Design and Evaluation of Moodle-based Instructional Module in a Professional Education Course

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Abstract. One of the most notable advancements in e-learning is the Learning Management System, which has aided the continuity of the teaching-learning process during the pandemic. The study aims to design and evaluate an instructional module for the professional education subject of the revised tertiary education curricula. This study employed mixed-method design. The Moodle-based instructional module was developed for Building *and Enhancing New Literacies Across the Curriculum* (BENLAC), a professional education course for pre-service teachers in the implemented tertiary education curriculum aligned to the K-to-12 curriculum of Basic Education. Experts in content, design/format, technical/technological, and pedagogical aspects evaluated the instructional module. Two hundred sixty-one pre-service teachers utilized the BENLAC instructional module in a semester during the COVID-19 pandemic. The results showed that the evaluation of the developed Moodle-based instructional module by experts in content, design/format, technical/technological, and pedagogical aspects was "very good". It can be concluded from the results that the designed and evaluated instructional module was relevant for use given the shift in modality during the COVID-19 pandemic.

Keywords: Instructional module design and evaluation, Moodle-based instructional module, professional education course, Virtual Learning Portal.

1 Introduction

The emergence of the COVID-19 pandemic has had an unprecedented impact on education systems worldwide, necessitating a dramatic shift in teaching and learning processes. One notable change has been the forced adoption of distance learning to ensure the continuity of education without compromising the health and safety of teachers and students. Amidst the rapid technological advancements during the pandemic, many universities have transitioned from traditional modes of education to e-learning [1]. However, implementing e-learning has presented benefits and challenges for educational institutions. Okagbue et al. highlight several issues of concern during the pandemic, such as the lack of online learning applications for synchronous classes, financial constraints or poverty, problems with internet connectivity, low digital literacy, and a shortage of ICT teaching and learning devices

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[2]. Along with these challenges, the pandemic has prompted the educational system to explore new methods of delivering learning content to students [3].

E-learning, which integrates and utilizes Information and Communication Technology (ICT) in delivering learning content and supporting distance education [4], has been a part of the educational system. However, it was fully utilized during the pandemic due to constraints on physical classes [5]. Video teleconferencing tools and learning management systems, such as Microsoft Teams, Zoom, and Google Classroom, have become alternatives for Higher Education Institutions (HEIs), providing more significant opportunities to enhance teaching and learning [1]. E-learning has been defined as various applications and processes available through electronic media and resources to deliver education and training [6]. Additionally, e-learning can offer training and higher education opportunities to students from diverse educational levels and cultural backgrounds [7]. As e-learning has transformed education, many institutions and educators are encouraged to adopt and embrace Internet-based learning resources to provide high-quality teaching and learning.

It reveals in the study by Bani Hani et al. [8] that Zoom and Skype were the most widely used platforms for e-learning. Similarly, as stated by Gunawan [9], the Zoom application can be used by the students on different mobile devices, PCs and laptops for them to be involved in the process of learning in any place. Several studies indicate that Zoom has been a good video teleconferencing app during the COVID-19 pandemic and is widely integrated into Learning Management Systems (LMS). The LMS becomes one of the most notable e-learning tools during the pandemic as technological advancements continue. LMS is defined by Lonn, Teasley, and Krumm [10] as a web-based technology that allows teachers and students to share learning materials and synchronous or asynchronous online interactions. Integrating multiple media formats, various resources, alternative technologies, and an organized presentation of information that facilitates learning [11] is what characterizes LMS. A high-quality LMS could be a vital tool for successful online course delivery, featuring course management, assessment, progress tracking, gradebook, communication tools, social connectivity, security and privacy, and ubiquitous access [12].

Oliveira, Cunha, and Nakayama [11] asserted that the advancements in e-learning have compelled educational institutions to adopt different learning activities, develop new processes, and seek solutions for emerging educational challenges and issues. They further stated that integrating Learning Management Systems (LMS) and e-learning management could enhance the planning, organization, management, control, and improvement of e-learning processes. In response to the continuous development of LMS during the pandemic, the Central Bicol State University of Agriculture (CBSUA) introduced the Virtual Learning Portal (VLP) through Modular Object-Oriented Dynamic Learning Environment (MOODLE) as an innovative solution to facilitate the continuation of the teaching-learning process [13]. Homillano defined VLP as a smart LMS alternative for delivering customized and relevant content that leverages various pedagogical models and engages students [13]. As an online LMS, MOODLE offers numerous advantages over traditional learning methods, potentially improving communication between students and between students and teachers [14]. According

to Maryati et al. [15], MOODLE-based LMS is one of the popular learning technologies utilized during the pandemic.

