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Development of Web-Let's Learn Online to Improve Student Competence in Learning Network Device Installation and Configuration with the PjBL Model

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ABSTRACT

Objective: *This study aims to produce WEB-Let's Learn Online to train the competency of installation and configuration of network devices of SMK students that are feasible (valid, practical, and effective).* ***Method:*** *This study is a type of development research employing the ADDIE model, which includes five stages: Analysis, Design, Development, Implementation, and Evaluation. Data collection techniques included validation, questionnaires, observations, and tests, involving 66 students from an SMK in Surabaya. The validity of the module was assessed based on learning, material, language, and media aspects. Practicality was evaluated through implementation processes and challenges encountered in project-based student competencies. Effectiveness was measured by the improvement in student competencies. The assessment of validity, learning implementation, and project-based competencies was based on average scores. The web-based learning media was considered feasible if the percentage across all eligibility criteria.* ***Results:*** *The results of the study showed 1) The average validity score of the web-based learning media was categorized as very valid; 2) The average learning implementation score was indicating a very practical category. The average he post-test score was categorized as good; 3) The average N-gain value was the moderate category, and the t-test confirmed a significant increase in student competency, indicating the media is effective.* ***Novelty:*** *This website-based platform allows students to learn anytime and anywhere, effectively enhancing their competencies and digital literacy in installing and configuring network devices.*

INTRODUCTION

The rapid development of information and computer technology enables individuals to access and explore data more quickly and easily (Heinich et al., 2022). Advances in science and technology have also brought significant changes to various aspects of human life, making it easier to search for and obtain information without being limited by space or time, as long as an internet connection is available. These developments have been widely utilized across different sectors, including education and learning. Basic computer and network subjects in Vocational High Schools (SMK) have a very important role in equipping students with skills and knowledge in this digital era (Anjarwati et al., 2021). In the context of an ever-growing industry, skills in the field of information and communication technology (ICT) are one of the main criteria sought by the world of work (Lintangesukmanjaya et al., 2024). Therefore, education in this field must be designed to meet these needs, as well as prepare students to be able to compete in an increasingly competitive job market.

Learning media is a channel or facilitator that can be used to convey messages or learning materials (Azhar, 2019) in such a way that students' attention, interests, thoughts, and feelings can be stimulated during learning activities in order to achieve

certain learning objectives (Sudatha, 2015; Sukma et al., 2021). The learning media that is very influential and very close to teenagers or students today is the internet (Diah Puspitasari, 2019). The advantages offered by computer and internet technology are not only the speed of obtaining the information that has been provided but also multimedia facilities that can make learning more interesting, visual, interactive, and fun so that it will foster students' motivation and interest in learning (Sitinjak & Siahaan, 2021; I R Dawana et al., 2022).

The competency of installing and configuring network devices for vocational high school students includes the ability to install, configure, and maintain network devices such as switches, routers, access points, IP addresses, VLAN configurations, network security, and servers. In network maintenance, students also need to be able to monitor network performance, troubleshoot, and fix problems that occur. This competency is important for students to be able to build and manage computer networks, both locally and widely. These competencies in vocational high schools are accommodated in project-based learning (PjBL) (Sudarmanto et al., 2021). There is a relationship between PjBL in learning and improving students' abilities through practical activities. In PjBL practical activities, of course, learning media and supporting infrastructure are very important in supporting learning success (Muthmainnah et al., 2022; Naqiyyah & Widiyanti, 2024).

However, based on initial observations made by the researcher, there were several problems in learning the installation and configuration of network devices at SMK PGRI Surabaya, including: (1) lack of variation in learning media used by teachers, so that learning becomes monotonous and less interesting for students; (2) lack of use of information and communication technology (ICT) in learning, even though ICT can provide ease and speed in accessing information and knowledge. This makes the PjBL activities carried out in schools less than optimal.

To overcome these problems, researchers intend to develop web-based learning media to improve the effectiveness of learning the installation and configuration of network devices. Web-based learning packaged in Web-Let's Learn Online is expected to be an interactive, informative, and easily accessible web-based learning media to support students' learning process in the course of network device installation and configuration. The presence of Web-Let's Learn Online not only helps teachers in delivering materials in a more interesting and varied way, but is also able to increase students' motivation, interest, and competence in understanding and mastering computer network skills that are relevant to current industry needs. With structured material coverage, practice guides, interactive simulations, learning videos, and evaluations that can provide direct feedback are very beneficial for students.

