Al-Bidayah : jurnal pendidikan dasar Islam
Volume 13, Number 2, December 2021
ISSN: 2549-3388 (online)
Available online at https://jurnal.albidayah.id
Submitted: October 16, 2021, Accepted: December 27, 2021

DEVELOPING ELECTRONIC STUDENT-BASED PROBLEM WORKSHEET FOR PRIMARY SCHOOL STUDENT

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DOI: 10.14421/al-bidayah.v13i2.699

ABSTRACT

The shift from face-to-face learning to online learning during the COVID-19 pandemic has made printed teaching materials irrelevant. Teaching materials in online learning need to be designed to be more interactive in the form of electronic teaching materials in order to create two-way communication between teaching materials and students because online learning requires maximum learning autonomy from students. The irrelevance of existing teaching materials causes various learning problems in primary schools such as the teaching materials used do not encourage students' willingness to learn, some students experience learning backwards, and teachers need extra time to correct students' assignments. This study aims to develop electronic student worksheets based on Problem Based Learning (PBL) in primary schools. This development research refers to the ADDIE model as the model consists of systematic stages in an effort to solve learning problems according to the characteristics of the learner. The subjects of this study were 40 grade 3 students of Madrasah Ibtidaiyah (Islamic Primary School) Pembangunan Lamongan. The results showed 1) the validity of the electronic student worksheets in the very valid category based on the assessments of linguists, material experts, design experts, and learning experts, 2) The attractiveness of electronic student worksheets in the very interesting category. Based on the results of this study, the use of electronic student worksheets is appropriate to be used to support the thematic learning process.

Keywords: development research; electronic student worksheet; primary school problem based learning; student

INTRODUCTION

Teaching materials are defined as a set of materials that are systematically arranged to support the implementation of effective learning and to create an environment or atmosphere that allows students to learn.[1] It is important to use teaching materials because they can improve the quality of learning. The availability of representative (appropriate) and quality teaching materials can foster students' enthusiasm for learning and increase interaction in learning.[2] In addition, the development of teaching materials can also be used as an effort so that students can develop optimally by providing wider services for students.[3] The importance of using teaching materials in learning is as a

[1] Andi Prastowo, *Pengembangan Bahan Ajar Tematik Tinjauan Teoritis Dan Praktik Edisi Kedua* (Jakarta: Kencana, 2016), 238.
[2] Prastowo, 239.
[3] Prastowo, 241.

medium for delivering information,[4] like the Qur'an which was revealed to the Prophet Muhammad SAW, to be conveyed to his people, according to the word of Allah SWT in the letter An-Nahl (16:44).

بِٱلْبَيِّنَٰتِ وَٱلزُّبُرِ ۗ وَأَنزَلْنَآ إِلَيْكَ ٱلذِّكْرَ لِتُبَيِّنَ لِلنَّاسِ مَا نُزِّلَ إِلَيْهِمْ وَلَعَلَّهُمْ يَتَفَكَّرُونَ

We sent them ˹with clear proofs and divine Books. And We have sent down to you O Prophet ˹the Reminder, so that you may explain to people what has been revealed for them, and perhaps they will reflect. (Q.S. An-Nahl, 16: 44.)

Based on the verse above, Allah SWT explains that the existence of the Qur'an is a source / material that is able to explain what has been revealed by Allah SWT to the Prophet Muhammad SAW. As well as teaching materials that can be used by teachers as a tool to make it easier to convey information that is more precise, clear, and easy to understand, making it easier for students to accept the material presented.[5]

When the pandemic spreaded in Indonesia, the government issued several policies such as working from home, studying from home, and large-scale social restrictions. This affects various fields, one of which is education. So that learning is carried out online or remotely but with the achievement and goals of education that remain proper.[6] In online learning, teacher-student interactions are limited, so students are more dominant in interacting with teaching materials.

