

Developing Project-Based Electronic Student Worksheet on Number Processing Application Materials

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Abstract: This study aims to develop a project-based electronic student worksheet on the number processing application course for tenth grade and investigate find out teacher's and student's responses to the product. This research and development study using Thiagarajan, Semmel, & Semmel 4D development methods, consisting of define, design, and development stages. Meanwhile, while the dissemination stage has not been carried out because of the limitations. This development aims to produce a project-based e-student worksheet, to analyze the project's development stages, and to analyze the feasibility of the project. This research material has been evaluated and validated by one of the teachers from Ketintang Vocational High School Surabaya and accounting education lecturer, education technology lecturer, and linguistic lecturer from Universitas Negeri Surabaya. The research subjects were tenth-grade accounting students in Ketintang Vocational High School, Surabaya. The data were analyzed using quantitative and qualitative analysis techniques. Meanwhile, the instrument involved in this study were open-questionnaire and close-questionnaire.

Keywords: Project-Based Learning, E-student worksheet, number processing application

INTRODUCTION

Education is an integral part of transforming general knowledge, professional knowledge, and moral values to shape the country's image. Indonesia carries this transformation by formulating guidelines or implementing educational policies, commonly referred to as curricula. As defined in Law No.20 of 2003 concerning the national education system, curriculum represents a set of plans and knowledge about learning objectives, content, materials, and methods used as guidelines for the administration of learning activities to achieve specific educational goals.

The implemented national curriculum is continuously adapted to the current development and needs. The 2013 curriculum is the refinement of the 2006 KTSP curriculum (Andrian & Rusman, 2019). The 2013 curriculum emphasizes that the learning process should focus on students. Student-centered learning carries a positive impact on the development of learning (Wright, 2011). The three elements required in teaching and learning activities are students, an educator, and learning resources. To facilitate material delivery, educators should prepare learning resources. Komalasari (2017) states that learning resources are essential to attain

effective learning. Learning material is one of those resources. It is used to encourage students to struggle in improving the learning process.

Teaching material refers to systematically arranged texts and information. It trains students to master the competencies required to achieve the learning objectives. Generally, teaching materials are divided into three types, namely printed, interactive, and listening materials. According to Trianto (2015), teaching materials are a crucial aspect of administering courses. In carrying out the course, a teaching and learning outline determines the learning direction and goals.

Teaching materials are an indispensable part of the syllabus, containing material based on student required skills, along with the learning objectives and direction. A teacher is expected to develop materials to realize effective and efficient learning to attain the proposed competencies (Yulaika, Harti, & Sakti 2020). Besides, the success of the learning process also relies on the teachers' ability to design and compile teaching materials (Kusumam, Mukhidin, & Hasan, 2016). As conveyed by Wahyudi, Hariadi, & Hariani, 2014, the success of a school's learning process is supported by teachers' ability to design teaching materials. The use of learning resources and

teaching materials in the learning process allows students to study material coherently and systematically to comprehensively accumulate all the integrated competencies (Cahyaningrum et al., 2017).

A number of aspects affect students' material understanding, such as the source of teaching material. One example of teaching material is the student worksheet (LKPD), which includes learning facilities that aid students to understand the material easily. Prastowo (2015) argues that LKPD belongs to printed teaching material containing material summaries and contents, along with instructions for students' assignments. Students' worksheets help students to participate in the learning process actively.

University of Nottingham (2003) reveals that project-based learning is a systematic learning model that invites participants to be more theoretical in working on assignments and projects. Wena (2011) describes Project-Based Learning as the method that allows teachers to involve project work in the learning process. Grant (2002) states that project-based learning is student-centered learning that investigates a topic deeply. In this method, students research relevant and heavy problems and questions. Additionally, it helps students understand a concept and find solutions to a problem.

The interview results with the teacher who taught Number Processing Application material in the tenth grade of Ketintang Vocational High School, Surabaya, showed that the teaching materials used in this course are textbooks and online handouts made by the teachers. According to that teacher, the teaching material tends to adopt the complicated language so that the students face issues in understanding them. Besides, the texts selected in the materials are less innovative, resulting in ineffective learning, while the students quickly get bored. The learning becomes worse during the pandemic period since it is carried out remotely, and the students cannot freely access the printed materials. Consequently, Ketintang Vocational High School, Surabaya, developed an electronic project-based student worksheet, expected to improve the teaching material and quality while helping students to get used to the general journal application.

To develop effective and supportive learning following the 2013 revised curriculum, this study seeks to develop teaching materials in the form of a Project-Based e-students worksheet to increase student references in studying accounting,

especially in the Number Processing Application material. This electronic student worksheet can be accessed using pdf so that they can open learning resources, even during distance learning. The brief material and HOTS (High Order Thinking Skill) questions presented in the e-worksheet aim to improve students' critical thinking.

