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Development of E-LKPD Based on Problem Based Learning (PBL) Using Liveworksheet Website on Acid Base Material in High School

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Abstract: Development of E-LKPD Based on Problem Based Learning (PBL) Using Liveworksheet Website on Acid Base Material in High School. The problem of chemistry learning in high school during learning is that students find it difficult to understand the material and determine problem solving. Therefore, teaching materials are needed to overcome these problems. The purpose of this study is to produce E-LKPD based on Problem Based Learning using the Liveworksheet website on acid-base material in high school that is valid and practical for use by teachers in online learning activities. The type of research used is R&D (Research and Development) using the ADDIE model, namely (Analysis, Design, Development, Implementation, and Evaluation). The data analysis technique in this study uses qualitative descriptive and quantitative descriptive analysis techniques. This was obtained from the results of the analysis of the expert validation instrument material 78% and media 79% with a valid category, and the results of student responses obtained a practical percentage of 87%, while the results of the N-Gain trial were 72.29% with high criteria. Based on the results of the research and discussion, it can be concluded that the development of E-LKPD based on Problem Based Learning using the Liveworksheet website on acid-base material in high school is valid and very feasible to be used in learning activities.

Keywords: Development, E-LKPD, PBL, Liveworksheet, Acid Base

Abstract: Pengembangan E-LKPD Berbasis Problem Based Learning (PBL) Menggunakan Website Liveworksheet pada Materi Asam Basa di SMA. *Permasalahan pembelajaran kimia di SMA pada saat pembelajaran yaitu siswa merasa kesulitan dalam memahami materi dan menentukan penyelesaian masalah. Oleh karena itu, diperlukan bahan ajar yang dapat mengatasi permasalahan tersebut. Tujuan penelitian ini adalah menghasilkan E-LKPD berbasis Problem Based Learning menggunakan website Liveworksheet pada materi asam basa di SMA yang valid dan praktis untuk digunakan oleh guru dalam kegiatan pembelajaran daring. Jenis penelitian yang digunakan adalah R&D (Research and Development) dengan menggunakan model ADDIE yaitu (Analysis, Design, Development, Implementation, dan Evaluation). Teknik analisis data pada penelitian ini menggunakan teknik analisis deskriptif kualitatif dan deskriptif kuantitatif. Hal tersebut diperoleh dari hasil analisis instrumen validasi ahli materi 78% dan media 79% dengan kategori valid, serta hasil respon siswa memperoleh presentase praktis*

sebesar 87%, sedangkan hasil uji coba N-Gain sebesar 72,29% dengan kriteria tinggi. Berdasarkan hasil penelitian dan pembahasan dapat disimpulkan bahwa pengembangan E-LKPD berbasis Problem Based Learning menggunakan website Liveworksheet pada materi asam basa di SMA sudah valid dan sangat layak untuk digunakan dalam kegiatan pembelajaran.

Kata Kunci: *Pengembangan, E-LKPD, PBL, Liveworksheet, Asam Basa*

- **INTRODUCTION**

Online learning can be supported by the use of learning media. The role of media in learning the 2013 curriculum is very important, because learning uses a scientific approach, which can be implemented optimally if supported by various learning resources. In addition, actually every learning material so that students' knowledge can be comprehensive must be explained with various media to meet various student conditions. Because in learning, the role of ICT can be utilized to present the abstract into something real. With the presence of ICT, it is expected to improve the quality of learning (Warsihna, 2014). The learning process using the 2013 curriculum directs students towards active learning because it gives students the opportunity to actively construct, search, process and use the knowledge gained so that students will be better able to develop themselves (Azkiya, 2017).