Web-Let's Learn Online media using the internet as a means of delivering interactive and multimedia learning materials has several advantages, including: (1) can be accessed anytime and anywhere as long as connected to the internet; (2) can accommodate diverse and varied learning materials; (3) can provide direct feedback to students; (4) can increase student motivation, interest, and participation in learning (Dawana et al., 2022). Thus, the web-based learning media developed can be an alternative effective learning media to improve student competence in the subject of installing and configuring network devices at SMK PGRI Surabaya.

Based on the background above, researchers can formulate research problems (1) How is the validity of the Web-Let's Learn Online media developed to improve learning

competency in installing and configuring network devices?; 2. How practical is the Web-Let's Learn Online media in improving student learning competency?; 3. How effective is the Web-Let's Learn Online media in improving student learning competency? This research will answer these three problems.

RESEARCH METHOD

Research Design

This research is a type of development research aimed at producing a product in the form of web-based learning media called *Let's Learn Online*. It was developed using the ADDIE development model, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation, as depicted in Figure 1 (Mulyadi et al., 2020).

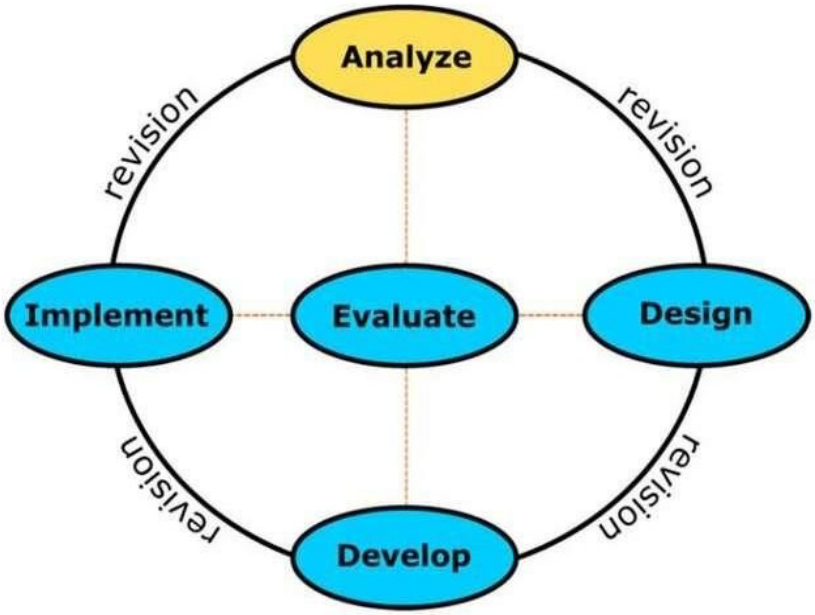

Figure 1. Research Design

The research time in this study was carried out in the even semester of the 2024/2025 academic year. The research location was carried out in two places, namely the Informatics Engineering Department, Surabaya State University for the development stage of Web-Let's Learn Online-based learning media and class XI SMK PGRI Surabaya for the implementation stage. The flowchart of Web-Let's Learn Online is depict in Figure 2.

