, the teacher is able to export exam, learning modules, quizzes and activities from previous semesters in the same course. The Teacher is able to download grade sheet for each class in excel format. Moreover, the LMS provides item analysis and class' score graph for each exam or quiz. Nevertheless, students can monitor his/her own progress in all his/her own courses, notify for his/her submissions and deadlines. However, 30 out of 33 or 91% agreed the multiple activities or assessment is in

accordance with their respective learning modality (item 4) and 29 out of 33 or 88% agreed that the teacher can change the setting of learning materials, assignments, quizzes to any other learning mode (item 6). These items of ease-of-use are still remained to be a challenge for most teachers since these involves creativity and resourcefulness of being a teacher. It is then then suggested for teachers to keep abreast with the current trends in teaching strategies for diverse learners in the new normal.

CONCLUSIONS AND RECOMMENDATIONS

Based on the foregoing discussion and synthesized related studies, the need assessment in establishing a tool in flexible teaching and learning modality in the new normal was evaluated to be ready in implementing Moodle-based Tel Education LMS for ISU-City of Ilagan campus. Moodle was a choice since it is free, and it is widely used among public and private universities around the world. The study found that the top management will be able to help them make sound decision to establish a customized Moodle-based open source LMS to keep abreast with the challenges of the Covid19 pandemic as regard to the delivering of quality education online. The faculty and students will have a platform for them to conduct flexible teaching and learning process in the new normal. In order to sustain the establishment of Tel Education LMS, a continuous support as to the maintenance and upgrade of the ICT resources is highly recommended. Likewise, regular training shall be conducted to new and old faculty members and students as needed. An additional technical support staff that is solely assigned to support the implementation of the LMS. Further study on the effectiveness of the Tel Education LMS on the part of the faculty, students and other stakeholders can be conducted. Faculty members may also conduct a study on the effectiveness of the course materials or IM uploaded in the Tel Education.

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