Nonetheless, the teaching materials used during the pandemic are the same as those used before the pandemic, causing several problems. Based on the results of observations and interviews conducted in four primary schools in Lamongan area, it was concluded that there were several problems during online learning: (1) students needed other learning resources to understand the material during online learning, (2) the teaching materials did not motivate students in learning, (3) the teacher needed extra time to correct students' assignments. Based on the problems found, it is necessary to develop interactive electronic teaching materials in online learning, one of which is an electronic student worksheet based on Problem Based Learning.

[4] Prastowo, 240.

[5] Halil Ibrahim Saglam, "An Investigation On Teaching Materials Used In Social Studies Lesson," *TOJET: The Turkish Online Journal Of Educational Technology* 10, no. 1 (2011): 36.

[6] Sulia Ningsih, "Presepsi Mahasiswa Terhadap Pembelajaran Daring Pada Masa Pandemi Covid - 19," *JINOTEP (Jurnal Inovasi Teknologi Pembelajaran) Kajian Dan Riset Dalam Teknologi Pembelajaran* 7, no. 2 (2020): 125, https://doi.org/10.17977/um031v7i22020p124.

Electronic student worksheets are a set of materials in the form of sheets in electronic form in which it contains a summary of material that contains elements of images and audio visuals, as well as practice questions that must be done by students referring to the objectives in learning.[7] Using electronic student worksheets ease students to understand the material when learning online as they are accompanied with learning videos that provide concrete observations so that students' understanding can be comprehensive. In addition, there are practice questions that improve students' understanding of the material, and train students' independence.[8]

In addition, the development of electronic student worksheets needs to pay attention to direct student involvement in the learning process, so that electronic student worksheets need to be prepared based on Problem Based Learning (PBL), namely learning that can improve critical thinking skills in solving problems and can increase new knowledge.[9] This is in line with the basic view of the 2013 curriculum that knowledge cannot be obtained directly but by seeking, processing, and using knowledge and providing stimulants to students so that they can think critically.[10] With PBL-based, it can activate students in developing problem-solving skills, while simultaneously encouraging students to solve problems independently,[11] and be able to filter the information obtained so that learning becomes meaningful.[12]

If teaching materials in the form of PBL-based electronic student worksheets are applied to grade 3 thematic learning and adapted to the material in theme 6 sub-theme 4 saving energy, it can provide alternative digital teaching materials for teachers, to assist teachers in carrying out learning with changes in the current learning system.

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[7] Ermelida Yosefa Awe and Maria Imelda Ende, "Pengembangan Lembar Kerja Siswa Elektronik Bermuatan Multimedia Untuk Meningkatkan Kemampuan Kognitif Siswa Pada Tema Daerah Tempat Tinggalku Pada Siswa Kelas IV SDI Rutosoro Di Kabupaten Ngada," *DIDIKA:Wahana Ilmiah Pendidikan Dasar* 5, no. 2 (2019): 51, https://doi.org/https://doi.org/10.29408/didika.v5i2.1782.

[8] Andi Prastowo, *Panduan Kreatif Membuat Bahan Ajar Inovatif* (Yogyakarta: Diva Press, 2015), 206.

[9] Maya Agustina, "Problem Based Learning (PBL): Suatu ModelPembelajaran Untuk Mengembangkan Cara Berpikir Kreatif Siswa," *At-Ta'dib: Jurnal Ilmiah Pendidikan Agama Islam* 10, no. 2 (2018): 164–73. 166.

[10] Muhammad Fathurrohman, *Model - Model Pembelajaran Inovatif Alternatif Desain Pembelajaran Yang Menyenangkan* (Yogyakarta: Ar - Ruzz Media, 2015). 113.

[11] Tri Kurnia Badu and Muh. Syihab Ikbal, "Perbedaan Pemahaman Konsep Fisika Siswa Melalui Model Problem Based Learning Dan Pembelajaran Interaktif," *Uniqbu Journal of Exact Sciences (UJES)* 1, no. 2 (2020): 23–30, https://doi.org/https://doi.org/10.47323/ujes.v1i2.27. 24.

[12] Ummu Khairiyah and Silviana Nur Faizah, "Respon Siswa Terhadap Penggunaan Modul Tematik Dalam Meningkatkan Kemampuan Berpikir Kritis," *Jurnal Ilmiah Pendidikan Dasar Islam* 2, no. 1 (2020): 1–8, https://doi.org/http://dx.doi.org/10.33474/elementeris.v2i1. 3.

