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# The Development of a PHP-Based Instrument for Skill Assessment of Learning Outcomes to Improve the Achievement Efficiency of Multimedia Expertise Program Students in Vocational High School in Malang

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**ABSTRACT**
Teachers use the assessment of learning outcomes (Penilaian Hasil belajar/PHB) to improve students' achievements. Teachers easily arrange the learning design and strategy based on the indicators in the assessment. The indicators are based on the expected achievement of the subjects' characteristics. This research aimed to improve students' skills and achievement and help teachers in the grading process. The PHB development used the ADDIE (Analysis, Design, Development, Implementation, Evaluation) using PHP and MySQL programming languages as the database. The results showed that the PHP-based skill PHB instrument affected students' learning achievement efficiency and that the instrument was proper to use. This research obtained that (1) the development of PHP-based skills PHB instrument at SMK Negeri 7 Malang used the ADDIE model; (2) the skill PHB instrument was very feasible based on a feasibility test conducted by Media Experts and User Experts; and (3) the development of PHP-based skills PHB instruments at SMK Negeri 7 Malang had efficiency in improving learning achievement.

***Keywords:*** *Assessment of learning outcomes (PHB), PHP: hypertext preprocessor, MySQL.*

## 1. INTRODUCTION

The current era of education development 4.0 highlights the ease of using technology. This is no exception for the assessment carried out by the teacher. The purpose of the assessment is to assist teachers in improving the education system [1]. However, because many students are to be evaluated, the manual assessment process takes a relatively long time. Hence, we need an assessment instrument to facilitate teachers to evaluate students. The convenience is not only from the teacher but also from the students. Teachers can efficiently process students' scores, while students can get information about learning outcomes according to assessment aspects.

Websites facilitate daily life, including promotional media, marketing media, information media, communication media, and educational media [2]. In developing the PHB instrument, the skill aspect used the PHP programming language since it is a scripting language suitable for web development and can be inserted into HTML [3]. The database to store data from student assessments was MySQL. MySQL is an SQL (Structured Query Language) database management system that manages the data collection structure [4].

Based on assessment process observations in 5 vocational high schools in Malang City (SMK Negeri 5, SMK Negeri 7, SMK Negeri 12, SMK Sriwedari, and SMK Muhammadiyah 2 Malang) on Multimedia expertise program, teachers assessed their students' skills using an established information system. However, the assessment instrument still used the manual method, in which teachers processed the grades

manually first and then entered them into the school assessment system.

From these observation results, it was necessary to have media as an alternative skill assessment for Multimedia study program teachers in the learning evaluation to improve student skills and, in turn, to improve graduates' skills in the world of work. This study built an information system for a PHP-based skills assessment instrument to assist in the assessment process. The development of the PHB instrument focused on assessing performance skills. A rubric is a guideline for the assessment consisting of scores and criteria that must be met to achieve that score [5]. Thus, to help teachers in the assessment process, a system was developed to choose criteria and enter values, resulting in assessing student learning outcomes. This final result was used to evaluate the learning for teachers and students.

## 2. LITERATURE REVIEW

### *2.1. Assessment of Learning Outcomes (PHB)*

Assessment of learning outcomes gives value to students' learning outcomes with specific criteria [6]. In the assessment, instructional objectives that contain the design of the desired abilities and behaviors that students can master become the basis and reference for assessment. The assessment aims to assist in improving the education system. Therefore, the education system's curriculum development, instructional processes, measuring graduate competencies, essential development of teaching materials, media, teachers, and many instrumental and other input components are based on assessment.

#### *2.1.1. Skill Assessment*

Psychomotor learning outcomes related to skills, movement abilities and actions. The psychomotor domain is a domain associated with skills or the ability to act after receiving specific learning experiences [7]. Skills or psychomotor aspects can be assessed using performance, project, product, portfolio, and written assessments. This study focused on skill assessment through performance with practical preparation, practical process, practice evaluation, and practical technology.

#### *2.1.2. Assessment Instrument*

An assessment instrument is a measuring tool for collecting data or information from each stage or at all stages of a studied program and becomes the object of evaluation [8]. In education, assessment instruments are used to obtain information on student learning success [9].

### *2.2. PHP (Hypertext Preprocessor)*

PHP (Hypertext Preprocessor) is a server-side programming language processed on the server-side [10]. PHP is a scripting language that is suitable for web development and can be embedded into HTML.

