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Author for correspondence:
Endah Oktaviana
e-mail: endahoktaviana2427@gmail.com

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Validity of Application-Assisted Project-Based Learning Liveworksheet on Linear Program Material

Endah Oktaviana[1], Zulfitri Aima[2] and Ramadoni[3]

[1,2,3] Mathematics Education Departement, Faculty of Science and Tecnology, Universitas PGRI Sumatera Barat, Padang, Indonesia

Abstract- The lack of use of technology and communication in the process of learning mathematics and the teaching materials used are still not able to guide students in the learning process. The purpose of this research is to develop an Application-Assisted Project Based Learning (PjBL)-based electronic live worksheet (E-LKPD) with the assistance of a live worksheet application on valid Class X Linear Program material. This type of research is the development of the Plomp model. The instruments used were interview guidelines and questionnaires. The technique of analyzing the data is qualitative and quantitative analysis. The results of the research are the assessments made by mathematicians, namely 92.1% (very valid). The results of the assessment carried out by technology experts were 94.4% (very valid). It is concluded that E-LKPD Based on Project Based Learning Assisted by Liveworksheet Application is very valid and feasible for use by teachers and students.

1. Introduction

21st-century learning demands innovation, creativity, and the use of technology in which teachers and students have an essential role in learning. Currently, students are able to acquire knowledge through various learning sources, not just fixated on the teacher (Ahmaidi & Dewi, 2014). Teachers with the role of facilitator can develop students' abilities with various technological innovations in learning, such as electronic modules, electronic worksheets, and so on Rusman (Rery & Marinsi, 2022). Therefore, students must be able to adjust their understanding of the concept of the material being studied in this modern era (Nurwanti, 2019). The current globalization brings innovation to the world of Education to create a quality generation. An institution must undoubtedly have a curriculum to make reference rules and to achieve a goal in the learning process.

The curriculum used in Indonesia now is the Merdeka Curriculum. The Merdeka Curriculum is a new policy launched by the Minister of Education and Culture of the Republic of Indonesia, Nadiem Makarim, to produce students who excel in various aspects, such as independence, courage, courtesy, and competence. (Hasim, 2020). The Merdeka Curriculum Q&A Pocket Book states that student activities in the Merdeka Curriculum consist of intra-curricular, extra-curricular, and projects to strengthen the Pancasila student profile. (Rachmawati, 2022). Projects to strengthen Pancasila student profiles can be carried out by training students to explore knowledge and problems that occur in the surrounding environment (Vhalery, 2022). This learning can be carried out by applying appropriate learning models, such as the Project-Based Learning model.

Project Based Learning (PjBL) is a learning model whose core activities are implementing project-based activities. This model leads students to be able to design a problem and find their solution (Arisanty, Hastuti, Setiawan, 2020). Students are asked to explore, assess, interpret, and synthesize information. PjBL is a learning model that invites students to think creatively, take part in performances, and experience first-hand what they are doing.

Mathematics is one of the subjects that has an essential role in school; mathematics is a science that is widespread because it is used by various teaching and is used in everyday life (Ramadoni & Boas, 2023). Mathematics is a subject that has an essential role in increasing the progress of science and technology (IPTEK). It causes mathematics to be a subject taught from elementary school to university (Haryono & Ramadoni, 2022). Mathematics subjects, according to Lestari (2018), is a subject that is considered complex, less attractive, and tedious by students. In learning mathematics, students should be accustomed to gaining understanding from experience through the process of identifying the properties that are owned and not owned by a mathematical object. Given this, in learning mathematics at school, teachers should be able to choose and use strategies, approaches, methods, and media that involve students in learning, both mentally, physically, and socially, so as to create active, creative, and independent mathematics learning.

