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Online Git Tutorial Application for Pair Programming Learning that Supports the Coworking Space Concept

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ABSTRACT
The existence of the COVID-19 pandemic has made the development of information and communication technology so rapid that it fosters new habits in the community to work from home and take advantage of the coworking space concept. Vocational High School students need to learn pair programming that supports the coworking space concept to face the era of disruption. The development of an application or mobile learning online git tutorial (OGITO) in this study aims as an alternative learning media to improve pair programming skills that support the coworking space concept. This study uses the 4D method with 4 steps, namely define, design, develop, and disseminate. The results of this study indicate that the software engineering aspects of OGITO learning application are included in the very good category with a score of 84.16%. The learning design aspect is included in the good criteria with a score of 80.46% and the communication aspect is included in the very good criteria with a score of 86.25%.

Keywords: *Mobile Learning, Coworking Space, Pair Programming, Git.*

1. INTRODUCTION

The increasing number of COVID-19 cases in Indonesia has prompted the government to update policies to be implemented in various fields. One of the policy reforms occurred in the field of education, where learning that was originally or usually carried out face-to-face (direct) was replaced with distance learning or online by staying at home or what is now commonly called School From Home (SFH). This policy update applies to all levels of education, from kindergarten, elementary, junior high, high school and college levels. This is done in order to reduce the spread of the virus and increase the number of Covid-19 cases in Indonesia.

COVID-19 pandemic has forced people to stay productive and work at home. This has fostered new habits and patterns of working people in Indonesia to work from home (Work from Home). But not a few people also choose to work outside the home to find inspiration or reduce boredom when working from home. Such as from freelance workers and start-ups who take advantage of coworking spaces to increase productivity during this pandemic. Coworking Space is a place or space to produce something by sharing, collaborating and exchanging ideas, both in terms of ability and knowledge, and can be used as a place to learn new experiences economically and efficiently [1].

The rapid development of technology, especially in the field of information and communication technology , supports distance learning during this pandemic. Distance learning makes educators and students take advantage of many platforms that support asynchronous online learning such as Google Classroom, Edmodo, Schology and platforms that support synchronous online learning such as Google Meet and Zoom. The creation of various learning platforms makes the distance learning process easy to be lived and implemented by educators and students [2]. This shows that the development of information and communication technology plays an important role in education, especially during this pandemic.

The development of the worl of information and communication technology today also fosters the habit of programming together in one place or coworking space. Coworking Space is a place or space to produce something by sharing, collaborating and exchanging ideas, both in terms of ability and knowledge, and can be used as a place to learn new experiences economically and efficiently [1]. As a shared workspace, coworking space has several values such as collaboration, accessibility, community, creativity, communication and openness [3]. Programming activities together with a team or a group requires good collaboration and communication. Therefore, the coworking space concept

supports these conditions because it can collaborate, exchange ideas, create creativity and new ideas in solving programming problems together.

To support the coworking space concept, Pair Programming skills need to be improved, especially for vocational students to face the era of disruption. Pair programming skills are effectively applied in the field of coding education [4]. Pair programming is a technique of using a computer in a team of two programmers. There are two roles in pair programming [5] the first is, "The Driver" is responsible for writing the code, while the second role is "The Navigator" is responsible for correcting errors and monitoring the process.

Git and GitHub repositories can be used to improve the knowledge and skills of vocational high school students towards Pair Programming mastery. Git is a Version Control System (VCS)-based software or tool used to revise code, while GitHub is an online service or hosting that is used for open source projects that use Git [6]. In slang, GitHub is a social media for software developers. GitHub has an attractive user interface and can make team work easier. GitHub can play an important role in helping developers and project managers work together with their teammates. So that GitHub can be used as an option in Pair Programming learning.

To realize Pair Programming learning that supports the concept of Coworking Space, a mobile learning Online Git Tutorial (OGITO) was developed. OGITO is an android-based learning application that contains learning modules in which there are PDF, Video and Quiz materials related to Git-GitHub material. By improving the quality of education, OGITO is applied to mobile learning. Because mobile learning is independent of place and time, mobile learning can be called an alternative learning model [7]. The use of mobile learning as a learning medium has a very high level of flexibility [8]. Therefore, it is hoped that OGITO can be used to learn Git-GitHub materials effectively and efficiently using only mobile devices so that an increase in pair programming abilities can be realized that supports the concept of coworking space for prospective programmers.

2. LITERATURE REVIEW

2.1. Pair Programming dan Coworking Space

The term Pair Programming was introduced in Extreme Programming where Pair Programming is the process of writing programs on one computer by two programmers who work together [9]. Pair Programming is a practice where two programmers work collaboratively on one computer with the same design, algorithm or code [10]. It can be said that Pair programming is the process of running the same computer by two programmers to collaborate and work together on programming.

Coworking Space referred to as a place or co-working space. Coworking space is derived from English which means working in the same room. Coworking Space is a space or work environment that is used as a place to work together, collaborate, exchange ideas and thoughts between individuals with different backgrounds. Various backgrounds or groups such as entrepreneurs, startups, freelancers, researchers, students and others can use Coworking Space to be used as a place to work [11].

