Design of Teleconference-based Learning Management System for a Learning Tool in the Co-19 Pandemic

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***Abstract*— The Co-19 pandemic affects worldwide classical education. It has led to the optimization of E-Learning. Learning Management Systems integrate the learning materials and human resources systems, but cannot provide human interaction in real-time. Teleconferencing platforms allowed communication in real-time, but cannot integrate the learning materials and human resources systems. In order to optimize real-time interaction in the learning management system, a teleconference-oriented learning management system is proposed. The configuration of database and user interface are required to combine the two systems. The Teleconference Platform was also hired as LMS course. In order to determine the experience of the teleconference-oriented LMS, the User Experience Questionnaire (UEQ) of the proposed LMS and the original LMS is tested using T-Test. UEQ is filled out by 85 students. The result show that attractiveness, perspicacity, performance, dependability, and stimulation reached respectively 0,0002; 0,0030; 0,0000; 0,0005; 0,0084; and 0,0297. It can be concluded that there is significant different experience between teleconference in LMS and original LMS.**

Keywords—learning management system, teleconferences platform, education, covid19.

I. INTRODUCTION

The Co-19 pandemic affects to 213 countries around the globe [1]. It encourages the government to reduce interaction among structures of human life, such as classical education [2]. It has led higher education leaders to reassess existing processes and optimize online learning [3]. Moreover, the online education business has achieved higher income since the Co-19 pandemic occurred. [4].

Information and communication technologies (ICTs) developed using Learning Management Systems (LMS) are suitable for universities to overcome social distances [5][6]. LMS is often though as a backbone of e-learning for the integration of learning materials and human resources systems. LMS has achieved a good level of efficiency, ease of use, ease of study and satisfaction [5][7][8]. The student access the course and assign the submission without arranging a schedule with the lecturer [9]. However, it cannot provide human interaction in real-time [10]. The characteristics of the LMS could not overcome courses requiring direct practice and direct exposure [11][12]. Furthermore, the non-real-time system only evaluate the knowledge grades without assess the learning behavior. [13] [14].

LMS research is continuously optimized in order to increase interaction between students and lecturers. Shabalina(2016) provides the interactions feedback that restrict access to modules for students who do not pass the evaluation[15]. Gorsenin (2018) proposed a service rating to increase the level of interactivity of teaching as a digital market [16]. King (2019) combined LMS and virtual reality in order to interact with the enjoyable experience [17]. However, the above-mentioned method does not handle feedback in real time, which means that there is no direct impact on lecturer-student interactions.

Teleconferencing platforms allowed communication in real-time[18]. It is often adapted as a model of virtual learning [19]. Teleconference based lecture have enabled the lecturer assess the physician and psychology face [20]. Besides that, Latour and Collody show that graduate and undergraduates student adapt easily to the teleconferencing platform [21]. However, learning materials and human resources systems are not integrated into this system. The quality of the teleconference also depends on the signal transmission [22] [23].

The study proposed a teleconference-oriented learning management system. The objective of the proposed method is to optimize real-time interaction in the learning management system which is expected to bridge the social distance during the Covid19 pandemic.

II. METHODOLOGY

The phases developed of teleconference-oriented learning management system is as follows: (1) database analysis, (2) architecture design, (3) prototype development, and (4) prototype evaluation.

A. Database Analysis

An analysis of the database is needed to merge the LMS system and the teleconference platform. The proposed method adapted the basic of Moodle database. In addition, the teleconference tables are embedded, which contain the detail of teleconference. Teleconference tables associated to the course_modules table. The proposed database is shown in Fig. 1.