Virtual Learning Portal (VLP) is primarily utilized to deliver lecture resources and content. The faculty members at CBSUA developed instructional modules based on the MOODLE platform for various academic disciplines. During the pandemic, these instructional modules have become the most used educational materials for delivering learning content across all levels, from laboratory high school to college. The shift towards e-learning has further facilitated the development of self-instructional modules, enabling teachers to explore and enhance their teaching approaches and strategies. Dechavez states that self-instructional modules empower learners to progress at their own pace, anytime and anywhere [16]. Recognizing the abrupt transition to e-learning, CBSUA took the opportunity to develop instructional modules across various fields through the VLP to facilitate the overall teaching and learning process.

In response to the rigorous revisions made to the Philippine Basic Education Curriculum, the Commission on Higher Education (CHED) has aligned the Higher Education curriculum with the K-to-12 curricula by implementing new Policies, Standards, and Guidelines for various undergraduate and graduate degree programs. The Higher Education curriculum necessitates exploring new literacies, concepts, strategies, challenges, and impacts of the 21st century to address current educational trends. Developing a Moodle-based instructional module for the Building and Enhancing New Literacies Across the Curriculum (BENLAC) course is crucial for equipping pre-service teachers with new literacies and 21st-century skills necessary to become effective educators in the future. De Leon defined 21st-century skills as comprehensive knowledge, abilities, work habits, and personal attributes required to navigate the contemporary world and future careers [17]. Concurrent with these emerging trends, the 21st-century curriculum emphasizes seven new literacies: multicultural literacy, social literacy, media literacy, financial literacy, digital literacy, ecological literacy, and creative literacy. This study aims to design and evaluate an instructional module for the professional education subject of the revised tertiary education curricula, thereby guiding pre-service and in-service teachers to acquire 21st-century literacies and skills. This study is urging to improve the quality of professional education in HEIs through the use of Moodle based instructional modules to provide accessible and effective learning in changing educational environments, especially in the current Philippine educational settings. The result of the study contributes to emerging pedagogical strategies with technology to create enriched learning experiences

2 Methodology

2.1 Research Method

The study utilized a mixed-methods approach in designing and evaluating an instructional module delivered through the Moodle platform for a particular

professional education course. Qualitative data were gathered through document analysis relative to the creation of the instructional module. A descriptive survey was employed for the quantitative component to evaluate the Moodle-based modules as to content, design/format, technical/technological aspects, and pedagogical dimensions. The evaluation of these online learning modules was established based on expert assessment using an evaluation tool modified by the researchers, adapted initially from Basilio & Sigua [17]. To evaluate the Moodle-based instructional modules, a descriptive analysis was conducted based on responses from experts to a Likert-style survey questionnaire. Data analysis was performed using IBM SPSS Statistics 21, employing statistical techniques such as weighted mean and standard deviation.

2.2 Instructional Module Evaluators

Five experts based on their relevant qualifications and expertise across key areas of module design evaluated the instructional module. These areas included content, format, design, technical/technological factors, and pedagogical considerations. The expert panel had diverse professional backgrounds to provide a comprehensive assessment. It comprised a curriculum development specialist serving as a Curriculum Director, a Dean from the College of Education, two faculty members specializing in teaching Professional Education courses, a distinguished professor in Instructional Materials Development, and a professor well-versed in information and communications technology (ICT). These evaluators held doctoral degrees (Ph.D. or Ed.D.) in Development Studies, Development Education, Educational Foundations, Human Development and Management, and Educational Leadership and Management respectively.