2.2. Mobile Learning

Mobile Learning defined as learning that utilizes ICT, both handheld and mobile devices that are used to learn and understand subject matter freely, i.e. anytime and anywhere [12]. The use of technology in mobile devices in learning can increase engagement, motivation and the delivery of information quickly to students [13]. According to [14], the concept of mobile learning where the flexibility and portability of the devices used make students feel enthusiastic in learning because they feel the benefits and new experiences and it is easier to learn without being limited by space and time. In research [15] also proves that learning is proven to be practical, feasible and efficient when using mobile or smartphone-based learning media applications, for example Android. From these statements, mobile learning can be said to be learning that utilizes of information and communication technology that can motivate students because the mobile devices used are flexible, portability, feasible, practical and efficient so that they can achieve learning objectives.

2.3. Version Control System dan Git-GitHub

Version control is a system that records all changes made to a file or collection of files so that all historical records can be recorded and available for later viewing, Version Control System is very useful for developers to analyze changes and avoid problems when manipulating or accessing code together [16]. In general, there are three kinds Version Control Systems (VCS) include Local Version Control Systems, Centralized Version Control Systems, and Distributed Version Control Systems (DVCS). One example of DVCS is GIT.

The creator of the Linux operating system kernel, Linus Torvalds, is best known for developing a version control system called GIT [16]. In Git, each copy of the developer's working code is also a repository containing a complete record of all changes. One of the advantages of Git is its flexibility. Git keeps multiple copies of the code in the repository, so the code doesn't overwrite each other [16].

GitHub is a Git tool released in April 2008 by Tom Preston-Werner and his colleagues Chris Wanstrath and PJ Hyett. GitHub provides social networking features such as followers, wikis, feeds and more. One of the other

features of GitHub is forks. Forks are very useful because this feature can duplicate a project and can be used as a channel for other developers outside the main team to submit code they want to contribute. GitHub has an important role in making the work of developers smoother, this platform is also not limited to developers but people others or anyone can use it to manage projects and work together [16].

3. METHODS

3.1. Research Methods

In developing the OGITO application, this research uses the research development method or the Research and Development method. In this study, the 4D (Four-D) development model proposed by [17] which is used as a learning device development flow with four steps: define, design, develop, and disseminate.

1. Definition (define), which is the first step to define or define the terms of learning. This step includes five more steps, namely: (1) front-end analysis; (2) learner analysis; (3) task analysis; (4) concept analysis; (5) specifying instructional objectives.
2. Design, which is the second step to design or design learning devices or prototypes of teaching materials. This design includes four steps, namely: (1) constructing criterion-referenced test; (2) media selection; (3) selection formats; and (4) initial design.
3. Development (develop), which is the third step to modify the prototype of teaching materials. In this development there are two steps, namely: (1) expert appraisal; and (2) development testing.
4. Dissemination, which is the final step of development where product development promotion is carried out with the aim of being accepted and used by users. In this deployment there are three steps, namely: (1) validating testing; (2) packaging; and (3) diffusion and adoption.

3.2. Research Instrument

The research instrument used in the development of the OGITO application is a questionnaire given to the teacher. during field testing. This instrument assesses product functionality. The indicators assessed are contained in the OGITO application assessment instrument, namely in Table 1.

3.3. Data analysis

Data analysis used in this research is quantitative and qualitative data analysis techniques. Quantitative data were obtained from the results of the OGITO application trial questionnaire at SMKN 2 Singosari. Qualitative data obtained from interview sessions with users. Quantitative data were analyzed from the questionnaire scores of respondents by the following formula is used to calculate the percentage of answers:

Table 1 Assessment instrument in OGITO application.

No	Sub Variable	Indicator
1	Software engineering aspects	Reliability
		Usability
2	Learning design aspects	Material presentation
		Contextual
		Product Functional Accuracy
		Completeness and Quality
3	Visual Communication Aspect	Communication
		Visual

$$p = \frac{\sum X}{\sum Xi} X\ 100\% \quad (1)$$

p = percentage
X = total number of all respondents' answers
Xi = total items/indicator

As a basis for making decisions on the results of field test validation (product testing), it can be seen in the system evaluation category table in table 2.

Table 2 System evaluation category.

No.	Interval	Percentage	Category
1.	3.25 – 4.00	81.25 – 100	Very good
2.	2.50 - <3.25	62.50 - <81.25	Good
3.	1.75 - < 2.50	43.75 - <62.50	Bad
4.	1.00 - <1.75	25.00 -<43.75	Very bad

4. RESULT AND DISCUSSION

This research produces a mobile-based learning media, namely OGITO, which is based on observations of programming learning which aims to find out problems and obstacles in learning.

4.1. Definition stage (define)

There are five steps to define learning requirements, namely:

1. *Front-end analysis*, which is the first step in the define stage where the researcher makes an initial

diagnosis of the learning media used by SMK Negeri 2 Singosari to increase the effectiveness and efficiency of the learning process.