Electronic student worksheets can be used by teachers when the thematic learning process is online, with teaching materials in the form of interesting electronic student worksheets that can be used as intermediaries in improving student understanding, besides the developmental characteristics of grade 3 children are at the concrete operational stage, such as thinking only on object of direct experience.[13] According to Ali Mudlofir and Evi Fatimatur Rusydiyah, this development is characterized by children who manage using logical thinking skills but limited to concrete thing, not abstract.[14]

In addition, electronic student worksheets can improve digital literacy in students so that students have wider learning experience, because knowledge and skills in utilizing digital technology are currently needed to keep up with the increasingly rapid developments of the era. According to Greene, Yu, and Copeland, students should research and compile digital information, even though they are generally considered technologically savvy, but they find it difficult to use it effectively. Thus, students should plan, monitor, and control matters related to information management and critical thinking skills.[15]

Research related to electronic student worksheets has been widely carried out. As in Haqsari (2014), this research produces electronic student worksheets based on multimedia on spreadsheet software material with the eligibility level of media experts and material experts in the very good category, as well as the user eligibility level in the good category.[16]

The development of electronic student worksheets containing multimedia is also the topic of Awe and Ende's research (2019), the results of the study show that 1) the electronic student worksheets containing multimedia produced have a feasibility level of linguists, materials, learning design, multimedia in the very good category, 2) user tryout results in the very good category, and 3) electronic student worksheets proved to be

[13] Ridho Agung Juwantara, "Anilisis Teori Perkembangan Kognitif Piaget Pada Tahap Anak Usia Operasional Kongkret 7 - 12 Tahun Dalam Pembelajaran Matematika," *Jurnal Ilmiah Pendidikan Guru Madrasah Ibtidaiyah* 9, no. 1 (2019): 27–34, https://doi.org/http://dx.doi.org/10.18592/aladzkapgmi.v9i1.3011. 30.

[14] Juwantara. 30.

[15] Jeffrey Alan Greene, Seung B. Yu, and Dana Z. Copeland, "Measuring Critical Components of Digital Literacy and Their Relationships with Learning," *Computers and Education* 76 (2014): 55–69, https://doi.org/10.1016/j.compedu.2014.03.008.

[16] Rizki Haqsari, "Pengembangan Dan Analisis E – LKPD (Elektronik Lembar Kerja Peserta Didik) Berbasisi Multimedia Pada Materi Mengoperasikan Software Spreadsheet" (Universitas Negeri Yogyakarta, 2014), 83.

effective in improving student learning mastery.[17] Based on the problems that have been described, a teaching material is needed, namely electronic student worksheets based on Problem Based Learning in thematic learning at the basic education level.

RESEARCH METHOD

This study is development research using the ADDIE development model. The selection of this model is based on the consideration that this model was developed systematically and based on the theoretical foundation of learning design. This model is structured programmatically with a systematic sequence of activities in an effort to solve learning problems related to learning resources that are in accordance with the needs and characteristics of students.[18] In addition, according to Made Tegeh, the ADDIE model provides an opportunity to evaluate development activities at each stage. This has a positive impact on the quality of product development, because with the evaluation at each stage it can minimize the error rate or product shortage at the final stage of this model.[19] The ADDIE model consists of five steps named analysis, design, development, implementation, and evaluation.[20]

This research was conducted in November – May 2021 at Madrasah Ibtidaiyah (Islamic Primary School) Pembangunan Lamongan, East Java, Indonesia. Expert validations in this development were learning material experts, design/media experts, and language experts. The experimental subjects in the study were 40 students as test subjects in three stages (individual tryouts, small group tryouts, field tryouts) and practitioners of thematic learning.