Several previous studies relevant to this research have been conducted. First, a study conducted by Andriyani, Ernawati, & Malik (2018) entitled the development of project-based electronic student worksheets on thermochemical material for the eleventh grade of senior high school. The results from that research confirm that the worksheet is applicable to the learning process. Meanwhile, in a study carried out by Sari, Prasetyo, & Wibowo (2017) entitled development of science student worksheet based on project-based learning model to improve junior high school students' collaboration and communication skills, revealing the worksheet suitability for the learning.

Therefore, this study develops a project-based e-student worksheet for tenth grader students in Number Processing Application courses, investigating the worksheet feasibility and the student's responses to the worksheet.

METHOD

This research and development aim to form a new product. The 4D development research model was adopted. The stages of that research model consisted of define, design, develop, and disseminate from Thiagarajan, Dorothy S. Semmel & Melvyn I. Sommel (Trianto, 2015). The dissemination stage was not carried out and became the limitation of this study.

The research subjects were the tenth-grade students of vocational high school Ketintang, Surabaya, who are taking the Accounting program. Besides, this research used quantitative and qualitative analysis. The Quantitative data were the scored (in the form of a percentage) validity sheet from the validator. Meanwhile, the qualitative data is in the form of notes based on the reviewers' review, describing the product improvement.

In addition, the research instrument was in the form of open and closed questionnaires containing research sheets and material, linguistic, and graphic experts validity test sheet compiled based on the teaching material feasibility guideline from the National Education Standard Agency (BSNP) (2014). The instruments provided

descriptive qualitative data, while the validation sheet produced descriptive quantitative data.

The data were analyzed using qualitative and quantitative techniques. The qualitative technique was adopted to analyze the suggestions and criticisms from the subject teachers and expert lecturers' suggestions and comments to the developed e-students worksheet. Meanwhile, the quantitative technique was used to analyze the validity sheet from the expert. The validity sheet employed the Likert scale. Its interpretation criteria are shown in Table 1.

Table 1. Criteria for Interpretation of Student Response

Assessment	Criteria
81% - 100%	Very Good
61% - 80%	Good
41% - 60%	Good Enough
21% - 40%	Not Good
0% - 2%	Bad

Source: Riduwan (2015)

The category used to interpret the data of products' feasibility is presented in Table 2.

Table 2. Category for Experts' Validity Sheet

	Highly not Feasible	Not feasible	Neither feasible nor not feasible	feasible	Highly feasible
Score	0% - 20%	21% - 40%	41% - 60%	61% - 80%	81% - 100%

Source: Riduwan (2015)

Meanwhile, students' responses were analyzed using the Likert scale category shown in Table 3.

Table 3. Likert Scale Assessment

Criteria	Score
Bad	1
Not Good	2
Average	3
Good	4
Very Good	5

Source: Riduwan (2015)

The obtained data were calculated using the formula explained below.

$$\text{Scoring percentage} = \frac{\text{Total score} \times 100\%}{\text{Maximum total score}}$$

Description = the highest score x number of aspects x number of respondent

The results of percentage calculation were used as the basis for drawing conclusions on students' opinions about project-based material e-students worksheet that followed the score interpretation criteria shown in Table 4.

Table 4. Criteria for Student Response Interpretation

Criteria	Score
Do not fully understand	0% - 20%
Do not understand	21% - 40%
Averagely understand	41% - 60%
Understand	61% - 80%
Fully understand	81% - 100%

Source: Riduwan (2015)

Based on table 4, the developed project-based e-students' worksheet on the general journal application format material can be classified as an excellent and good instrument if the average students' responses score is > 61%.

RESULTS AND DISCUSSION

Results

This study aims to analyze the development process, feasibility, and students' responses to project-based e-student worksheets on the number processing application course for the tenth grade of vocational high school. The data were collected by distributing questionnaires to 90 accounting department students at Ketintang Vocational High School, Surabaya.

The development of an electronic student worksheet (E-LKPD) for the number processing application course for the ten grade students adopted the 4D development model from Thiagarajan, Semmel. It consists of four stages, namely the stage of description (define), assembling (Design), development (develop), and dissemination. The final stage of dissemination was not carried out due to the research limitation.

The front-end analysis was completed as the first phase of defining process. Ketintang Vocational High School implemented the revised version of the 2013 Curriculum. In the learning activities, the teaching materials used for the number processing application course include textbooks and additional material created by the teachers. However, those materials used do not contain project-based exercises and HOTS (High

Order Thinking Skills) questions, so that the students could not sharpen their thought.