In learning, the teacher's duty is to provide facilities to students in the teaching and learning process; the teacher must be able to present material concisely or efficiently to understand and help students solve the problems given. The process of learning mathematics is a process of teacher-student interaction to achieve a learning goal, and students are simultaneously instructed as students and become a learning process. The success or failure of learning objectives is reflected in student learning outcomes (Hesti Filmiari et al., 2023). One of the facilities in learning that can be given to students, according to Pardede (2018: 3), is the Student Worksheet (LKPD).

As technology develops, LKPD can experience innovation in terms of presentation, one of which is integrated with electronic media or a technology known as E-LKPD Adilla (Zahroh, 2021). E-LKPD can be accessed easily either via a PC/laptop or smartphone. Pictures and videos support the data on the E-LKPD. Questions on the E-LKPD can be answered immediately by students without having to enter an active link to go to the Google form or the like, and the results of working on the e-LKPD by students after clicking the "Finish" menu will then be automatically sent to the educator's email (Zahroh, 2021).

Therefore, an E-LKPD is needed that can be used by teachers and students in learning mathematics, one of which is the Liveworksheet, which is the answer to this challenge. Liveworksheet is one of the media assisted by electronic media, which contains text, images, animations, and videos that are more effective so that students don't get bored quickly.

Many previous researchers have researched Electronic LKPD. One of the studies relevant to this research is a research conducted by Bombang et al. (2022) entitled "Development of Electronic LKPD Material for Building Flat Side Space Using the Liveworksheet Application for Class VIII Students of SMP Negeri 17 Malang". The results showed that the validity aspect of the E-LKPD product developed obtained a percentage of 87.5% with an excellent category and did not need to be revised. Meanwhile, in the effectiveness aspect, the percentage of completeness of student scores was obtained at 90%, indicating that E-LKPD was included in an outstanding level of effectiveness.

In addition, research conducted by Putri & Astawan (2022) with the title "Development of Interactive E-LKPD with a Project-Based Learning Model for Building Classroom V Elementary School Materials." The results of calculating the percentage of material experts, media experts, practitioners or teachers, and students, respectively, are 92%, 95%, 96%, and 92% with very good predicates. Through the results of testing the validity of the product, it can then be concluded that the E-LKPD of Elementary Schools is declared valid and suitable for use in learning activities.

Based on the description above, it is fascinating and essential to research the use of Project Based Learning (PjBL) in mathematics learning as outlined in the title "Project Based Learning (PjBL) E-LKPD Development Assisted by Liveworksheet Applications on Linear Program Material for Class X TKJ SMK

Taman Siswa Padang. Based on the background above, a problem can be formulated, namely, How to develop E-LKPD Based on Project Based Learning (PjBL) Assisted by Liveworksheet Application on valid Class X Linear Program Material of TKJ SMK Tamansiswa Padang.

2. Methods

This type of research is research and development (R&D). According to Sugiyono (2016:30), research and development methods are research methods used to research, design, produce, and test the validity of the products that have been produced. This study aims to develop a Project Learning (PjBL) E-LKPD Assisted by Liveworksheet Application on Linear Program Material for Class X TKJ SMK Taman Siswa Padang, which is valid and practical. Plomp & Nieveen (2013) suggest that the Plomp model consists of 3 phases, namely preliminary research, prototyping phase, and assessment phase. In the preliminary research stage, among others used are needs analysis sheets, curriculum, students, observation sheets, and interview guidelines. Then, in the prototyping phase, self-evaluation and expert review are carried out. In this research, two stages were carried out. Namely, the preliminary research stage and prototyping phase, the validation section for the practical stage, and the assessment phase carried out in the following research. The research instruments used were interview guidelines and product validity sheets. Data analysis techniques in the development of this E-LKPD are qualitative and quantitative. Qualitative data were obtained from criticism and suggestions by the validator, while quantitative data were obtained from questionnaires given to experts. First, data analysis at the preliminary analysis stage used descriptive techniques in the form of data from needs analysis, curriculum, and concepts, as well as data from interviews. Second analysis of validity data. The results of the Liveworksheet-based E-LKPD validity analysis. Based on the validation sheet, several steps are taken:

(a) Give an assessment score as in Table 1.