The data collection instruments in this study were observation, interviews, and questionnaires. Firstly, observation is data collection where the researcher records information as the researcher witnessed during the study.[21] Through observation,

[17] Awe and Ende, "Pengembangan Lembar Kerja Siswa Elektronik Bermuatan Multimedia Untuk Meningkatkan Kemampuan Kognitif Siswa Pada Tema Daerah Tempat Tinggalku Pada Siswa Kelas IV SDI Rutosoro Di Kabupaten Ngada," 48.

[18] Rahmat Arofah Hari Cahyadi, "Pengembangan Bahan Ajar Berbasis ADDIE Model," *Halaqa: Islamic Education Journal* 3, no. 1 (2019): 39, https://doi.org/10.21070/halaqa.v3i1.2124.

[19] I Made Tageh, I Nyoman Jampel, and Ketut Pudjawan, *Model Penelitian Pengembangan* (Yogyakarta: Graha Ilmu, 2014), 42.

[20] Tageh, Jampel, and Pudjawan, *Model Penelitian Pengembangan*.

[21] Herman Khunaivi, "Developing 'Beberan' Game Board As an Innovative Media To Improve Students' Speaking Skills of Pre-Service Teachers of Islamic Elementary Education," *Al-Bidayah : Jurnal Pendidikan Dasar Islam* 13, no. 1 (2021): 150, https://doi.org/10.14421/al-bidayah.v13i1.314.

researchers will know the initial state in the field (school) to analyze the needs that will be used as starting material for the development of electronic student worksheets. Secondly, interviews were conducted to find certain information about students, used to find out problems that could be used as a reference in developing electronic student worksheets.[22] Lastly, questionnaires were used to collect data on student characteristics, expert tryouts (materials, design, language, learning), individual tryouts, small group tryouts and field tryouts, learning practitioner tryouts, and the attractiveness of using electronic student worksheets. has been validated with a score of 90.76% in the very feasible category and did not need to be revised.

The media expert validation questionnaire was adapted from Kiki Septria's research,[23] the linguist validation questionnaire was adapted from Zunaidah and Amin's research,[24] the material expert validation questionnaire was adapted from Tageh, et al.[25] Quantitative data analysis techniques were used to process the data obtained through questionnaires in the form of descriptive percentages with a five-scale qualification in giving meaning and making decisions to revise the teaching materials used.

RESULT AND DISCUSSION

Analysis

The analysis stage is the initial stage before designing the e-LKS. At this stage, performance analysis, student analysis, material analysis, and analysis of learning objectives were carried out[26].

a. Performance Analysis

This activity is intended to raise problems faced by teachers and students in learning.[27] Based on the results of observations and interviews at SD/MI in the Lamongan

[22] Khunaivi, "Developing 'Beberan' Game Board As an Innovative Media To Improve Students' Speaking Skills of Pre-Service Teachers of Islamic Elementary Education."

[23] Kiki Septaria, Binar Ayu Dewanti, and Mimid Iza El Afidah, "Development Of Module Disaster Mitigation Based On Stem For Secondary Schools," *Jurnal Peneliltian Pendidikan IPA* 5, no. 2 (2020): 61–68, https://doi.org/https://doi.org/10.26740/jppipa.v5n2.p61-68.

[24] Farida Nurlaila Zunaidah and Mohamad Amin, "Pengembangan Bahan Ajar Matakuliah Bioteknologi Berdasarkan Kebutuhan Dan Karakter Mahasiswa Universitas Nusantara PGRI Kediri," *Jurnal Pendidikan Biologi Indonesia* 2, no. 1 (2016): 19–30, http://repository.um.ac.id/id/eprint/60472.

[25] Tageh, Jampel, and Pudjawan, *Model Penelitian Pengembangan*, 91–93.

[26] Cahyadi, "Pengembangan Bahan Ajar Berbasis ADDIE Model," 36.