One of the branches of science is chemistry. There are three things related to chemistry, namely chemistry as a product (chemical knowledge in the form of facts, concepts, principles, laws and theories), chemistry as a process (scientific work) and chemistry as a scientific attitude (Afifah, 2015).Chemistry is a branch of natural science (IPA) that studies the study of the structure, composition, properties and changes of matter and the energy that accompanies these changes. In chemistry, various materials and their changes are studied.In reality, the characteristics of chemistry are less noticed by teachers where teachers still teach chemical concepts verbally, practice working on questions, and practical activities are very rarely carried out (Sunyono, 2015).So most students think that chemistry is one of the most difficult subjects because of the characteristics of chemistry itself which is mostly abstract. In fact, one of the goals of chemistry subjects in high school is for students to understand chemical concepts and their interrelationships and applications in everyday life and technology (Mentari in Mulyani et al., 2022).

Based on the results of observations and interviews conducted with chemistry teachers at Nurani Private High School when teaching in class, many grade XI students at Nurani Private High School thought that chemistry was a subject that was considered difficult to learn, one of the chemistry materials that was considered difficult was acid-base material. From the results of the observation, teachers only used teaching materials in the LKS, where the LKS only contained a summary of the material and exercises that were less varied. So that the learning process that was applied was still dominated by teacher explanations and the completion of exercises was only in the LKS, and what happened was that students tended to accept whatever the teacher said and were not given the opportunity to find out, think, solve problems and find their own concepts of the material they were studying, as a result students were less actively involved in the learning process.The weakness of the learning process is a problem that must be solved, students are not used to recognizing the relationship between concepts so that it is difficult to understand the concept, especially those that are abstract theoretical, this results in low student chemistry learning outcomes. Teachers' efforts to improve learning models so that

students' mastery of concepts increases, so that during learning students are more active, understand the information provided and student grades are high (Rudibyani & Efkar, 2018).

From these problems can be overcome by the need for teaching materials that can make students active in the learning process. Supporting media used in learning have utilized technology. One of the teaching materials that can make students actively involved in the learning process is LKPD (Student Worksheet).Student Worksheets (LKPD) are media that can be used in classroom learning. The advantage of LKPD is that it facilitates the implementation of teaching according to the methods and materials that the teacher will teach to students and directs students in learning in class. LKPD is made to facilitate the learning process (Monica, 2023). According to (Soekamto, 2020) LKPD is a sheet that contains guidelines for students to carry out the learning process in class. From the description, it can be seen that in LKPD, it must contain instructions for students to carry out learning activities such as reading, calculating, writing, discussing, even analyzing and evaluating. Meanwhile, E-LKPD is a type of LKPD that is created, developed, and run with the help of a computer system and internet support (Nirmayani, 2022).

The selection of the right learning model in developing LKPD is very necessary in a good learning process. The right learning model to be combined with LKPD is a model that is able to activate students' learning independence through problem solving activities.(Syamsidah and Suryani, 2018). In selecting a model, PBL is considered to be able to make student learning more meaningful because it can be used to develop thinking skills, problem solving, and self-regulation by using authentic problems as the focus of learning (Novia et al., 2021).According to researchers, the problem-solving model that can be combined with E-LKPD is the Problem Based Learning (PBL) Model. With the PBL Learning Model, it is considered effective because students can search for solutions and solve problems themselves so that students' understanding of mathematical concepts can increase.

However, along with the development of increasingly sophisticated technology, printed LKPD can be transformed into electronic form to attract more student interest, be practical and economical. Technology-based LKPD can be created using web-based applications, for example liveworksheet. Liveworksheet is an application that can be accessed via a website. Liveworksheet allows teachers to create interactive worksheets for their students.Students do not need to download or create an account on Liveworksheet, and can simply work on LKPD by accessing the site via Google Chrome (Amalia & Simanjuntak, 2023).The use of the Liveworksheet website is very beneficial, because with Liveworksheet teachers can create their own interactive E-LKPD. In addition, Liveworksheet is also easy for students to use. Students can work directly and can get feedback directly after completing the assignment. Students do not need to download or register an account on Liveworksheet, and only work on E-LKPD by visiting the site via Google Chrome. In addition, Liveworksheet has variations in the steps of student activities to work on E-LKPD (Prastika & Masniladevi, 2021).

