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Need Analysis for Development of Web-Based Flipped Classroom Learning Models in Vocational Education

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Abstract. This study aims to determine the potential and needs of lecturers and students in studying computer network security which will be used as a basis for developing a web-based inverted classroom model in vocational education. This research is also based on 21st century learning competencies needed in the digital age such as critical thinking, communication, collaboration and creativity. This research needs analysis consists of field observations and literature studies. This research is a type of descriptive research. The results of this study indicate that lecturers and students need a learning environment that integrates technology in learning so as to enable students to communicate and get information from various sources. Based on the needs analysis conducted, learning innovation is needed in the form of developing web-based flipped classroom models that are expected to create learning competencies that are more effective, efficient, interesting, and able to improve learning competencies and learning abilities of 21st Century students.

1. Introduction

The rapid development of technology has an impact on the challenges and global competition faced by every country, especially Indonesia. Now there is no limit in space and time anymore for every human being to find information and communicate. 21st Century requires every individual to have the skills or skills both hard skills and soft skills that are qualified to be able to jump in and be able to compete in the world of work [1]–[3]. There are 18 kinds of 21st Century Skills that need to be equipped for every individual, where one of them 21st century skills is Learning and Innovation Skills which consist of 4 aspects, namely critical thinking, communication collaboration, and creativity [4], [5].

Learning and Innovation Skills 4Cs can be mastered by the nation's next generation through education. Education is the main alternative to prepare the next generation who are ready to compete in the 21st century [6]–[9]. Now improving the quality of education is needed to face competition in the era of globalization [7], [8], [10]–[12]. One of the concrete efforts made by the Indonesian government is to fix or improve the applicable education curriculum.

Industry challenges and opportunities 4.0 in the 21st Century encourage innovation and creation in the field of education. The challenges of vocational education are increasingly complex with industry



4.0[13], [14]. Brown, Kirpal, & Rauner [15] stated that vocational education and skill acquisition greatly influence the development of one's identity related to work. Furthermore, Lomovtseva and Edmond [16] explained, education is a place to forge one's maturity and skills so that it cannot only be borne by a group but rather becomes a shared responsibility. Education is also directed at increasing individual independence in accordance with their competencies [17]. Preparation of several competencies must be done because vocational education is education that prepares graduates to be able and willing to work in accordance with their fields of expertise [18]. Mastery of concepts according to Bloom is the ability to capture notions such as being able to express a material presented in a form that is more understood, able to provide interpretation and be able to apply it [19]. Hierarchy of thinking skills in the Revised Bloom Taxonomy from low-level thinking skills to high-level thinking skills [20]

One component in a learning system is a condition, where this component is about learning experiences and teaching and learning models or learning models [12], [21], [22]. Learning models can be interpreted as a series of a unified whole between approaches, strategies, methods and techniques . which describes systematic procedures for organizing learning experiences to achieve learning goals [23]. The function of the learning model is as a guide for instructor designers and teachers in implementing learning. Besides that, each learning model also has stages (syntax) that students can do with the guidance of the teacher [24]. So, the learning model is a wrapper or frame of the application of an approach, method and learning technique.

Various theories related to learning styles, which aim to explain the differences of each individual in learning. Some experts provide an explanation of the understanding of learning styles from different angles, but experts agree that learning styles influence students in understanding lessons [25]–[27]. The experts recommend that teachers assess their students' learning styles and adapt the media or teaching methods in class to fit the style student learning.

The literature in the field of science has encouraged lecturers and instructors to use learning models that require student involvement in shifting material from passive to active, where students are physically involved in learning activities, building knowledge and students are required to have new outputs that go beyond the information presented in class [28]–[30]. Flipped classroom learning forms interactions between students and students and between teachers and students to be actively involved in problem solving [31]. A lecturer must develop his professional abilities by developing models and teaching media that are appropriate to the conditions learning encountered, including the making of videos and web media in accordance with the development of current educational conditions [32].