2.3 Phases of Moodle-based Instructional Module

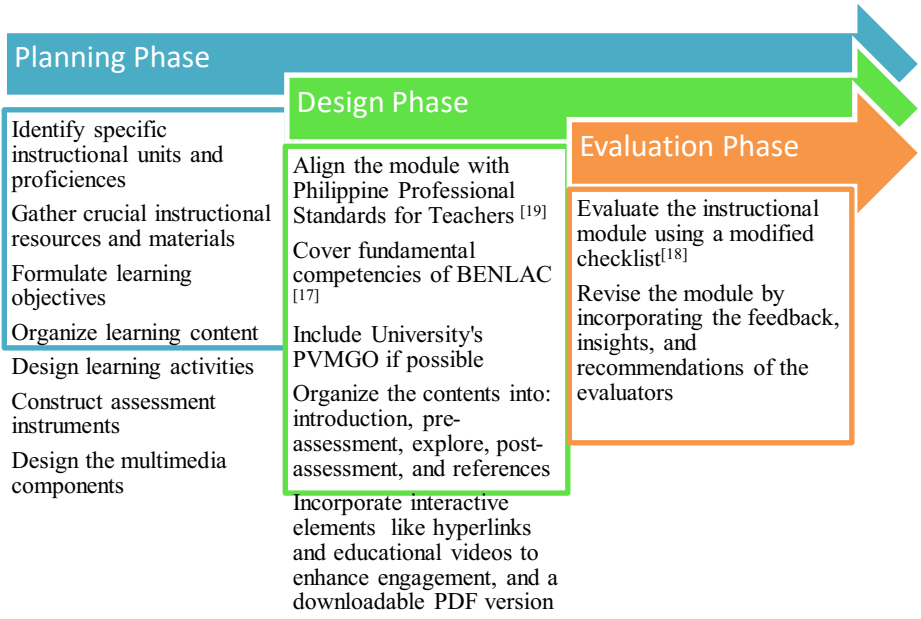


Fig. 1. Phases of Moodle-based Instructional Module

The instructional module utilized a modified checklist, adopted from a study by Basilio and Sigua [18] which contains 36 items on a 5-point Likert scale ranging from strongly disagree (1) to strongly agree (5) (Table 1).

Table 1. Scale and Verbal Interpretation of the 5-point Likert Scale

Scale	Likert-Scale Interval	Interpretation
1	1.00 – 1.80	Poor
2	1.81 – 2.60	Fair
3	2.61 – 3.40	Neutral
4	3.41 – 4.20	Good
5	4.21 – 5.00	Very Good

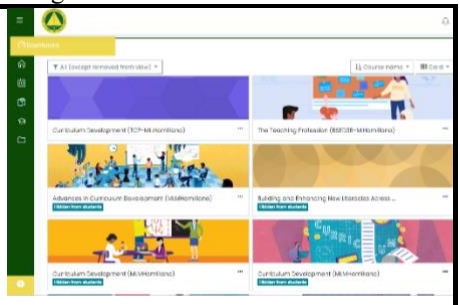
3 Results and Discussion

3.1 Design of the Moodle-based Instructional Module

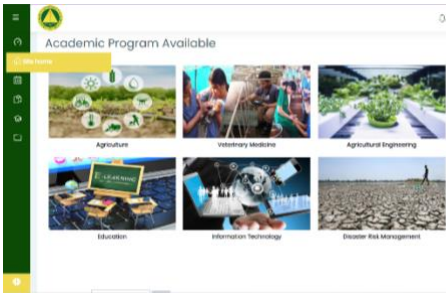
The implementation of a Moodle-based learning system involves various components like attendance tracking, synchronous activities using video conferencing tools,

asynchronous activities facilitated by third-party applications, assignment creation and submission, and the uploading and linking of instructional materials such as PDFs, PowerPoint presentations, documents, videos, and more [20]. In response to the challenges posed by the COVID-19 pandemic, the Central Bicol State University of Agriculture (CBSUA) developed the Virtual Learning Portal (VLP), a Moodle-based Learning Management System (LMS) designed to ensure the delivery of quality education in an online format. The VLP was developed to maintain the continuity of online teaching and learning experiences during the pandemic. The Moodle-based learning portal comprises several key pages, including a login page, a dashboard page, a site home page, a course section page, a course content page, a discussion board page, and an assessment page (Figure 2). Instructional modules and their associated content and materials were regularly uploaded according to the subject's schedule. A wide range of learning resources and materials, such as lecture videos, PowerPoint slides, PDFs, and more, were made available to students through the VLP.