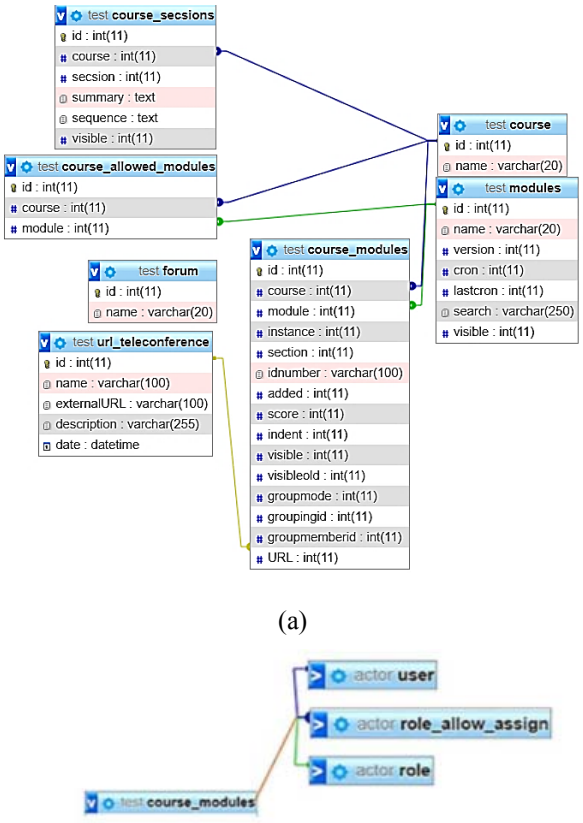

Fig. 1. Database of Teleconference-oriented Learning Management System

The database consists of a collection of course data presented in Fig. 1(a) and a set of human resources data shown in Fig. 1(b). Learning materials are managed using the course_modules table. Course_modules table has relations with other tables, such as: modules, course_sections, and course_allowed_modules table. The modules table contains a list of modules that have been entered by the lecturer. The course_sections table represents a class in a particular subject, while the course list is normalized in a course table Whereas, course_allowed_modules tables contain a combination of courses and associated modules.

User has a particular role in a course, thus there are relationships between tables of user, role_allow_assign, role, and course_modules. There are two role in human resources, namely: student and lecturer. Table of role_allow_assign shows the user who can access the course_module table. A course involves learning resources, such as modules, assignments, or virtual meetings. The flow of this system covered the needs of LMS. However, human resource systems need to be developed with details of users and roles.

B. *Architecture Design*

A basic outline for the proposed system is being developed. Architectural design is one of the important sketches established. the architecture proposed shown in Fig. 2.

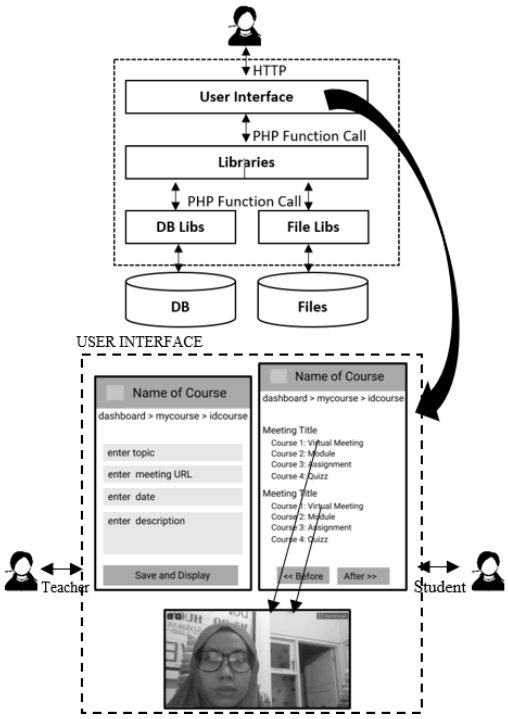

Fig. 2. Architecture of Teleconference-oriented Learning Management System

In Fig.2, the proposed architecture encompasses three layers. User using a web browser that contains both an HTTP language and a user interface. We provide a teleconference input menu on the lecturer account and a teleconference list menu on the student account. Teleconference connections and other learning materials (modules, quizzes and assignments) are provided throughout the student page. Whereas the list of teleconferences can be entered if requested by the lecturer. The PHP function is used to access the database in the form of SQL to compile the teleconference feature. The file is stored in the mood_data file, included recorded file.

C. *Prototype Development*

The aim of this research is to assess user experience on the user interface. While the user interface on the proposed module restricts the device's development. In subsequent studies the connection of the database and the user interface is established.