The flipped classroom based learning model prioritizes collaboration between students, experimental activities to improve student skills in learning. The flipped classroom-based learning model approach effectively helps students learn the material, increasing their ability to solve problems independently. In conclusion, by applying a learning model based on flipped classroom students are able to interact intensively in the classroom, so that learning independence is formed [33]. Based on the opinion of some experts who have examined the flipped classroom model, it is found that the implementation of the flipped classroom model is able to improve critical thinking on their learning when they view videos at home or when organizing learning in class. This flipped classroom based learning model prioritizes interactions with peers, conduct group discussions, presentations and problem solving to integrate cognitive abilities of application and analysis [34]. Comprehensive assessment is an inseparable part of flipped classroom, this activity includes an assessment of the understanding process , the process of applying and analyzing through presentations, learning outcomes reports and self-evaluation. The assessment of flipped classroom based learning models is carried out in the beginning of learning, during the learning process and the end of learning in the classroom [35].

The Flipped Classroom learning model is present because of technological developments that have a major influence on the world of education. Today's increasingly sophisticated technology can be an effective learning facility for teachers and students. Flipped Classroom was first introduced, that the benefits of using multimedia devices such as videos given to students before learning in class so that students can watch, play back or accelerate according to the needs of each student. Flipped Classroom

is also a principled concept for exchanging class activities such as teacher explanations through class presentations, with activities that are usually carried out outside the classroom such as doing homework [36].

The Flipped Classroom Model is intended to make learning more effective in the classroom. In conventional classroom learning, generally much time is spent explaining teaching material, but very few students do the analysis, synthesis and evaluation of the problems the teacher gives to their students. Flipped Instruction, also known as Flipped Classroom, is reversing the acceptance and use of material in traditional classes by using class time to clarify questions from giving new material. Bergmann and Sams compare the conventional learning model with the Flipped Classroom learning model. In the conventional learning model, students come to class confused with the homework given in the previous meeting. Usually the teacher spends the first 25 minutes discussing homework that students don't understand. The teacher gives new material for 30 to 45 minutes and the rest is spent in class by practicing independently or in groups. However, in the Flipped Classroom learning model, time is fully regulated. At the beginning of learning students need to ask questions about the material that has been sent via video, so the teacher generally answers the question during the first minute in class. This allows the teacher to complete the misconception before they practice and make a solution in applying the concept. The remaining time is used more broadly for the activities themselves to solve problems directly.

2. Method

The research design needs analysis using the type of descriptive research conducted by the survey method [37]. The survey aims to obtain data: (1) Learning Design models used in tertiary institutions, (2) analysis of the need for web-based flipped classroom learning designs. (3) finding specifications and components of web-based flipped classroom learning design [38]. Based on these data, we will find out the specifications of web-based flipped classroom learning designs that suit the learning needs of computer network security.

The research subjects in the survey research consisted of lecturers, and students of the Information Systems Study program at the Faculty of Computer Science, Dharmas Indonesia University Research Instruments. The instruments to measure the research variables are arranged by themselves based on the variables translated into research indicators. Data analysis. The data obtained were analyzed using descriptive statistics.

3. Result and Discussion

3.1. System Analysis

Requirement analysis (need analysis) is an analysis conducted to examine a phenomenon of the needs of a program. Respondents used in filling out this needs analysis questionnaire were lecturers and vocational students of Strata 1 in Information Systems. The questionnaire used in this needs analysis is a collection of information to determine the level of competency achievement of vocational Strata 1 vocational students in the Information Systems field between current conditions and conditions of expectation. The needs analysis questionnaire uses the dual response survey category with a Likert scale, namely: 1 = Not Good (TB), 2 = Poor (KB), 3 = Good (CB), 4 = Good (B), and 5 = Very Good (SB). Based on the results of data analysis, the research findings show that the level of achievement of the competencies of vocational Strata 1 students in the Information Systems field, based on the opinion of the lecturer, the current condition has only reached an average of 60.47 or still in the sufficient category, as shown in figure 1.