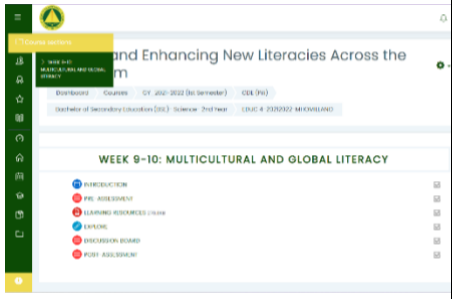
Login Page



Dashboard Page



Site Home Page



Course Section Page

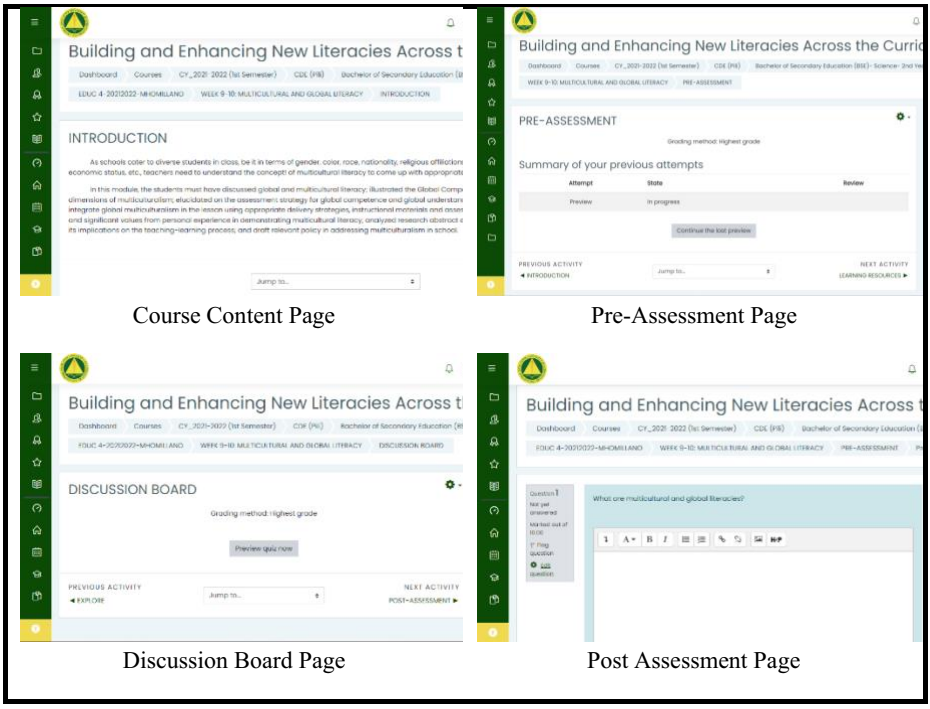


Fig. 2. CBSUA Virtual Learning Portal Workflow

3.2 Evaluation of Experts on the Moodle-based Instructional Module

The study focused on developing Moodle-based learning modules as an alternative solution for Higher Education Institutions during the COVID-19 pandemic's peak when online education was widely used. Experts in content, design/format, technology, and pedagogy evaluated the modules. Second-year college students studying professional education courses utilized these modules through the Virtual Learning Portal for 18 weeks, with 15 weeks dedicated to formative assessments and three weeks for summative assessments.

Table 2 shows the content validation of the Moodle-based instructional module received a "very good" rating with a mean score of 4.6. The design and format validation also achieved a "very good" rating with a mean score of 4.63. The technical/technological aspect obtained a "very good" rating with a weighted mean of 4.73, and the pedagogical parameter received a "very good" rating with a weighted mean of 4.57.

Table 2. Evaluation of Experts on the Content of the Moodle-based Instructional Module

Indicators	Mean	SD	Interpretation
CONTENT			
"The topic/lessons included in the module are very relevant to the main goal of the course and greatly contribute to the achievement of the specific lesson objectives."	4.67	0.52	Very Good
"The module provides information that are very important and useful to the students who will be utilizing it."	4.83	0.41	Very Good
"Adequate information is provided in every lesson with links and references to guide students for further research activities."	4.5	0.84	Very Good
"The content is presented clearly using language that is understandable and suited to the level of the target learners."	4.5	0.84	Very Good
"The knowledge and ideas presented in every lesson are accurate, recent, and free from errors using terminologies that suit the distinct characteristics of the target learners."	4.5	0.55	Very Good
Weighted Mean	4.6		Very Good

Content of the Module. The evaluation of the content indicates that the module effectively organizes topics, allowing pre-service teachers to grasp the learning materials with ease. The instructional module encompasses essential, practical, and relevant information presented in a clear, precise, and error-free manner, as evaluated by experts. This means that the designed instructional module offers a wide array of activities designed to assist pre-service teachers in comprehending the subject BENLAC. This is consistent with the study of Sirisuthi and Chantarasombat [21] that learning content should encourage innovative knowledge and stimulate creativity during the learning process. The module is still a versatile tool in delivering important competencies, especially for students who may have missed certain topics due to the challenges they faced in their classes [22].