Table 1. E-LKPD Validation Score

Symbol	Description	quality
SS	Strongly agree	5
S	Agree	4
RR	Doubtful	3
TS	Disagree	2
STS	Strongly Disagree	1

Source: *Modified dari (Riduwan, 2010)*

(b) Perform validation-level calculations

$$Validation\ Value = \frac{Total\ score\ obtained}{Maximum\ Score} \times 100\%$$

The percent value is interpreted in Table 2 to measure the validity of the product developed in this study.

Table 2. E-LKPD Validation Criteria

Percentage (%)	Validity Category
80 < NV ≤ 100	Very valid
60 < NV ≤ 80	Valid
40 < NV ≤ 60	Valid Enough
20 < NV ≤ 40	Invalid
0 ≤ NV ≤ 20	Invalid

Source: *Modified dari (Riduwan, 2010)*

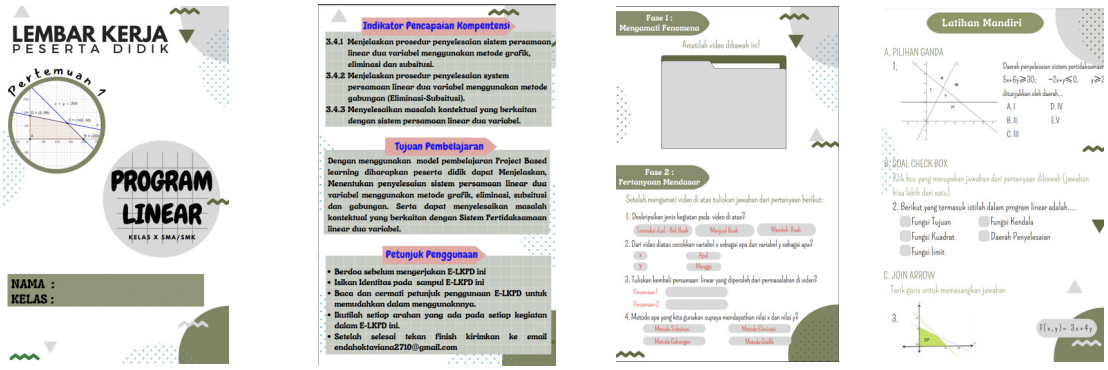
3. Results and Discussion

The data presented in this section is data collected during the process of developing E-LKPD learning media using the live worksheets application. Each data is grouped by type and stage of development. The first is the preliminary research stage (preliminary investigation); data at this stage are obtained from curriculum analysis, student analysis, printed book analysis, and needs analysis. The results of the

curriculum analysis showed that the curriculum used was appropriate but still in the adjustment stage. The results of the analysis of the characteristics of the students show that students do not like the books used by the teacher because there is too much writing and not enough pictures; students also do not like the activities carried out in learning, such as taking lots of notes, students prefer to practice more dominantly.

The results of the analysis of printed books and textbooks are presented entirely and systematically. The material presented is in accordance with the competencies that students must achieve. Still, students are less interested in learning to use textbooks because the language used in textbooks is too standard and contains a lot of writing and few pictures. The results of the needs analysis show that students need teaching materials that are able to attract the attention of students so that they are interested in learning, such as the use of E-LKPD by utilizing electronics, which are almost owned by every student, so that it can support students' learning interests.

In the second stage of the Prototyping Phase, the data were obtained from the initial design of the E-LKPD using the live worksheet application consisting of Cover, Introduction, Contents, and Exercises. The shape of the design can be seen in Figure 1.



Cover *Introduction* *Contents* *Exercise*

Figure 1. Form of E-LKPD Assisted with Liveworksheet Application

Furthermore, the data was obtained from self-evaluation; in self-evaluation, there were several improvements, one of which was that the writing was still not neat, and there were errors in typing and background elements. It was repaired by tidying up the writing, changing the mistakes in typing, and changing the background elements as well. The form of improvement can be seen in Figure 2.