2. *Learner analysis*, namely the second step in the define stage where the researcher analyzes the characteristics of students such as background knowledge and skills as well as matters related to learning materials and others carried out in the RPL and TKJ classes at SMK Negeri 2 Singosari
3. *Task analysis*, namely the third step in the define stage where the researcher identifies and establishes a comprehensive review of the task of learning materials that must be mastered by RPL and TKJ students at SMK Negeri 2 Singosari.
4. *Concept analysis*, namely the fourth step in the define stage where the researcher analyzes the criteria and basic abilities or competency standards with the aim of determining the number and types of learning resources and teaching materials at SMK Negeri 2 Singosari.
5. *Specifying instructional objectives*, which is the last step in the define stage where the researcher summarizes the results of the task analysis and concept analysis to determine the behavior of the research object.

After doing this stage, the researcher identified that programming learning carried out in the classroom has the opportunity for students to collaborate with their friends, which tend to be rare.

4.2. Design stage (design)

At this stage, namely designing a prototype learning device where at this stage the researcher designs a design to develop the OGITO application as a learning medium. The things that are needed in designing the design are to determine the concept of the appearance of the application and determine learning materials for developing the OGITO application with a focus on Git-GitHub material only.

The next stage requires data collection or other supporting aspects to be used as learning teaching materials in the OGITO application such as videos, images and others. Where is the collection of material to be applied to the OGITO application using relevant sources. The pictures are taken from the internet and the learning videos can be accessed from YouTube. The following is the initial design of the OGITO application:

Figure 1 OGITO application initial screen.

Figure 2 Module page view.

Figure 3 Video material display.

4.3. Development Stage(develop)

At this stage, the product is made, namely the OGITO mobile learning application. At this stage, namely the stage to modify the prototype of teaching materials where the results of this development will be tested for the level of validity and practicality through expert assessment and development testing.

Figure 4 Quiz view.

4.4. Deployment Stage(disseminate)

At this stage, training on the use of the OGITO application was carried out for teachers and students of RPL and TKJ at SMK Negeri 2 Singosari. The purpose of this training is to improve students' skills in pair programming so as to support the coworking space concept. Then the stage of distribution is also through the Play Store application.

4.5. Discussion

After the training on the use of the OGITO application was carried out at SMK Negeri 2 Singosari, then a field validation test (product test) was carried out. With several aspects, namely aspects of software engineering, aspects of learning design, and aspects of visual communication. The results of field validation (product test) on the software engineering aspect can be seen in table 3. The results of field validation (product test) on the learning design aspect can be seen in table 3. The results of field validation (product test) on the visual communication aspect can be seen in the table 5.

Table 3 Product test validation results on software engineering aspects.

No.	Indicator	Average
1.	User experience using media (Reliability/Reliability)	87.5%
2.	User interest in media (Reliability/Reliability)	85%
3.	Easy to run (Usability)	80%
Average Software Engineering Aspect		84.16%

Based on the description in table 3, the results of product test validation on the software engineering aspect show that the average result on the user experience indicator using the media (reliability/reliability) is 87.5%. The average result on the indicator of user interest in the media is 85%. The average yield on the usability indicator is 80%. For the total average on the aspect of software engineering is 84.16%. Based on table 2 of the category evaluation system, the results of product test validation in the software engineering aspect are considered to be in the "very good" category.

Table 4 The results of field product test validation on aspects of learning design.

No.	Indicator	Average
1.	The material is clear and easy to understand (presentation of the material)	78.75%
2.	Video supports understanding (Contextual)	82.5%
3.	Images support understanding (Contextual)	83.75%
4.	Attracting interest and attention (Product Functional Accuracy)	77.5%
5.	Quizzes support understanding (Completeness and Quality)	81.25%
6.	The quiz guide is clear and easy to understand (Completeness and Quality	78.75%
7.	Evaluation supports understanding (Completeness and Quality)	82.5%
8.	Can be used independently (Completeness and Quality)	78.75%
Average Learning Design Aspect		80.46%

Based on the description in table 4, the results of product test validation in the learning design aspect with indicators of material presentation, contextual, product function accuracy, completeness and quality that the average product test validation results in these aspects is 80.46%. Based on table 1 of the category evaluation system, it can be concluded that the results of product test validation in the learning design aspect are in the "good" category.

Based on the description in table 5, the results of product test validation on the visual communication aspect with communicative and visual indicators show that the average product test validation results in that aspect are 86.25%. Based on table 1 of the category evaluation system, it can be concluded that the results of product test validation in the visual communication aspect are in the "very good" category.

Table 5 Results of product test validation on visual communication aspects.

No.	Indicator	Average
1.	Easy to understand language (Communicative)	81.25%
2.	Font type is clear and easy to read (Communicative)	87.5%
3.	The font size is clear and easy to read (Visual)	90%
4.	Attractive media display (Visual)	86.25%
Average Visual Communication Aspect		86.25%

5. DISCUSSION

This research produces a mobile-based application that contains materials about git and github to support pair programming learning. for this application, it has features to access learning materials such as PDF materials and video materials and there is a quiz feature to measure user understanding in studying git-github material.

The results of the product test validation showed that the software engineering aspect got a "very good" score, in the learning design aspect it got a "good" score and in the visual communication aspect it got a "very good" score.

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