D. *Prototype Evaluation*

We tested Teleconference-oriented LMS and original LMS the using user experience Questionnaire (UEQ) which is bundled with System Usability Scale (SUS) [24]. The questionnaires were filled by 85 students in electrical engineering at Universitas Negeri Malang. The UEQ matrix are shown in Fig. 3. The UEQ matrix in Fig.3 is divided into six categories, including: Attractiveness, Perspicacity, Performance, Dependability, Stimulation, and Novelty. One-sample-T-test was used in this analysis, which indicates that one group was tested on two separate items. Means in the five groups were determined using Equation (1).

	1	2	3	4	5	6	7		
annoying	O	O	O	O	O	O	O	enjoyable	1
not understandable	O	O	O	O	O	O	O	understandable	2
creative	O	O	O	O	O	O	O	dull	3
easy to learn	O	O	O	O	O	O	O	difficult to learn	4
valuable	O	O	O	O	O	O	O	inferior	5
boring	O	O	O	O	O	O	O	exciting	6
not interesting	O	O	O	O	O	O	O	interesting	7
unpredictable	O	O	O	O	O	O	O	predictable	8
fast	O	O	O	O	O	O	O	slow	9
inventive	O	O	O	O	O	O	O	conventional	10
obstructive	O	O	O	O	O	O	O	supportive	11
good	O	O	O	O	O	O	O	bad	12
complicated	O	O	O	O	O	O	O	easy	13
unlikable	O	O	O	O	O	O	O	pleasing	14
usual	O	O	O	O	O	O	O	leading edge	15
unpleasant	O	O	O	O	O	O	O	pleasant	16
secure	O	O	O	O	O	O	O	not secure	17
motivating	O	O	O	O	O	O	O	demotivating	18
meets expectations	O	O	O	O	O	O	O	does not meet expectations	19
inefficient	O	O	O	O	O	O	O	efficient	20
clear	O	O	O	O	O	O	O	confusing	21
impractical	O	O	O	O	O	O	O	practical	22
organized	O	O	O	O	O	O	O	cluttered	23
attractive	O	O	O	O	O	O	O	unattractive	24
friendly	O	O	O	O	O	O	O	unfriendly	25
conservative	O	O	O	O	O	O	O	innovative	26

Fig. 3. The User Experience Questionnaire [24]

$$t = \frac{\bar{x} - \mu_0}{S/\sqrt{N}}, \quad (1)$$

where x is a questionnaire value filled by respondents that can be seen in Fig. 3. Set the mean of sample $\bar{x}$ value on each assessment component, including: Attractiveness, Perspicacity, Performance, Dependability, Stimulation, and Novelty. t present the t-test value which is calculated using the mean of sample $\bar{x}$ and the mean of comparison μ_0. S indicated standard deviation of the sample, while N indicated the number of samples

The conclusion is obtained by comparing the values of t and α as the threshold. The determination of conclusions is shown in Equation (2).

$$result = \begin{cases} there\ is\ no\ different\ significantly, t \geq \alpha \\ there\ is\ different\ significantly, t < \alpha \end{cases}. \quad (2)$$

Based on Equation (2), if t is more than or equal to threshold α, thus there is no different of two comparison significantly. if t is less than threshold α, thus there is different of two comparison significantly.

III. RESULTS AND DISSCUSSION

The learning management system database was developed. There are three positions in human resources, namely: admin, student and lecturer.

Lecturer access the database using a browser interface. Two menu displays have been improved to combined LMS and teleconference, namely: the meeting input menu and attend meetings menu. Input menu in Fig. 4(b) can be displayed after the lecturer activates the 'Enable Editing' in Fig.4(a). The topic, meeting URL, date, and description will be inserted in the column name, meeting URL, date, and description successively. The id of url_teleconference is not inserted, but it is generated automatically and it linked to the table of course_modules. There are virtual meetings that do not require a password, so if virtual meeting requires a password, it can be filled in the description.