▪ METHOD

This research will be conducted at Nurani Private High School which is located at JL. Kakap 2 Belawan, Belawan Bahagia, Medan District, Belawan City, Medan City, North Sumatra. The subjects in this study were 20 students as respondents, 1 chemistry lecturer as expert and media validator, and 1 chemistry lecturer as test instrument

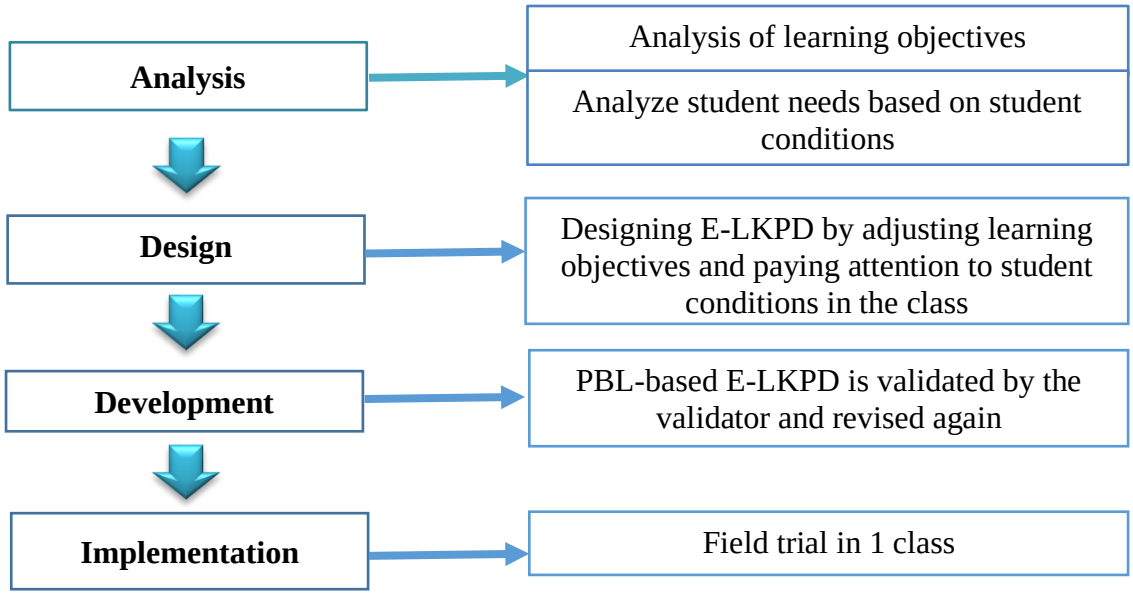
validator. While the object in this study is E-LKPD based on Problem Based Learning (PBL) on acid-base material. E-LKPD which will be the product of the development will be validated by the validator. In addition, the practicality of E-LKPD will also be seen by asking for responses from 30 students. And the effectiveness of E-LKPD will be seen from the increase in student learning outcomes.

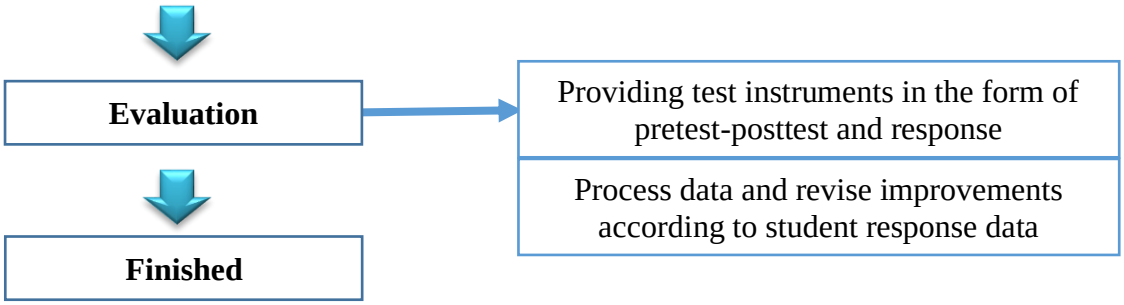
The type of research conducted is the type of Research and Development (R&D) research or often referred to as development research. This development research uses the ADDIE development model. The ADDIE model has five stages that must be taken: Analysis, Design, Develop, Implement, and Evaluate.The five stages are carried out systematically. In the ADDIE model, the framework used is structured for instructional development and is equipped with evaluation and revision at each stage (Asmayanti ddk,. 2020).