Table 3. Evaluation of Experts on **DESIGN/FORMAT** of the Moodle-based Instructional Module

DESIGN/FORMAT			
"Textual information is clearly presented with appropriate choice of font size and style, including other formatting features (e.g., italics, boldface, underline, etc.)."	4.67	0.52	Very Good
"Proper spacing, margin, and indentation are observed between texts, sentences, and paragraphs to avoid congested pages."	4.5	0.55	Very Good
"The module utilized graphics and other media elements to motivate and engage students in the topics presented."	4.5	0.84	Very Good

"The important parts of the module are properly labeled for easy recognition (e.g., main topics, subtopics, specific discussions, etc.)."	4.83	0.41	Very Good
"Each section of the module has clear instructions for students to follow, and it is appropriately packaged and ordered such that each component complements the others."	4.67	0.52	Very Good
Weighted Mean	4.63		Very Good

Design/Format of the Module. The module's design and formatting elements are comprehensive wherein it includes a logical order of instruction and activities, appropriate font size and style, adequate spacing, effective use of graphics and other multimedia components, clear labeling of sections. Cruz and Rivera [23] posit that a well-designed learning module is crucial in facilitating teaching and learning processes. Similarly, the study by Lau et al. [24] emphasizes that incorporating engaging visuals, captivating designs, illustrations, and color schemes can enhance the attractiveness of learning materials, making them more appealing to students. In developing an instructional module, it is imperative to employ features that foster meaningful learning experiences for learners. Using thoughtfully designed instructional modules can potentially enhance students' comprehension and knowledge acquisition in a particular subject area [25].

Table 4. Evaluation of Experts on **TECHNICAL/TECHNOLOGICAL** of the Moodle-based Instructional Module

TECHNICAL/TECHNOLOGICAL			
"Use of the module does not require equipment or applications beyond what is typically available to the students (e.g., operating systems, browsers, application software)."	4.83	0.41	Very Good
"The module can be accessed by students either through the internet (online) or offline by providing an electronic copy (from CD, flash drive, and other modes of transferring files)."	4.83	0.41	Very Good
"The module can be embedded or fully integrated into a Learning Management System (LMS) for wide dissemination and accessibility."	5	0.00	Very Good
"The module has a user-friendly interface and navigational tools that even novice users can easily follow."	4.5	0.55	Very Good
"The module allows students to interact with the teacher and other students through various communication tools such as email, messenger, videoconferencing, etc."	4.5	0.55	Very Good
Weighted Mean	4.73		Very Good

Technical/Technological aspect of the Module. The result shows that the developed module is highly suitable for smooth integration into a LMS, guaranteeing broad accessibility, particularly during the COVID-19 pandemic. Moodle, an LMS

solution, is one of the most popular and best free open source learning system. It provides an accessible solution for educational institutions engaged in e-learning without incurring costs [26]. Incorporating a module into an LMS enables students to access diverse resources, including videos, quizzes, and forum discussions, which are crucial for supporting the learning process [27]. In order for modules to be successfully integrated into an LMS, it is crucial to make sure that the LMS has the tools and capabilities required to support the intended modules in addition to providing a number of fundamental features and specialized tools designed for efficient learning [28].

Table 5. Evaluation of Experts on **PEDAGOGICAL** aspect of the Moodle-based Instructional Module

PEDAGOGICAL			
"Objectives are well-formulated, giving clear direction and establishing a sense of expectancy among students."	5	0	Very Good
"Prior knowledge of students are properly assessed to bridge the gap between what they already know and what they have to know."	4.83	0.41	Very Good
"Various motivational and cognitive strategies are properly embedded in every lesson/unit to keep students on track."	4.33	0.52	Good
Tasks or activities required in the module are very relevant to the main objectives of the course and lessons and must be realistic considering the resources available (e.g., time, materials, equipment, etc.)."	4.5	0.55	Very Good
"The module provides provision for individual differences by supporting diverse learners with different learning styles, preferences, interests, and experiences."	4.17	0.41	Good
"Assessment tools included ensure the development of higher-order thinking skills such as critical and creative thinking."	4.67	0.52	Very Good
"The module also provides a good feedback mechanism so learners can regularly receive formative feedback on learning (i.e., they can track their performance, monitor their improvement, or test their knowledge)."	4.5	0.55	Very Good
Weighted Mean	4.57		Very Good