[27] Marfilinda Atma Sari Subekti and Rully Charitas Indra Prahmana, "Developing Interactive Electronic Student Worksheets through Discovery Learning and Critical Thinking Skills During Pandemic Era,"

area, it was concluded that several learning problems during the Covid-19 pandemic include: (1) students needed other learning resources to understand the material during online learning, (2) the availability of teaching materials supporting thematic books was still limited, (3) the teaching materials used did not motivate students in learning (4) the teacher needed extra time to correct students' assignments.

b. Students' Analysis

The students' analysis covers their initial knowledge, interests, talents in general, learning styles, language skills, attitudes, and other related aspects.[28] Grade 3 students at MI Pembangunan Lamongan were 8 to 9 years old on average and included in the phase of concrete operational development. In this development phase, children could not think abstractly, children had the ability to think logically but only with concrete objects.[29]

c. Material Analysis

Material analysis focused on the thematic learning of the Energy theme and its changes to the energy saving sub-theme consisting of 6 lessons with learning material content: (1) Indonesian language subject with the main material presenting information in oral, written, visual, and or environmental exploration forms, (2) PPKn (Civil Education) material basic rights and obligations, (3) Mathematics with the basic material of circumference and area of flat shapes with non-standard units, (4) PJOK (Physical Education) with locomotor, non-locomotor and manipulative basic movements, and (5) SBDP (Applied Arts) with cutting, folding, and connect.

d. Learning Objective Analysis

Analysis of learning objectives is a necessary step to determine the abilities or competencies that students need to possess.[30] It is intended that the products made still refer to the learning objectives that will be achieved by students after using development products in learning both knowledge, attitudes, and skills.

Based on the analysis of the problems that have been described, a learning material is needed that contains material in the form of images and audio-visuals and is

Mathematics Teaching-Research Journal 13, no. 2 (2021): 137–74; Cahyadi, "Pengembangan Bahan Ajar Berbasis ADDIE Model."

[28] Made Tegeh and Dkk, *Model Penelitian Pengembangan* (Yogyakarta: Graha Ilmu, 2014). 44.

[29] Juwantara, "Anilisis Teori Perkembangan Kognitif Piaget Pada Tahap Anak Usia Operasional Kongkret 7 - 12 Tahun Dalam Pembelajaran Matematika."

[30] Cahyadi, "Pengembangan Bahan Ajar Berbasis ADDIE Model."

accompanied by an evaluation. Thus, it is necessary to develop electronic student worksheets in helping students understand concrete learning materials.

Design

At this stage, the focus is on three activities, namely the selection of materials relevant to student characteristics and competencies to be achieved, learning strategies, forms and methods of assessment and evaluation. The results of the analysis stage were then used as a reference in the design stage, in which the development of electronic student worksheets was arranged based on five stages of Problem Based Learning including 1) Defining the problem, 2) Independent study, 3) Investigation, 4) Knowledge exchange, 5) Assessment.[31]

Figure 2 is a storyboard of electronic student worksheets arranged based on five stages of PBL with the characteristics of scientific thinking. Each activity in the PBL stage trained students to improve their thinking skills.[32] In addition, PBL helps students to have autonomous learning skills, where students are able to control their learning process rather than being directed by the teacher.[33]

[31] Endah Amalia, Edi Surya, and Edi Syahputra, "The Effectiveness of Using Problem Based Learning (PBL) in Mathematics Problem Solving Ability for Junior High School Students," *International Journal of Advance Research and Innovative Ideas in Education* 3, no. 2 (2017): 3402–6, https://doi.org/16.0415/IJARIIE-4659.

[32] Rustam E Simamora, Dewi Rotua Sidabutar, and Edy Surya, "Improving Learning Activity and Students' Problem Solving Skill through Problem Based Learning (PBL) in Junior High School," *International Journal of Sciences: Basic and Applied Research (IJSBAR) International Journal of Sciences: Basic and Applied Research* 33, no. 2 (2017): 321–31, http://gssrr.org/index.php?journal=JournalOfBasicAndApplied.

[33] Lisette Wijnia, Sofie M M Loyens, and Remy M J P Rikers, "The Problem-Based Learning Process," in *The Wiley Handbook of Problem-Based Learning* (John Wiley & Sons, Ltd, 2019), 273–95, https://doi.org/https://doi.org/10.1002/9781119173243.ch12.