### *2.3. Learning Achievement*

Learning achievement is a series of learning activities done by someone from an achieved result as a change from behavior passed with experience and insight to interact with the environment concerning knowledge, attitudes, and skills as stated in the final result [11]. This study measured student learning achievement using the psychomotor or skills that assessed movement and action skills and verbal and non- verbal expression skills. The assessment was conducted when students performed good practice preparation, process, and practice evaluation.

### *2.4. Printing Graphic Design*

Printing Graphic Design is one of the vocational subjects in the multimedia study program. Through Printing Graphic Design, students learn to manage graphic design, especially in the printing medium. The software to manage the subject is Adobe Illustrator, Corel Draw, and Adobe Photoshop. According to media, this study used Printing Graphic Design on typography material with Basic Competencies of KD 3.2 Understanding typography according to media and 4.2 Making typographic designs.

## 3. METHODS

This research used Research and Development method. This study developed a PHB (Learning Outcome Assessment) instrument product in skills that could improve the efficiency of student achievement in the multimedia expertise program of SMK Malang. The resulting product was an instrument for assessing skills learning outcomes as an alternative assessment in this study.

This PHB (Learning Outcome Assessment) instrument was PHP-based using the ADDIE (Analysis, Design, Development, Implementation and Evaluation) model. The ADDIE procedure has five stages: analyze, design, develop, implement, and evaluate [12].

The process stages in the ADDIE model can be seen in Figure 1. The first stage of ADDIE is Analysis. At this stage, the activities analyzed the background of developing the skills PHB instrument and analyzing needs and identifying what was needed in a skills assessment. Next was the second stage, namely design or

development planning. The PHB skills assessment instrument was formulated based on data obtained from the analysis stage in this stage. The third stage was development, in which at this stage, the results of the design stage process were developed following the made designs. After the development was complete, validation was carried out by media experts, learning instrument experts, and user experts. The validation of suggestions, comments, and input was used to improve the PHP-based skills PHB instrument and the learning instrument.


**Figure 1** Stages of the ADDIE Model.
Source: Tegeh et al., 2015b in (Zuriah, N., & Kautsar, N. M., 2020)

The next stage, which was the fourth stage, was implementation. In this study, the implementation of learning instruments that were made through trials involving students who have studied typography material in Printing Graphic Design subjects was performed. After the implementation phase, namely small-scale and large-scale trials, was carried out, the next step was to implement it for students. This implementation was conducted by teaching class XI students of the Multimedia Study Program at SMK Negeri 7 Malang in Printing Graphic Design. The fifth stage was evaluation, in which this stage was done to find out whether the resulting product was valid or not. Evaluation and improvement were performed at each stage of the research before proceeding to the next stage.

The data collection instrument used a questionnaire to obtain data from experts and test subjects in this study. The Likert scale in filling out this instrument was to use 4 (four) answer choices. The Likert scale measures attitudes, opinions, and perceptions of a person or group of people about social phenomena [13]. "TABLE I" shows the feasibility qualification level using the criteria to determine the feasibility of the PHP-based skill PHB instrument. Information system development can be classified as feasible and according to the criteria if it has obtained a percentage of 51%.

**Table 1** Feasibility qualification level.

| Feasibility Criteria (Percentage) | Criteria |
|---|---|
| 76%-100% | Very Feasible |
| 51%-75% | Feasible |
| 26-50% | Quite Feasible |
| 0-25% | Less Feasible |

Source: modification of Arikunto (2012)

## 4. RESULTS AND DISCUSSION

In this section, researchers described the results from developing PHP-based skills PHB instruments to improve the efficiency of student achievement. The research was conducted in two stages: the development and research stages. At the development stage, the development of PHP- based PHB instruments and skills PHB instruments was carried out. This development used the ADDIE model. Media experts, instrument experts, and user experts carried out product validity tests in this development process. Subsequently, an empirical test was conducted involving students who had taken the Print Graphic Design subject. The empirical test consisted of two stages: a small-scale test (one study group) and a large-scale test (two study groups).

The results obtained from the product validity and empirical tests were used for the evaluation stage, either on the PHP-based PHB instrument or the skills PHB instrument used in the study. "TABLE II" displays the product eligibility instruments by Media while "TABLE III" and "TABLE IV" exhibit the product eligibility by User Experts. If the product has met a minimum percentage of 51%, it can be included in the feasible category and can be implemented.