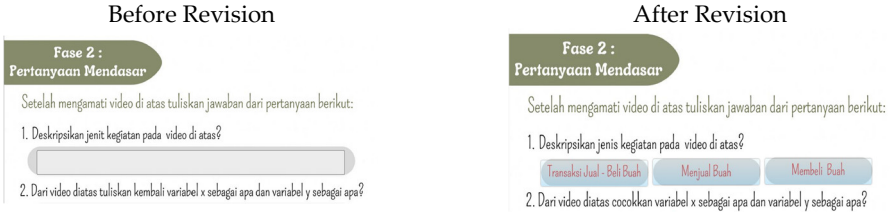


Figure 2. Revision of Typing Based on Self-Evaluation

Then, the validity data, the data from the results of the validator's assessment, were described and analyzed qualitatively and quantitatively. The results of the E-LKPD validation sheet use live worksheets for mathematicians and technology experts. The percentage obtained from the results of the validation sheet can be seen in Table 3.

Table 3. Mathematician Validation Results

Validators	Final score	Category
Mathematician	92,1%	Very Valid
Tech Expert	94,4%	Very Valid
Average Percentage	93,25%	Very Valid

Based on Table 3, a percentage of 93.25% is obtained with a very valid category by mathematicians and

technology experts, so the E-LKPD is valid for use by students and teachers. Following are some suggestions from mathematicians and technology experts for improving E-LKPD.

Figure 3. Phase 1 & 2 Revision Forms of Mathematicians

Based on Figure 3 in phase 1, observing the phenomenon of validators suggesting sources in the video, then in phase 2, the fundamental question number 1 validators suggest answer choices using the check method. The initial letter in the word "Minute" in question number 2 and the word "Your opinion" in question number 3 are changed to lowercase.

Figure 4. Technologist Font Revision Form

Based on Figure 4 on the type of font used for the E-LKPD answer, the size is too small, and the color used is not attractive, so the teacher has difficulty correcting students' answers. Then, validators suggest fixing the font type of interest again and adjusting the font size to E-LKPD.

The overall validation score of mathematicians and technologists from the validation aspects of E-LKPD using the live worksheet application on linear program material obtained a final score of 93%. It shows that E-LKPD using the live worksheet application is very valid. E-LKPD validation is seen in 5 aspects, namely content feasibility, language feasibility, didactics or presentation, Graphic or Display Feasibility, and Ease of Use. It can be concluded that the content of E-LKPD shows the suitability of the Project Learning model appropriately. The use of language in E-LKPD is in accordance with Indonesian rules so that it is easy to understand. The presentation of E-LKPD is clear and systematic; the display of E-LKPD can convey information well. E-LKPD is very interesting and creative; E-LKPD is developed efficiently to carry, easy to access, and easy to use (Bakar et al., 2020).

This opinion is relevant to research conducted by Putri & Astawan (2022) entitled "Development of Interactive E-LKPD with Project-Based Learning Model for Building Classrooms V Elementary School Materials." The results of calculating the percentage of material experts, media experts, practitioners or teachers, and students, respectively, are 92%, 95%, 96%, and 92% with very good predicates. Through the results of testing the validity of the product, it can then be concluded that the E-LKPD of Elementary Schools is declared valid and suitable for use in learning activities (Harisman et al., 2023).

4. Conclusion

Based on research and data analysis that has been carried out, it can be concluded that E-LKPD using the live worksheet application on linear program material by mathematician validators obtained a percentage of 92.1% with a very valid category. Technology expert validators obtained a percentage of

94.4% with a very valid category. Then, the average of the two validators was obtained at 93.25% with the category of very Valid. Based on the percentage above, this proves that E-LKPD using the live worksheet application on linear program material is feasible to use.

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