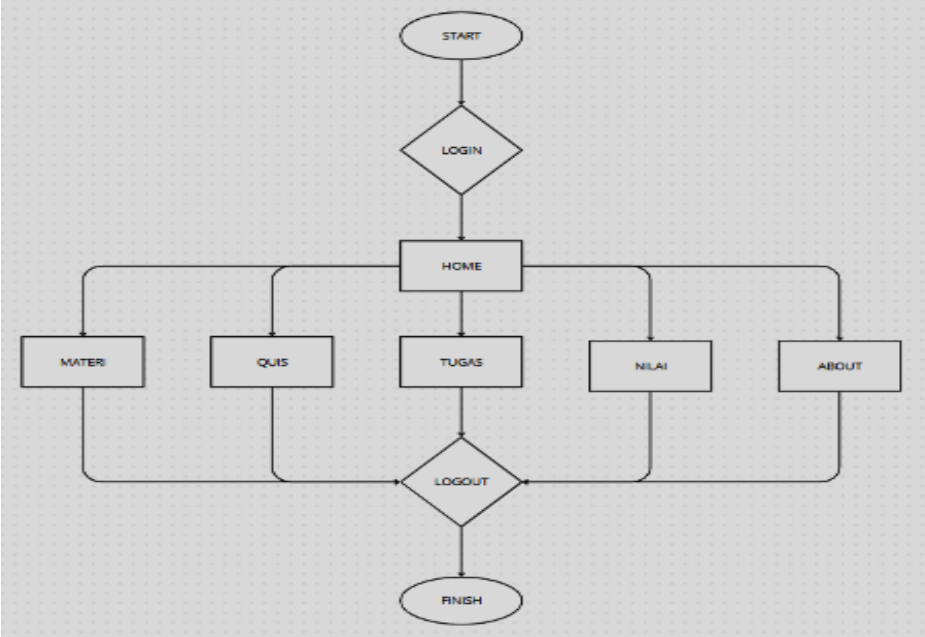

Figure 2. Web-Let's Learn Online flowchart

Instrument and Procedures

To obtain the validity of the Web-Let's Learn Online Media, the media validity sheet, material validity sheet, and language validity sheet were used (Almubarak & Saadi, 2022). To obtain the practicality of the Web-Let's Learn Online Media, a learning implementation sheet and a note sheet were used to overcome the obstacles that occurred. For the practicality of the Web-Let's Learn Online Media, a Competency Test for installing and configuring network devices was used (Dwikoranto et al., 2024).

Data Analysis

Validity is calculated using the average assessment of the validators. For practicality, the percentage of learning implementation is calculated. For effectiveness, it is calculated using N-Gain and t-test (Sugiono, 2015; Hake, 1998).

RESULTS AND DISCUSSION

Results

The results of the study were obtained based on the ADDIE development steps. In the initial stage, the analysis of data collection through interviews and observations used as a preliminary study related to the analysis needs as an initial reference in the development of learning media/applications to be developed. The results are then designed and developed so as to obtain development data from the validity of experts in their fields.

1. Validity of Web-Let's Learn Online Media

The following are the results of the validity value of Web-Let's Learn Online Media to improve student competence in learning the installation and configuration of network devices with the PjBL model.

Table 1. Validity Results of Web-Let's Learn Online Media

No	Validated Aspects	Validator			Mode	Category
		V1	V2	V3		
	Media					
1	Compliance with the principles of learning media: visible, interesting, simple, useful, accurate, legitimate, structured	3	3	4	3	Very Valid
2	Compliance with the principles of the curriculum used: giving students space to find out and learn independently	4	4	4	4	
3	Compliance with the systematics of writing and design: appearance, ease of navigation, completeness and usefulness of buttons, clarity of commands, completeness of information and services.	4	3	4	4	
	Material					
1	Relevance between material and Learning Achievements and Learning Objectives	4	4	4	4	Very Valid
2	Consistency in presenting Learning Objective Flow	4	4	4	4	
3	Adequacy in presenting everyday phenomena material with its solutions	4	4	4	4	
4	Contextual in nature	4	4	4	4	
	Language					
1	The language used is appropriate to the student's development.	4	4	4	4	Very Valid
2	Spelling according to EYD	4	4	4	4	
3	Effectiveness of Language Use in Web-Let's Learn Online	3	4	4	4	
4	Accuracy of vocabulary selection in Indonesian	4	4	4	3	
Percentage of Agreement					96,0	Very high

The validation results provide an understanding that the developed device or instrument has met the requirements and is worthy of being tested (Van Vo & Csapó, 2021). High validation results explain that the Web-Let's Learn Online Media has clarity in terms of media, materials and language used for learning (Knight et al., 2020). The design and development components are seen in the validator results in Table 1 which pay attention to the skills and learning objective indicators that are to be conveyed to students.

2. Implementation and Learning Constraints

Observation of the implementation of learning in the installation and configuration of network devices with the PjBL model in the classroom and the obstacles encountered are as follows, as tabulated and described in Table 2.