**Table 2** Product feasibility instrument of functionality test by media expert.

| Aspect | Assessment | | Validity |
|---|---|---|---|
| | ∑x | ∑xi | |
| Learnability | 9 | 9 | 100% |
| Efficiency | 5 | 5 | 100% |
| Memorability | 4 | 4 | 100% |
| Security and Error | 6 | 6 | 100% |
| Mean | | | 100% |

The validation results by Media Experts, as seen in Table 2, obtained a percentage of 100%. Based on the validity criteria by Arikunto [14], it is declared very feasible. Thus, Media Experts argue that: (1) The system ran smoothly in terms of learnability aspects; (2) the features on the system ran well in terms of efficiency aspects; (3) the layout of the menu was well organized in terms of memorability; (4) error handling and system security level was running well.

The validation results by User Experts obtained a percentage of 100%, which indicated that the criteria were very feasible. Hence, the User Experts gave the opinion that: (1) PHP-based PHB skills instruments ran smoothly; (2) the features on the PHP-based skill PHB Instrument were running well; (3) the layout of the menu was well organized; (4) error handling and system security level were running well.

**Table 3** Product feasibility instrument of functionality test by expert users.

| Aspect | Assessment | | | | Validity |
|---|---|---|---|---|---|
| | ∑x1 | ∑x2 | ∑x3 | ∑x4 | |
| Learnability | 9 | 9 | 9 | 9 | 100% |
| Efficiency | 5 | 5 | 5 | 5 | 100% |
| Memorability | 4 | 4 | 4 | 4 | 100% |
| Security and Error | 6 | 6 | 6 | 6 | 100% |
| Mean | | | | | 100% |

**Table 4** Product feasibility instrument of usability test by users expert.

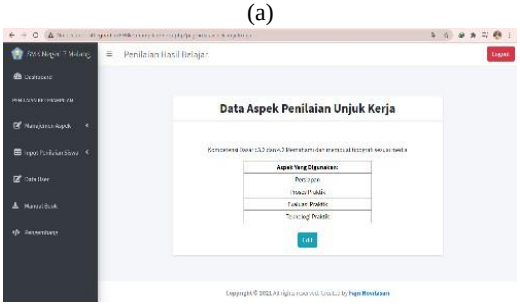
| Aspect | Assessment | | | | Validity |
|---|---|---|---|---|---|
| | ∑x1 | ∑x2 | ∑x3 | ∑x4 | |
| System Content | 9 | 9 | 10 | 12 | 77.8% |
| System Utilization | 7 | 6 | 8 | 8 | 87.5% |
| Display Quality | 10 | 9 | 11 | 12 | 83.3% |
| Program Interaction | 66 | 6 | 6 | 8 | 75% |
| Mean | | | | | 100% |

User Expert usability validation results obtained a percentage of 80.8%, showing that the criteria were very feasible. Thus, the User Experts gave the opinion that: (1) the benefits and features of the PHP-based skills PHB instrument were excellent; (2) The use of systems such as ease of operation and ease of understanding sentences or words used in the PHP-based skills PHB instrument was excellent; (3) the display quality of the PHP-based skill PHB instrument, such as text or writing readability, color composition, and the quality of the user interface were excellent; (4) the ability of the PHP-based PHB instrument in processing data and speed in displaying information was good. The advice given by User Experts was to add a follow-up feature to analyze the learning process results better.

"Fig 2" displays the results of the PHP-based skills PHB instrument". The interface design on the PHB Instruments page used the AdminLTE Master Version 3.