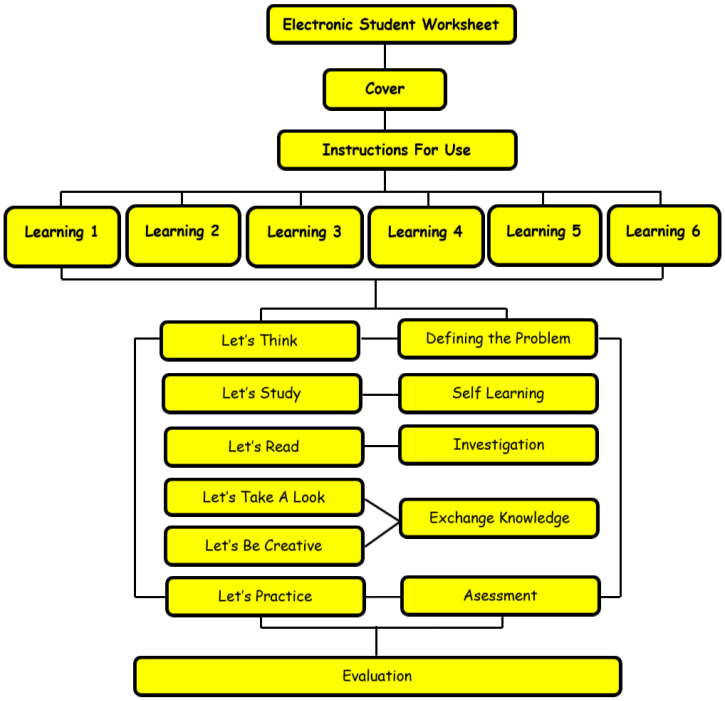

Figure 2. Storyboard of Electronic Working Sheets

Development

The development stage involves product manufacturing and product testing.[34] This stage is the continuity to the previous stage, so that product development activities begin by compiling instructions for use, materials, evaluation and display of electronic student worksheets with Microsoft Word 2019. While the image design on the e-LKS uses Photoshop CS3 and Canva. Afterwards, the draft was developed into an electronic student worksheet using the live worksheet application. Furthermore, the electronic student worksheets produced were tested for feasibility by material experts, design experts, and linguists with validator identities as shown in Table 1.

Table 1. Description of Validators

Musa'adatul Fitriyah, M.Pd.I.	Validating electronic students' worksheets as learning material expert. Validating students' response instrument.
Kiki Septaria, M.Pd.	Validating electronic students' worksheets as media/design expert.
Abdul Kholiq, M. Pd.	Validating electronic students' worksheets as linguistic expert.

[34] Mohammad Taufiq Abdul Ghani and Wan Ab Aziz Wan Daud, "Adaptation of Addie Instructional Model in Developing Educational Website for Language Learning," *Global Journal Al-Thaqafah* 8, no. 2 (2018): 7–16, https://doi.org/10.7187/GJAT122018-1.