Pedagogical aspect of the Module. The data highlights the well-designed objectives of the instructional module, which effectively guides learners and creates a sense of anticipation. The integration of the module into a LMS allows e-learning objectives to provide learners with comprehensive explanations, examples, interactive elements, questions, feedback, glossaries, and more, thereby enabling them to become self-reliant in acquiring new concepts and skills [29]. In alignment with these well-structured objectives, the instructional module also incorporates various assessment tools to foster higher-order thinking skills. Moodle offers diverse assessment methods, including essay-style questions, online audio recording, multiple-choice assessments, short-answer questions, matching-type questions, embedded answers, the option to upload

PDF files, and interactive video and audio recording [30]. Kotzer [31] emphasized that the goal of Moodle-based instruction focuses on supporting inquiry and discovery-based approach to online learning. To improve various aspect of LMS, further analysis on the implementation and effectiveness of the material is important for e-learning success [32]. In addition, Taban [33] stated that many scholars have proposed that LMS can be an intervention of technology in the current reforms in education where e-learning approach is needed.

4 Conclusion

The study reported significant findings in preparing pre-service teachers to address the evolving needs of K-to-12 Basic Education in the 21st century. Through a comprehensive data analysis and literature review, the research provided insights into the design and evaluation of Moodle-based instructional modules for professional education course, BENLAC. The findings have substantial implications for future educators in effectively integrating technology, aligning instruction with standards, employing diverse assessment strategies, fostering active learning within communities, and providing ongoing learning opportunities.

The implementation of the Virtual Learning Portal (VLP) during the COVID-19 pandemic represents a significant advancement in enhancing the educational landscape. The VLP streamlined course content delivery and provided an innovative platform for collaboration, assessment, and continuous learning. The VLP was analyzed to show its potential to meet the diverse needs of educators and students in an interactive and engaging educational environment. Despite those challenges, the promising outcomes of the study provide a base for future educational technologies that help facilitate efficient and effective teaching and learning experience.

Additionally, the evaluation of the Moodle based instructional module was found to be a valuable educational tool. Strong evidence of its educational usability was provided by rigorous evaluation by experts in content, design/format, technical/technological, and pedagogical aspects, with an overall 'very good' rating in all parameters. Expert reviewers' positive feedback and constructive suggestions confirmed good applicability and great potential for improving learning experiences. The results helped refine the instructional module and demonstrated that continuing evaluation and improvement in instructional design are crucial. The findings highlighted the importance of well-designed instructional materials to support active and meaningful learning experiences.

Recommendations. Regarding the implementation of the instructional module, the following recommendations are proposed for educational institutions: a) Offering professional development opportunities for faculty and staff to be able to successfully navigate, integrate and assess their developed modules; b) Seeking, and incorporating student feedback constantly to improve the modus operandi of the module in areas of usability and content; c) Updating regularly the module’s content based on new developments and research in the field; d) Assessing the effectivenes of the module on

the achievement of student outcome goals; and e) Clarifying ownership and dealing with module content copyright concerns.

Furthermore, to enhance the effective utilization of LMS in educational environments, the following recommendations are suggested based on the findings and analysis of the developed and implemented Moodle-based instructional module through VLP: a) Accommodate scalable educational landscape changes and growth; b) Support the educators to produce diverse teaching materials; c) Upkeep accessibility standards of the LMS for inclusivity; d) Secure the users information and privacy; e) Community of practice of the teachers to share the best practice, experience and resource to best utilize the LMS for learning and teaching; and f) Regular update and upkeep for technical question, new features engagement and with contemporary educational technology.

Limitations. The study was focused on designing and evaluating instructional modules on professional education courses integrated on the Moodle platform as well as assessing their effectiveness in preparing pre-service teachers with 21st-century competencies. Notwithstanding such limitations, the study makes important contributions to the field of teacher education.

Conflict of Interest. The author declares no conflicts of interest that could influence the study's process, findings, or interpretations.

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