In the meantime, the student attends meeting by enter the meeting link which is shown in Fig. 5(a). Virtual links are combined with other learning resources and categorized each section of the course. If the teleconference finished, the device will be shown in Fig. 5(b). Fig. 5 (b) is also shown when the teleconference has not begun. System was tested using two concurrent classes on both sample classes on Google Meet. The system runs smoothly when the speaker signal is good, but there are interrupted voices when signal is limited, especially on cellular provider. The full version of meeting is recorded in [25], while the recorded sample of can be show in Fig.5(c). It present power point that is not obvious. It indicated that virtual meetings depend on the quality of other component, such as internet signals. The quality of lecturer also influenced the enjoyable virtual classes. The attractiveness related to the perspicacity, which implies penetrating discernment. The clear voice of the lecturer and student environment helps to provide a deeper understanding and insight. It requires good cooperation between lecturers and students. Teleconference proposals can be managed flexibly by lecturers or majors. A decentralized system is expected to be able to warn host loads. The recording attendance might be developed in further studies.

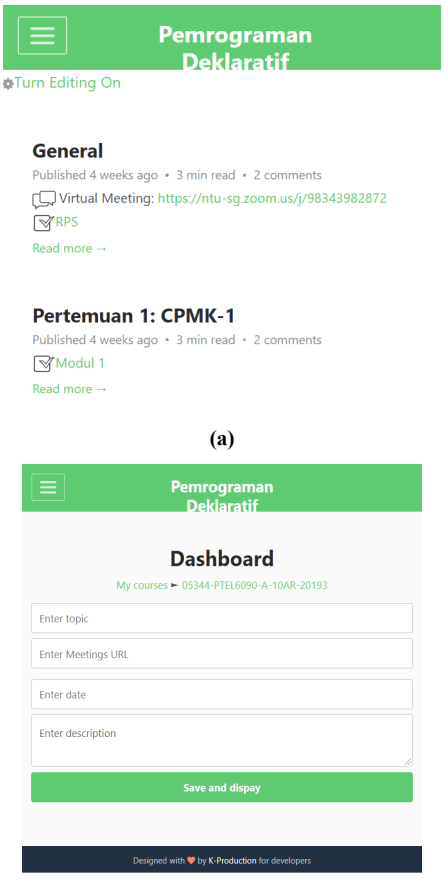

Fig. 4. Lecturer Homepage (a) Turn On Editing (b) Input the Virtual Meeting

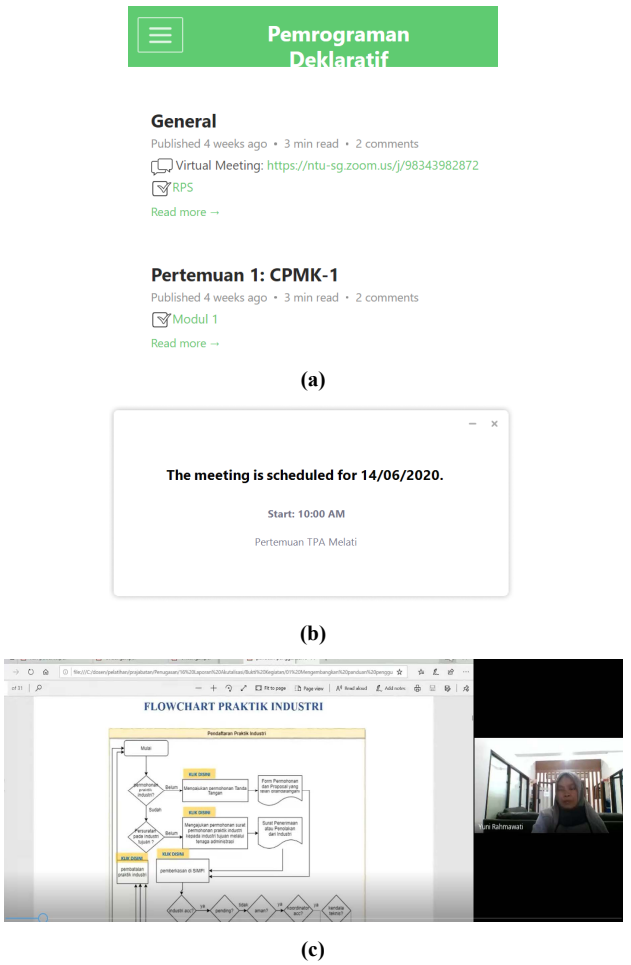

Fig. 5. Student Homepage (a) Enter the link (b) Attend the Virtual Meeting (c) Sample of Recorded Meeting

Teleconference-oriented LMS is also compared to original LMS using user experience Questionnaire (UEQ) based on Attractiveness, Perspicacity, Performance, Dependability, Stimulation, and Novelty. It filled by 85 students in electrical engineering at Universitas Negeri Malang. The UEQ categorization results are shown in Table I. Attractiveness, perspicacity, performance, dependability, and stimulation reached respectively 0,0002; 0,0030; 0,0000; 0,0005; 0,0084; and 0,0297. It shown there is significant different between teleconference in the proposed LMS and original LMS.