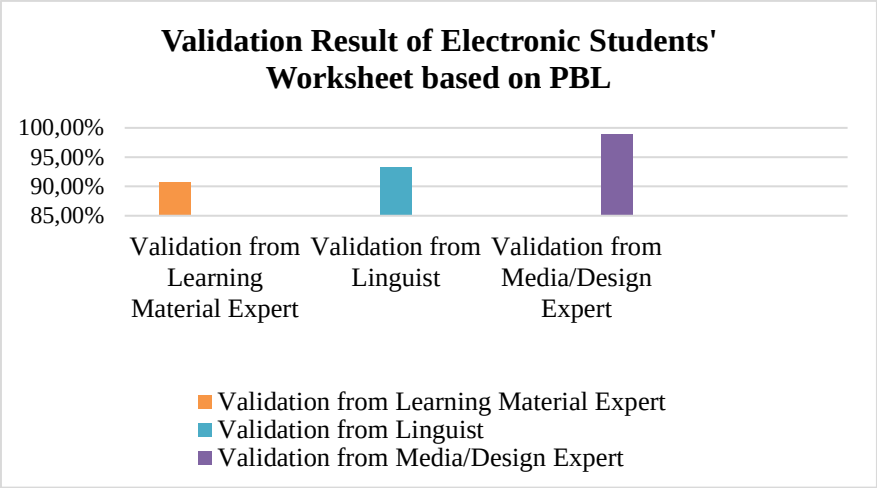

Figure 1. Validation Result of Electronic Students' Worksheet based on PBL

The language validation was based on students' development appropriateness, communicativeness, coherence, and flow of thought accuracy. Figure 1 shows that the score for language validation is 93.33%, with a total score of 28 from the maximum 30. The score is included as very good criteria. Therefore, no revision is needed.[35] This means that the validity of the electronic student worksheet from the linguistic side has very good validity.

Furthermore, in the validation of design/media experts, the aspects assessed were the depth of the material, accuracy of facts, concept truthfulness, recentness, periodic reference, fostering curiosity, academic skills development, social skills development, concrete examples availability, and clarity of message.[36] Figure 1 shows that the score for media/design validation is 98.97%. The score is included as very good criteria. Therefore, no revision is needed. Thus, this worksheet can be tested with improvements according to suggestions.

Related to the media/design validation, balance, image presentation, and writing method should be carefully considered.[37] According to Asyhar, in writing media, it must

[35] Tageh, Jampel, and Pudjawan, *Model Penelitian Pengembangan*. 83.

[36] Septaria, Dewanti, and Afidah, "Development Of Module Disaster Mitigation Based On Stem For Secondary Schools."

[37] Eka Yuni Andriyani, M. Didik Wiwik Ernawati, and Affan Malik, "Pengembangan Lembar Kerja Peserta Didik Elektronik Berbasis Proyek Pada Materi Termokimia Di Kelas XI SMA," *Indonesian Society Of Integrated Chemistry* 10, no. 1 (2018): 6–11, https://doi.org/https://doi.org/10.22437/jisic.v10i1.5306. 10.

be presented according to the material that can be written in writing or pictures, taking into account the size and type and balance in the developed media.[38]

Components of electronic student worksheet teaching materials include titles, instructions for using electronic student worksheets, basic competencies and indicators, supporting information, summaries, exercises, assessments, and references. This is in accordance with the criteria in the selection of appropriate teaching materials according to Andi Prastowo. Firstly, the principle of relevance, meaning that learning materials should be in accordance with the achievement of competency standards and the basic competencies. Secondly, the principle of consistency, meaning that teaching materials should have a constant value, so that the basic competencies is in accordance with those students should achieve. Thirdly, the principle of sufficiency. This means that teaching materials must be adequate to help students master the basic competencies being taught.[39]

Meanwhile, qualitative data from three expert validations were concluded and used as material for revision of the development of electronic student worksheets. Firstly, based on the suggestions and comments of design experts, image presentation should be carefully considered. In general, the developed electronic student worksheets are good and good according to design experts. Secondly, suggestions and comments from material experts was the indicators adjusted to the Ministry of Education and Culture standards, clarifying instructions for using student worksheets in each lesson, content framework, adjusting materials for competencies and indicators, compiling final tests containing lessons 1-6, and including bibliography on the end of the electronic student worksheet. Thirdly, based on the suggestions and comments of linguists, there are some improvements, namely regarding language rules and the lack of liaison between chapters.

Implementation

At the implementation stage, the development results are applied in the learning process to determine the effectiveness, attractiveness, and efficiency of its use.[40] In this study, the application of electronic student worksheets was limited to determine the interest in the learning process as shown in Figure 2. This stage consisted of 3 cycles

[38] Andriyani, Ernawati, and Malik. 10.

[39] Prastowo, *Panduan Kreatif Membuat Bahan Ajar Inovatif*. 242.

[40] E. Widyastuti and Susiana, "Using the ADDIE Model to Develop Learning Material for Actuarial Mathematics," in *Journal of Physics: Conference Series*, vol. 1188, 2019, https://doi.org/10.1088/1742-6596/1188/1/012052.

consisting of individual tryouts conducted on a limited basis, conducted by 3 students, small group tryouts conducted by 6 people, and field tryouts were conducted by 31 students.