Table 2. Implementation of Web-Let's Learn Online

No	Observed Aspects	Observer			Mean	Category
		P1	P2	P3		
	Introduction					
1	Explaining the Objectives and Opening the Lesson	3	3	4	3.3	Very good
2	Focusing Discussion to Provide Solutions in PjBL Learning	4	4	4	4	
3	Web-Let's Learn Online Learning Media Preparation	4	3	4	3.7	
	Core activities					
1	Fluency in using Web-Let's Learn Online Media	4	4	4	4	Very good
2	Bringing out the competencies that are billed	4	4	4	4	
3	Facilitating students in using Web-Let's Learn Online Media to achieve learning objectives	4	4	4	4	
4	Conduct evaluations according to the learning activity plan for core activities	4	4	4	4	
	Closing					
1	Review/conclude the competency material taught	4	4	4	4	Very good
2	Give students the opportunity to ask questions	4	4	4	4	
3	Assignment for next meeting	3	4	4	3.7	
4	Closing Lesson	4	4	4	4	
Average Implementation Rate					3.9 = 97,5%	Very good

The obstacle to learning using Web-Let's Learn Online is the strength or availability of the internet signal which sometimes weakens, so that certain features are somewhat late in appearing. For group network practice activities, there is a problem with the availability of certain damaged components, but this can be overcome by using the stock available for other classes.

3. Effectiveness of Web-Let's Learn Online Media

At the implementation stage, extensive trials were conducted on 66 students by measuring effectiveness through the results of the pre-test and post-test given. The results of students' competency scores after learning with Web-Let's Learn Online Media with 5 competencies taken in the pre-test and post-test increased.

Table 3. Results of Student Scores Based on Competencies

No	Competence	Total Pre-test Score	Average	Total Post-test Score	Average
1	Creating a network topology.	4620	70.0	5214	79
2	Building and managing local area networks (LANs).	4554	69.0	5280	80
3	Implement network security.	4686	71.0	5412	82
4	Troubleshooting network problems.	4488	68.0	5148	78
5	Install and configure network devices (switches, routers, access points).	4752	72.0	5346	81

The effectiveness analysis of Web-Let's Learn Online media was conducted through the analysis of students' competency test scores. Judging from the average value of the pre-test (70.0) and post-test (80.0), there was a difference in students' competency results before and after learning with PjBL. Furthermore, to prove whether the difference was truly real (significant) or not, a paired t-test was conducted and the results showed a Sig value of 0.002 <0.05, there was a significant difference between the pre-test and post-test scores.

4. N-Gain Student Competency Improvement

N-gain score analysis was conducted to determine the improvement of student competency through pre-test and post-test scores in each class. The results obtained were then classified into 3 levels, namely low, medium, and high. The results are as in Table 4.

Table 4. N-Gain Test Results

No	Class	Students	Male	Female	Score	Category
1	A	33	21	12	0.67	Medium
2	B	33	22	10	0.69	Medium
		Average			0.68	Medium

From the results of the N-Gain test, it was found that there was an increase in students in answering the pre-test and post-test in the moderate category. This proves that the Web-Let's Learn Online Media that was developed has an effectiveness value in the product development research standards (Spatioti et al., 2022). The existing effectiveness can be a reason as well as a basis for implementing media and making decisions that this Web media can be given to students and disseminated.

Discussion

In this development research, a Web-Let's Learn Online media product was produced to improve competency in learning the installation and configuration of network devices with a valid, practical and effective PjBL model. The description of the three aspects can be followed in the following explanation.

1. Validity of Web-Let's Learn Online Media

The validation process of Web-Let's Learn Online Media was carried out by three education experts. According to (Riduwan, 2018), media will be said to be valid if it meets the valid criteria ≥ 61%. The validation of the media developed consists of validation of learning, materials, language, and media (L. Sürücü And A. Maslakçi, 2020; Saputra, 2023). The results of the learning validation as shown in Table 1 obtained a percentage of 96.0% which is included in the very valid category based on the grouping of the established validity criteria. This means that the media is suitable for use in further data collection (Cheung, 2024; Setiani, 2024). The highest validation mode value results are in the material aspect. This shows that Web-Let's Learn Online Media has complete materials that are in accordance with student capacity. The arrangement of interesting materials from visual power also affects the use of media, so that it can attract students' interest in learning.