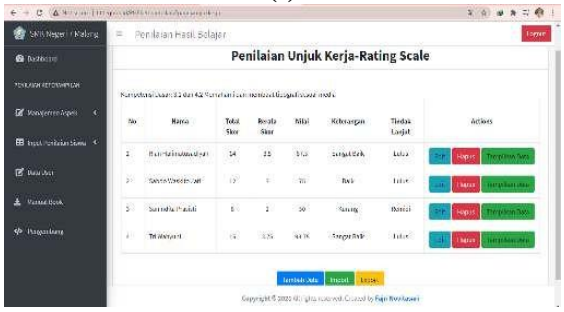
Fig 2 (a) is the login screen, in which the user is required to log in first to access the PHP-based skills PHB instrument. Fig 2 (b) is the aspect management display that shows the essential competencies (KD) and skills aspects used. If the user wants to change the KD and aspect, the user can press the 'Edit button, and a display will appear as shown in part (c). Users can choose KD or aspects for the skill assessment that the developer has provided. Fig 2 (d) is a display of student skills assessment data, in which user can add assessment data manually one or inputting an excel file containing a skills assessment. In addition, users can also view more details, edit, delete, and print skill assessment data. The skills PHB instrument can be accessed online at http://littlegood.id/PHBketerampilan/login.php.


(a)




(b)


(c)




(d)

**Figure 2** PHB skills instrument user interface display; (a) Login pagedisplay (b) Aspect management view; (c) KD and aspect edit view.

The feasibility test of the learning instrument is shown in Table 5 for Instrument Experts and Table 6 for User Experts. These results were being used at the implementation stage for students.

**Table 5** Percentage of instrument expert validation results.

| Aspect | Assessment | | | Validity |
|---|---|---|---|---|
| | ∑x1 | ∑x2 | ∑xi | |
| Identity | 48 | 48 | 48 | 100% |
| Contents | 139 | 156 | 156 | 94.5% |
| Evaluation | 22 | 28 | 28 | 89.3% |
| Assessment | 71 | 72 | 72 | 99.3% |
| Mean | | | | 95.8% |

**Table 6** Percentage of user expert validation results.

| Aspect | Assessment | | | Validity |
|---|---|---|---|---|
| | ∑x1 | ∑x2 | ∑xi | |
| Identity | 37 | 48 | 48 | 88.5% |
| Contents | 120 | 156 | 156 | 88.46% |
| Evaluation | 21 | 28 | 28 | 87.5% |
| Assessment | 66 | 70 | 72 | 94.4% |
| Mean | | | | 89.7% |

Based on Table 4, learning instrument validation by Instrument Experts obtained a 95.8%. Meanwhile, the validation by Expert Users in Table 5 received an 89.7% or was classified as very feasible. Therefore, the developed learning instrument was classified as very feasible and could be applied to the learning process.

The next stage was implementing the product that was developed. The research focused on class XI Multimedia expertise program students. According to media of Printing Graphic Design, the subjects were KD 3.2 Understanding typography according to media and 4.2 Making typographic designs. Researchers conducted a learning process and an evaluation process for students to determine the product efficiency in improving learning achievement.

At the beginning of learning, students were given a pretest to determine their typography. Researchers used the results to determine the initial knowledge. The posttest was used after the material was delivered to the students, and it was used to measure students' understanding. The pretest and posttest using 25 items with three cognitive levels of C3, C4, and C5. Both pretest and posttest scores were tested using the paired t-test to find whether the data were related or not and to determine the efficiency of the developed instrument. The results of the paired t-test are shown in "Fig 3".

**Paired Samples Statistics**

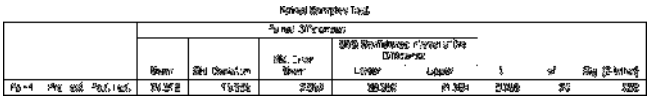
| | | Mean | N | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Pair 1 | Pre Test | 60.69 | 29 | 15.931 | 2.958 |
| | Post Test | 88.00 | 29 | 5.855 | 1.087 |

(a)

**Paired Samples Correlations**

| | | N | Correlation | Sig. |
|---|---|---|---|---|
| Pair 1 | Pre Test & Post Test | 29 | .190 | .324 |

(b)



(c)

**Figure 3** Paired pretest and posttest; (a) Mean pretest and posttest scores; (b) Correlation between pretest and posttest; and (c) Theresults of the paired test.

Based on the paired t-test in Fig. 3, part (a) shows a significant change with 60.69 mean for the pretest and 88 mean for the posttest. Furthermore, the efficiency ratio analysis, in which the results obtained from the posttest value was divided with a pretest score, got a value of 1.450, and it has a ratio value f more than 1; thus, the PHB skill instrument was efficient to improve learning achievement in students of the Multimedia study program at SMK Negeri 7 Malang. Fig 3 (b) exhibits a correlation value of 0.190; it meant a lack of correlation between pretest and posttest data because it has less than 0.5 correlation value.