The results of the analysis of the diagram in Figure 3. show that the individual test got a score of 94.44%, the small group tryout got a score of 95.83% and the field tryout got a score of 95.83%. Based on the results of the analysis of the attractiveness of students, the average percentage was 95.36%, and the results of the assessment of learning practitioners were 96.92% with very good qualifications. So that the PBL-based electronic student worksheets are categorized as very interesting.

The selection of teaching materials should also be adjusted with the level of students' intellectual development. This is in accordance with the theory founded by Jean Piaget that the adjustment of students' cognitive development determines success in learning. The example of the adjustment is that students can conduct experiments with their friends assisted by questions from the teacher who can provoke students so that students can actively search and find things from the environment.[41] Interesting electronic student worksheets are good medium to improve student's understanding. Additionally, the developmental characteristics of grade 3 children are at the concrete operational stage thinking only on objects from direct experience.[42] This development is characterized by children already using logical thinking skills but only on objects that are concrete and cannot think abstractly.[43] The use of electronic student worksheets is also accompanied by learning videos that provide concrete or real experiences and observations in accordance with the development of 3rd graders so that their understanding can be comprehensive.

[41] Juwantara, "Analisis Teori Perkembangan Kognitif Piaget Pada Tahap Anak Usia Operasional Kongkret 7 - 12 Tahun Dalam Pembelajaran Matematika." 30.

[42] Juwantara. 30.

[43] Juwantara. 30.

Figure 2. Using Electric Student Worksheet during Online Learning

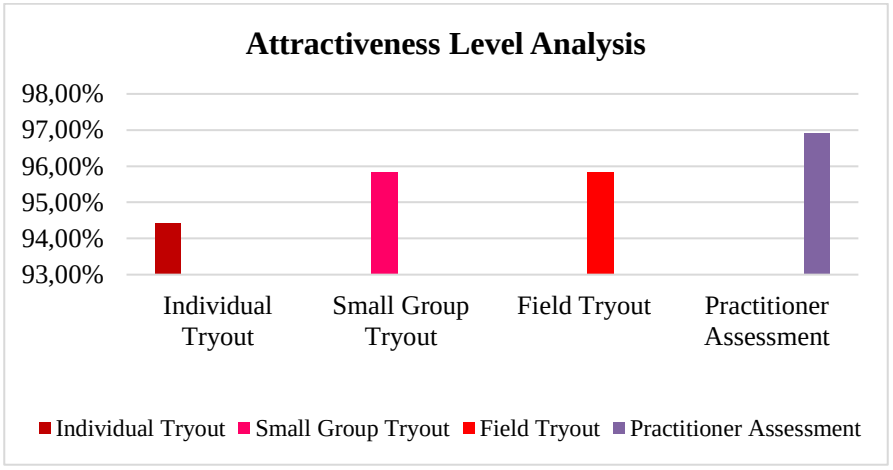

Figure 3. Attractiveness Level Analysis

CONCLUSION

This study has formulated electronic student worksheets based on Problem Based Learning in accordance with the ADDIE development model. The teaching materials developed are teaching materials in the form of electronics on the Energy theme, the sub-theme of saving energy, which consists of 6 lessons. The results of the analysis of the product development show that the electronic student worksheet based on Problem Based Learning has a material validity score of 90.76%, language validity 93.33%, media/design validity 98.97%. The level of attractiveness of PBL-based electronic student worksheets for all components with an average of 98.36% with a very good classification. Based on the overall analysis of the data, it can be concluded that the electronic student worksheet based on Problem Based Learning are very valid category and very interesting for grade 3 students of MI Lamongan Development.

ACKNOWLEDGMENT

The Principal of MI Pembangunan Lamongan who has given the researcher the opportunity to carry out this development research, as well as the entire board of teachers of MI Pembangunan Lamongan who have helped and provided valuable experience to complete this journal.

DECLARATION OF CONFLICTING INTERESTS

The author declares that there is no potential conflict of interest in accordance with the research, authorship, and/or publication of this article.

FUNDING

This research was independently funded by the researcher

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