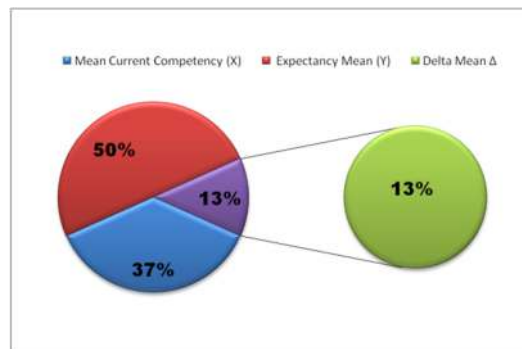


Figure 1. the results of the CBT implementation questionnaire

3.2 Learning Design Analysis

Preparation of Learning Designs. Most of the lecturers prepare learning plans in carrying out learning activities. There were 94% of respondents who stated that they compiled a learning plan, while 6% of respondents did not draw up a learning plan because there was no standard format as a guide in preparing the learning format. Relating to the components contained in the learning plan shows that there is a tendency that the learning design prepared by respondents consists of the components presented in Figure 2.

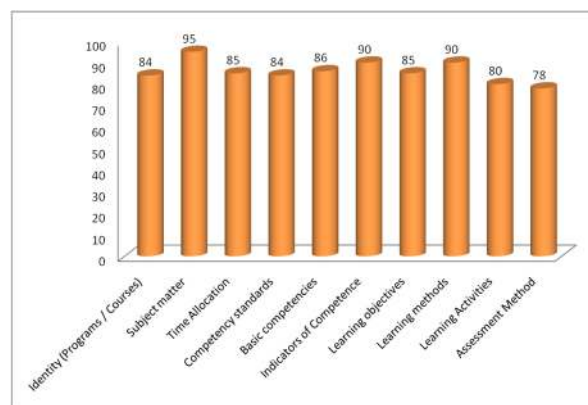


Figure 2. Learning Design Components

Learning materials are an important learning resource for students, the majority (76.2%) of respondents include textbooks / books / journals in learning approaches while teaching materials in audio and audio visual formats have not been an important part of learning. However, some teachers have used computers (40.6% and the internet (31.8%).

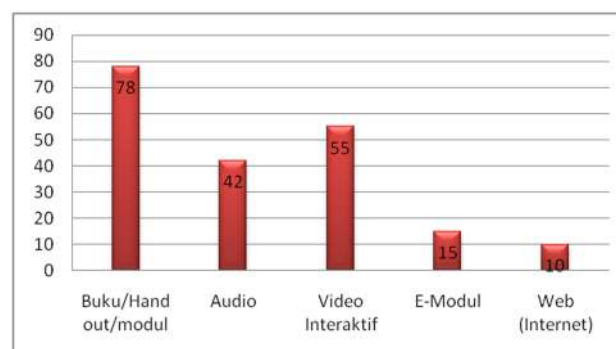


Figure 3. Resources of Learning Available

High Order Thinking Skills (HOTS) based learning. Regarding learning to improve HOTS capability, some respondents (65%) have given questions in the form of High Order Thinking Skills oriented questions and are able to apply the material in their daily lives. Further developed, related to future learning of flipped classroom (for example the real problem 15 years to come) has also been done, only 58% of respondents did, the rest 42% have not done.

Private facilities owned by lecturers. Most of the respondents 98% already have a mobile phone as a means of communication, even though the mobile phone has not functioned as a learning facility, nevertheless this is a good start to move towards m-learning (mobile learning) based learning. Likewise, the ownership of laptops or PCs for teaching staff is sufficient, at 95%, this is capital for computer-based learning and can access more diverse learning resources. Other facilities are presented in Figure 3.