In part (c), the hypotheses were 1) H0: the mean pretest and posttest are the same and 2) H1: the mean pretest and posttest are not the same. Based on the paired t-test, the t- count is -9.253 with a probability of 0.000. Since 0.000 < 0.025, then H0 was rejected, or there was a difference between the pretest and posttest scores from students of the Multimedia Expertise Program at SMK Negeri 7 Malang in Printing Graphic Design subject.

The results included: (1) developing a PHP-based skill PHB instrument at SMK Negeri 7 Malang using the ADDIE model with analysis, design, development, implementation, and evaluation stages as reinforced by the research of Marhaeni and Lasmawan (2021) titled "Pengembangan Instrumen Keterampilan Menulis Karangan dan Kemampuan Berpikir Kreatif pada Materi Karangan Narasi Siswa Kelas IV Sekolah Dasar" (Development of Essay Writing Skills Instruments and Creative Thinking Skills in Narrative Writing Materials for Class IV Elementary School Students) using the ADDIE model in its development [15]. The results of developing a narrative essay writing skill instrument

using the ADDIE model were declared valid with a reliability value of 0.77 > 0.60. (2) The feasibility of the PHP-based skill PHB instrument based on the feasibility test by the Media Expert was 100%, and the User Expert in the functionality test obtained 100% and 80.8% for the usability test. The feasibility of the skills assessment instrument was also proven by the research of Veronica Ayu Refsi Dewindra and Endang Susilaningsih (2020) titled "Pengembangan Instrumen Penilaian Berbasis Web pada Keterampilan Presentasi Proyek Materi Minyak Bumi" (Development of Web-Based Assessment Instruments on Petroleum Material Project Presentation Skills) [16]. The skill assessment instrument of this study was declared valid with a value of 20 from a maximum value of 24 by the validator. Thus it was feasible to measure the presentation skills of students. (3) Development of PHP-based skills PHB instrument at SMK Negeri 7 Malang was efficiently used for assessment as evidenced by the paired test results of the pretest and posttest scores.

Based on the paired test results, the mean value of the pretest was 60.69, and the mean value of the posttest was 88. So there was an increase in the pretest value with a value of 60.69 to 88 for the posttest value. Furthermore, the efficiency ratio analysis, in which the results obtained from the posttest value was divided with a pretest score, obtained a value of 1.450, and it has a ratio value f more than 1; thus, the PHB skill instrument was efficient to improve learning achievement in students of the Multimedia study program at SMK Negeri 7 Malang. This was also evidenced by a study titled “Pengembangan Instrumen Penilaian Aspek Psikomotor Pembelajaran IPA Materi Tumbuhan Hijau Kelas V Berbasis Kompetensi Pendekatan SEA Berwawasan Konservasi” (Development of Psychomotor Aspect Assessment Instruments for Science Learning Green Plant Material Class V Competency-Based SEA Approach with Conservation Insight) by Fuadi, Totok Sumaryanto, and Wahyu Lestari (2014) [17]. This study concluded that the assessment instrument developed can measure process performance. Based on the comparison of the t-test obtained, the value of Sig. 0.000 = 0% then the assessment instrument had relatively high effectiveness on increasing student learning achievement in the psychomotor aspect.

## 5. CONCLUSION

Based on the results and discussion to develop PHP-based PHB instruments to improve the efficiency of student learning achievement, it can be concluded that: (1) The process of developing the process of developing a Hypertext Preprocessor (PHP) based skill learning outcome assessment instrument (PHB) in SMK Negeri 7 Malang was used the ADDIE (Analys, Design, Development, Implementation, Evaluation) model; (2) The feasibility level of the PHP-based skills PHB instrument through the feasibility test by Media Experts had very feasible criteria, the feasibility test by User Experts in the functionality test obtained very feasible criteria, and the usability test obtained very feasible criteria; hence, the PHP-based skills PHB instrument could be used to assist teachers in the skills assessment process; and (3) Development of a skill assessment instrument (PHB) based on Hypertext Preprocessor (PHP) at SMK Negeri 7 Malang had efficiency in improving learning achievement as evidenced by the increase in pretest and posttest results calculated using paired sample t-test test and was influenced by skills assessment, namely preparation, process, evaluation, and practical technology aspects

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