2. Practicality of Web-Let's Learn Online Media

The assessment of the practicality of Web-Let's Learn Online Media is seen from two aspects, namely the aspects of implementation and overcoming learning obstacles. The assessment of the aspects of implementation and learning obstacles is assessed by observers using the implementation and learning obstacle instruments. According to (Riduwan, 2018), Web-Let's Learn Online Media will be considered practical if it meets the practical criteria ≥ 61%. The aspects observed in the preliminary activities, core activities and closing activities obtained an average value of 97.5% which means very practical as shown in Table 2. This means that the learning process carried out has met the criteria according to the designed Web Media. These results are in line with research conducted by (Kholiq, 2020). The obstacles encountered can be overcome during the learning activities.

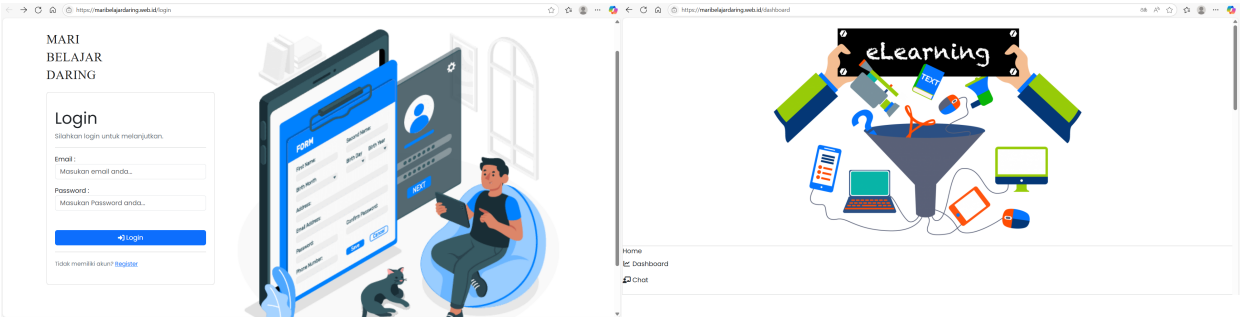

Figure 3. Web-Let's learn online media

The implementation of learning given to 2 classes (A and B) with the PjBL learning model assisted by Web-Let's Learn Online Media went well. Especially in the core activities section. This shows that the use of Web-Let's Learn Online Media is very suitable to be given in the PjBL learning model. The existence of a digital learning platform that allows students to learn independently, collaboratively, and based on practice, and helps teachers in managing and monitoring the development of student projects (Muthmainnah et al., 2022; Naqiyyah & Widiyanti, 2024). It can be seen in Figure 3 that Web-Let's Learn Online Media is not only attractive but also in terms of visual design but also a simple layout is very easy to use so that learning to install and configure complicated network devices can be easier.

3. Effectiveness of Web-Let's Learn Online Media

Effectiveness assessment is seen from two aspects, namely the results of the pre-test and post-test and the results of the students' N-Gain (Hake, 1998). The results of the pre-test and post-test were then subjected to prerequisite tests for normality tests, homogeneity tests, and paired t-tests. The results of the calculation of the increase in the five (5) competencies can be seen in Table 3. It can be seen that in each competency there is an increase in the average value of the pre-test and post-test. The increase in the average value from 70.0 to 80.0. While the N-gain with the results of the n-gain score percentage for class A is 67.0% in the moderate category, and in class B 69.0% also in the moderate category. Based on the calculation of the n-gain score carried out in Table 4, the average score value is 68.0% in the moderate category. The results obtained are in line with research conducted by (Kholiq, 2020) which states that the ability to use the internet and

media in the learning process by both teachers and students can influence their level of scientific literacy skills.

CONCLUSION

Fundamental Finding: The Web–Let's Learn Online media, developed using the Project-Based Learning (PjBL) model to enhance students' competence in installing and configuring network devices, meets the criteria for being highly valid. It is also practical to implement and effective in improving student competencies. **Implication:** Since the media fulfills the criteria of validity, practicality, and effectiveness, it is considered suitable for use as a learning tool and can be integrated into relevant instructional activities. **Limitation:** The improved competencies are limited to only five components; further components should be added to broaden its scope. **Future Research:** The Web–Let's Learn Online media can be refined further by adapting it to various device availabilities and by integrating more comprehensive features.

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