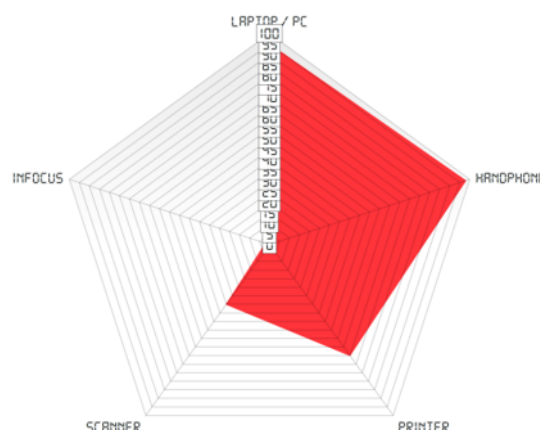


Figure 4. The personal technological device of the lecturer

Skills using technological devices. To be able to plan, implement, and evaluate learning to be more effective, efficient and attractive requires the skills to operate technological devices, the skills to process data through applications that are on the device (laptop / pc / handphone) that are mastered, namely: word processing, numbers (ms office) (92%), number processors, and multi-media processors (text, images, videos, animations) with PowerPoint (80%), mindmanager (25%), web-based application processing (18%). Regarding the ownership of email accounts as a means of digital communication, there are still around 32% who do not have e-mail, even though most of the teaching staff, namely 68%, already have e-mail.

An understanding of flipped learning and online learning. Today's learning trends are a combination of face-to-face learning, learning (interactive computer) and online learning (internet). Learning that is traditionally on a face-to-face basis, is now also moving towards learning that was originally online, such as distance learning, is also starting to move towards face-to-face combinations. Therefore, the ability of lecturers to manage learning has also begun to be directed towards blended. Based on the data of respondents, who already knew about the discourse of flipped learning and web-based learning (online) by 25%, 34% had never heard of it, and 39% percent knew it after this research activity. Description of respondents' knowledge related to flipped learning and web-based learning (online).

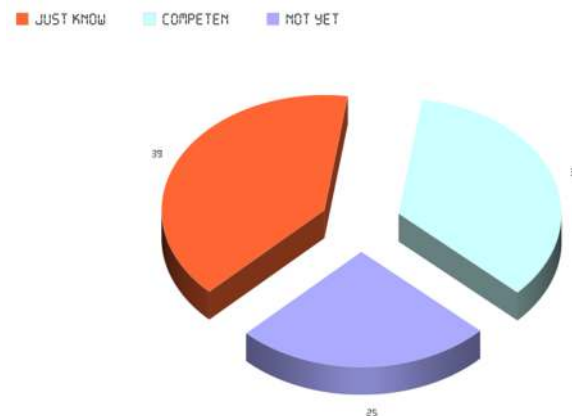


Figure 5. competency of Flipped classroom and E-Learning

The need for developing web-based flipped classroom learning. Online learning is present and future learning that needs to be mastered by teaching staff, therefore learning development activities related to learning media (e-learning) and learning models (flipped classroom) are needed. Most respondents 94% agreed that the web-based flipped classroom learning model was developed. Respondents who disagreed at 6%, there were several reasons for their disagreement due to the unavailability of technological devices and the rush of other jobs (administration). Another reason is that if technology is an important part of learning, the task of the teacher must always be to update his knowledge because technology and the development of the learning situation (environment and students) continue to develop.