The second analysis carried out was the analysis of students. During the learning activities, the students are observed to be less independent and demonstrated minimum ability to adapt to distance learning. Many students do not submit their assignments and tend to be passive, especially in the practice of number processing applications.

The third analysis is task analysis, which investigates students' determination in completing their assignments. This electronic student worksheet contains the 3.10 - 3.12 basic competencies for the even semester mentioned in the curriculum. The students have to finish the projects within the electronic-based worksheet that has been provided.

The fourth analysis is concept analysis, where the design of the developed product's material is determined. The design is created as concisely as possible using 3.10, 3.11, and 3.12 basic competencies explained in the 2013 curriculum, that demands students to analyzed the required spreadsheet formula, apply the format of the book application in general journals, ledgers, and auxiliary books, while also applies the path plan application format.

The designing stage was carried out by determining the students' worksheet format and structure. The guidelines from National Education Standards Agency 2014 were used as a reference to develop the e-student worksheet with some modifications to facilitate students. Furthermore, the generated e-students worksheet is in electronic form, using pdf format.

The third stage was the development stage, carried out involving material, graphics, and language experts. The qualitative data obtained in this stage are presented in Table 5.

Table 5. Results of Material Expert's Review

No	Aspect	Results and Improvements
1.	Content and Presentation	In the feasibility component, the content has fulfilled the criteria of material presentation, material accuracy, and the student worksheet presentation technique. However, it does not include an introduction, a table of contents, instructions for use, bibliography, and student assessment sheets, so that it should be revised.

In addition, the data from the language expert review is presented in Table 6.

Table 6. Result of Language Expert Review

No	Aspect	Results and Improvements
1.	Language	The content feasibility, in the language element, generally, has been classified as applicable. However, the terms should follow the common standard. Thus, it should be revised and adjusted Indonesian dictionary.

The review from the graphic expert is presented in Table 7.

Table 7. Review from Graphic Experts

No	Aspect	Results and Improvements
1	Graphic	The graphic design experts conclude that the design of covers and illustrations are pertinent. However, the colors should be revised to be more attractive colors and more contrasting with the content. Besides, the logo on the cover should be changed to be more visible.

Feasibility of Teaching Materials

Table 8 shows the results of the developed teaching material's feasibility level obtained from the validity test completed by the material, linguistic, and graphic experts. The material validity level was obtained from the material expert, one of the numbers of application course teachers for ten grades of Ketintang Vocational High School, Surabaya.

Table 8. Material Expert Validity Test

No	Aspect	Percentage	Criteria
1	Material Coverage	80%	Appropriate
2	Material Accuracy	100%	Very Appropriate
3	Novelty and Context	80%	Appropriate
4	Compliance with laws and constitution	90%	Very Appropriate
5	Presentation Technique	100%	Very Appropriate
6	Material presentation support	90%	Very Appropriate
7	Learning presentation	80%	Appropriate
8	Presentation completeness	85%	Very Appropriate

Following the material feasibility classification form (Riduwan, 2016), the developed student assessment can be classified as very feasible since its average score ranges from 81% -100%. The accuracy of the material, conformity to legal regulations, techniques in presenting data, supporting material presentation, and completeness of presentation obtained very feasible classification with the percentage of 100%, 90%, 100%, 90%, and 85%, respectively. Meanwhile, the material coverage, novelty, contextuality, and learning presentation obtain an 80% score, classified as feasible.

The results of the validity test from the graphic expert are presented in Table 9. The expert is a lecturer in an education technology major department.

Table 9. Result of Validity Test from the Graphic Expert

No	Aspect	Percentage	Criteria
1	Size	100%	Very Appropriate
2	Cover	80%	Appropriate
3	Content Design	78%	Appropriate
4	E- worksheet Design	90%	Very Appropriate

Based on the graphic validity test results, the developed worksheet's size and e-worksheet design are classified as very feasible, with 100% and 90% scores, respectively. Meanwhile, the e-student assessment content design and cover obtained proper scores of 78% and 80%, respectively. From those results, the content design received the lowest score of 78%.

Table 10. Results of Language Validity Test

No	Aspect	Percentage	Criteria
1	The suitability of students' development	100%	Very Appropriate
2	Readability	80%	Appropriate
3	Motivation skill	80%	Appropriate
4	Discretion	80%	Appropriate
5	Coherence and line of thought	90%	Very Appropriate
6	Conformity with Indonesian language rules	80%	Appropriate
7	Use of terms and symbols	80%	Appropriate

The results of the linguistic validity table show that most of the elements attain an 80% score, classified as feasible, such as aspects of readability, motivation ability, straightforwardness, conformity to the use of language or symbols, and symbols following the rules. Meanwhile, the suitability to the students' development receives a score of 100%, categorized as very feasible, while the coherent mindset aspect gets a score of 90%.