TABLE I. THE UEQ CATEGORIZATION RESULTS

No	Result[a]		
	Category	*t*	*Information*
1	Attractiveness	0,0002	Significant Difference
2	Perspicacity	0,0030	Significant Difference
3	Performance	0,0000	Significant Difference
4	Dependability	0,0005	Significant Difference
5	Stimulation	0,0084	Significant Difference
6	Novelty	0,0297	Significant Difference

[a] $a=0,05$

TABLE II. SCALE MEANS OF TRADITIONAL LMS

No	Result[b]			
	Category	$\bar{x}(\mu_0)$	*S*	*N*
1	Attractiveness	0,32	1,03	85
2	Perspicacity	0,35	0,91	85
3	Performance	0,48	1,03	85
4	Dependability	0,38	0,92	85
5	Stimulation	0,17	1,11	85
6	Novelty	0,05	0,92	85

[b] $a=0,05$

TABLE III. SCALE MEANS OF PROPOSED LMS

No	Result[c]			
	Category	$\bar{x}$	*S*	*N*
1	Attractiveness	0,89	0,90	85
2	Perspicacity	0,74	0,80	85
3	Performance	1,09	0,87	85
4	Dependability	0,84	0,74	85
5	Stimulation	0,59	0,94	85
6	Novelty	0,35	0,89	85

[c] $a=0,05$

Table II shows a scale means of traditional LMS, while table III shows the scale means of proposed LMS. Table II and Table III is rated by 85 same students. Based on Equation (1), t-test (t) is computed using means ($\bar{x}$), number of respondent (N), and standard deviation (S) which is presented in Table II and Table III. The means of comparison- μ_0 is shown by means ($\bar{x}$) in Table II. The t values are earned on each category compared to threshold a using Equation (2). In this study, the variable of a is set to 0.05. Because all values are less than 0.05, it can be concluded there are significant differences between traditional LMS usage and proposed LMS.

Students and lecturers can provide feedback through the proposed application attractively. The involvement of a lecturer offers a different experience to get the perspicacity compared to independent learning which dependent on the student's spirit. There is no different performance between the original LMS. Nevertheless, the bandwidth costs on the teleconference network needs can be conducted. The presence of a teacher increases the value of dependability or reliability on learning resources. Unlike other factors, stimulus of lecturer cannot be partly determined by LMS and Virtual Meeting, but also by the ability of lecturers to complete the teaching material in LMS. In addition, attendance system developed in subsequent research

IV. CONCLUSSIONS

Teleconference-oriented Learning Management System is proposed. A series of experiment is developed to evaluated. System was tested using two concurrent classes on both sample classes on Google Meet. The system runs smoothly when the speaker signal is good, but there are

interrupted voices when signal is limited, especially on cellular provider. The User Experience Questionnaire (UEQ) of the proposed LMS and the original LMS is also tested using T-Test to determine the user experience. UEQ is filled out by 85 students. The result show that attractiveness, perspicuity, efficiency, dependability, stimulation, and novelty reach 0,0002; 0,0030; 0,0000; 0,0005; 0,0084; and 0,0297. It can be concluded that there is significant different experience between teleconference in LMS and original LMS.

The presence of lecturers virtually allows students to learn in attractiveness, perspicacity, dependability, and stimulation manner. The comparation shows that the performance of the proposed LMS and original LMS work well. However, the proposed LMS reduce the chance of skipping lessons, especially if the attendance system works on the teleconference-oriented LMS automatically. This challenge increases the chance of renewal in system development.

The further research is combining attendance of teleconference-oriented LMS will be conducted using the approaches of previous study [26]–[28]. In addition to improving the sound noise, the noise signal needs to be eliminated.

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