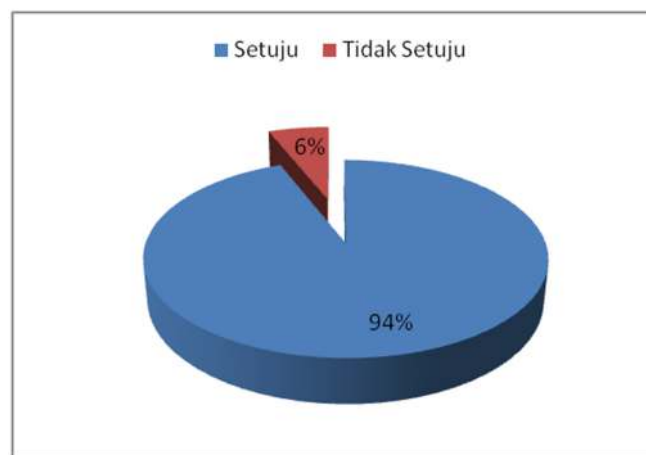


Figure 6. Knowledge of the Terminology of Flipped classroom

To disseminate concepts, principles, procedures, and practices in online-based flipped classroom learning requires the development of electronic-based learning resources (interactive multimedia) such as e-modules that can be accessed through and WEB. Most respondents stated that the level of need for developing learning resources is very large, successively developing textbook desktop-based applications (91%), E-Modules (96%), audio-mp3 learning media (90%), textbooks (93%), Web (98%), and mobile (91%). In the diagram the level of need for the development of teaching materials that can increase the competence of students and be able to synergize with the development of existing technology is presented at figure

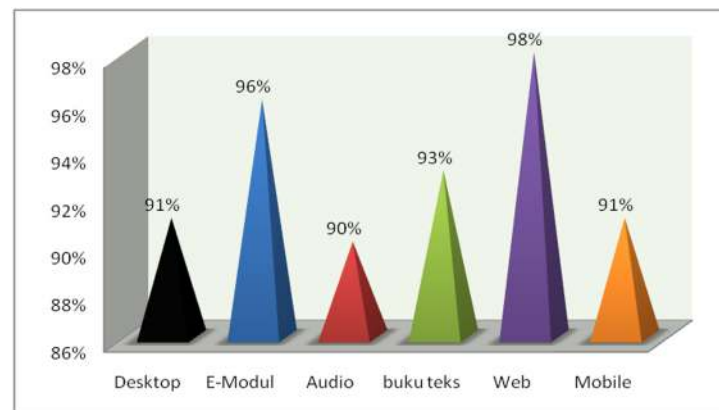


Figure 7. Knowledge of the Terminology of Flipped classroom

4. Conclusion

Based on the results of quantitative data analysts the conclusion is that most of the lecturers (respondents) have implemented learning through planning, implementing, and evaluating activities in learning. The learning design model has components that are in accordance with the applicable provisions in vocational education, but a small part has not included the prerequisite components of learning and student / student characteristics in designing learning. Web-based flipped classroom learning is done to improve the HOTS competency of students, most respondents have given questions in the form of solving real problems in their daily lives and solving future problems. In learning activities, most respondents already have the basic skills of using technological devices, namely: namely word and number losers, and multi-media processors. Most respondents do not understand flipped classroom learning, most have never heard of it, therefore it is necessary to develop a web-based flipped classroom learning model.

The web-based flipped classroom model is a present and future learning that needs to be mastered by the teaching staff, therefore it is necessary to develop learning activities related to the flipped classroom discourse and online-based learning model. Most respondents 97% agree that the flipped classroom learning model web based learning developed. Respondents who disagree by 8%, there are several reasons for disagreement, namely the lack of infrastructure owned and busy other jobs (administration). Another reason is that if technology becomes an important part of learning, then the task of the teacher must always be to renew his knowledge because technology continues to develop, (7) to disseminate concepts, principles, procedures, and practices in problem solving learning based on blended learning requires the development of print, audio, audio visual, computer, and WEB learning resources.

Most respondents stated that the level of need for developing learning resources is very large, successively developing textbooks (98%), Audio (98%), videos (98%), computers (98%), and WEB (90%). In the diagram the level of need for developing blended learning based problem solving teaching materials is presented as follows.

Based on the conclusion of a needs analysis research that has been done, further suggestions for this research activity is to develop a web-based flipped classroom learning model (online) that needs to be done in the second year. Blended learning based problem solving models that need to be developed are; The design of web-based flipped classroom learning, e-module based Print Materials (textbooks) and presented in web form that can be accessed online; (3) Audio / video teaching materials (interactive multi media) can be accessed on electronic devices owned by lecturers and students, Implementation of web-learning in learning web-based flipped classroom (online).

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