Table 11. The Average Validity Test for The Developed Product

No	Aspect	Percentage	Criteria
1	Material Expert	89%	Very Appropriate
2	Graphic Expert	85%	Very Appropriate
3	Language Expert	83%	Very Appropriate
	Average Percentage	85.7%	Very Appropriate

The average validity score obtained from the expert is 85.7%. According to Riduwan (2016), the score range of 81% -100% can be categorized as very feasible. Therefore, generally, the developed product is classified as very valid.

After the experts' reviews and validation, the e-student worksheet was tried out to 95 tenth grade students from the accounting department of Ketintang Vocational High School, Surabaya, accompanied with a questionnaire, using Likert scale, consisting of 1 (Strongly Disagree), 2 (Disagree), 3 (Neutral), 4 (Agree), 5 (Strongly Agree). The questionnaire results indicate the developed product's validity from the students' perspective. The students' responses are presented in Table 12.

Table 12. Results of Students' Responses to the Questionnaire

No	Aspect	Percentage	Criteria
1	Content Eligibility	79%	Understandable
2	Presentation Eligibility	83%	Fully Understandable
3	Language Eligibility	82%	Fully Understandable
4	Graphic Eligibility	81%	Understandable

The results showed that the product's presentation and language feasibility obtained 83% and 82% scores, respectively, classified as very feasible criteria. Meanwhile, the content and graphic feasibility attain the score of 79% and 81%, respectively, categorized as applicable.

DISCUSSION

Based on the initial material analysis carried out in the project-based e-student worksheet, during the online learning, the schools still use conventional teaching materials in the form of collective textbooks lend to students. In addition, students are given teacher-made handouts on the number processing application material.

Based on a preliminary study conducted prior to this study, the number of processing application teachers at Ketintang Vocational High School, Surabaya, encounter challenges in explaining the material to the students in detail. They also argue that the material explanation requires a step-by-step tutorial. Besides, the language used in the students' collective textbooks used as the teaching material is also complicated. Therefore, innovation is required in the teaching materials for the number processing application courses, especially in online learning during a pandemic.

According to Arsyad (2014), in the process of making good teaching material media, teachers should consider several aspects to support the continuity of teaching materials development, namely simplicity, integration, emphasis, balance, shape, and color. This study develops an attractive and easy e-student worksheet. The developed project-based e-students worksheet on the number processing application course contains high-order thinking skill (HOTS) questions and has an attractive design that the students can easily interpret.

The developed e-students worksheet contains three basic competencies: analysis on the required, application format in the general journal, general ledger, auxiliary ledger, and implementation of a worksheet application format.

The product's feasibility has been assessed by several experts, including material experts, linguists, and graphic experts. On the material validity, the aspects of the content and presentation are assessed. Based on that validity test, the product attains a score of 88%, categorized as highly feasible. Therefore, the Project-Based e-student worksheet on the number processing application material is very viable to be tested. Second, the results of the language validity test shows that the product has attained 84% score, categorized as highly feasible. Thus, the e-student worksheet's

language has been classified as very valid. Besides, in the graphic validity test, the product gets an 87% score, indicating that the graphic component in the developed e-student worksheet is very feasible to be tested.

In addition to product feasibility, the project-based e-student worksheet on the number processing application course has also been scored by 90 students through an online questionnaire regarding their understanding of the product's usage. The results showed an 81% score, representing students' high understanding of the e-student worksheet on the number processing application course. Besides, they also give positive comments on the developed worksheet.

CONCLUSION

The findings of this study suggest that the process of project-based e-student worksheet development has been successfully carried out online by implementing number processing application materials for tenth grade, in the form of an e-student worksheet at the Ketintang Vocational High School, Surabaya. The product development meant aims to improve students' online literacy. This project-based e-student worksheet contains high-order thinking skill (HOTS) questions, following the revised version of the 2013 curriculum. The product attains average feasibility of 85.7% from several experts, including material, graphic, and language experts. That validity score is classified as highly feasible to be used as teaching material. Additionally, from the results of the online questionnaire distributed to the students, a score of 81% is obtained. Thus, it indicates that the students place the developed e-student worksheet as a very comprehensible learning instrument.

SUGGESTION

Based on the results of this study, some suggestions have been drawn for some relevant actors. First, the dissemination process in the development stages in this study could not be carried out. Thus, future researchers are expected to carry that stage. Second, future researchers can develop similar research that describes broader basic competencies. Lastly, future researchers can develop a project-based e-student worksheet using a more comprehensive technology.

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