This method was chosen because it aims to develop existing products in the form of PBL-based E-LKPD using the liveworksheets website. The developed product is then tested for its feasibility with validity and product trials or effectiveness tests to determine the extent to which student learning outcomes have increased in acid-base material after learning using the developed E-LKPD.

The instrument used in this study is a test instrument. The test instrument is used to measure the effectiveness of students using E-LKPD while the non-test instrument is used to determine the validity of E-LKPD and the practicality of students in the E-LKPD that was developed..The test instrument used in this study was a chemistry learning outcome test on acid-base material using the developed E-LKPD. While the non-test instruments used in this study were interview sheets, validation sheets, and student response questionnaire sheets. The data collection technique in this study was qualitative data obtained from the results of research on questionnaires based on assessments and suggestions for improvement from expert validators and student responses in developing E-LKPD based on Problem Based Learning. The data collection techniques in this study were interviews, validation sheets, posttests, questionnaires and documentation.

Research Procedures





The analysis stage aims to determine and define the requirements needed in the development of E-LKPD. This stage is carried out by analyzing the objectives within the limits of the subject matter developed in E-LKPD based on Problem Based Learning. In this step, the author conducts an initial analysis to determine the problems of learning. The analysis is carried out by observing the implementation of learning in the classroom and interviewing teachers who teach chemistry in the classroom.

The design stage aims to design E-LKPD. Designing E-LKPD is done by selecting a format that is in accordance with the good and correct E-LKPD research format by paying attention to the suitability of the material and curriculum.The preparation of E-LKPD is based on the analysis of learning objectives and the results of student analysis. From the results of the compilation of the analysis results, an instrument grid is prepared that is adjusted to the cognitive abilities of students. The selection of media for making e-LKPD is by adjusting the learning media that is in line and effective with the conditions of the students. The media used to design the e-LKPD design is the Canva application. After all the designs are finished, they are saved in PDF format and integrated into Liveworksheet.

At the development stage, namely developing E-LKPD based on Problem Based Learning according to the National Education Standards Agency (BSNP) with the material and objectives that will be delivered in learning, as well as the learning environment that will support the learning process. In the E-LKPD that is developed, validation is carried out by lecturers as expert validators, if the product that is developed gets decent results, then the E-LKPD development activity that is carried out is complete.

E-LKPD that has been validated by the validator can then be used in learning activities. The sample used by the researcher was 1 class as an experimental class, the effectiveness test was carried out with the hope that the E-LKPD that had been developed could improve student learning outcomes. The test instrument used was in the form of multiple choices of 20 questions related to acid-base material. While the practicality test of E-LKPD was carried out using a questionnaire given to students after using the E-LKPD. Students assessed the practicality of the E-LKPD that had been developed.

After the E-LKPD has been tested, improvements are made to the E-LKPD that has been developed. The E-LKPD that has been re-evaluated is then calculated for data analysis related to learning outcomes and student responses. The results of this questionnaire are used as a basis for making improvements to the E-LKPD that has been developed. If it is known that the E-LKPD that has been developed gets a practical response, then the student's response to the E-LKPD that has been carried out has been completed. However, if the E-LKPD that has been developed is responded to as impractical, then the E-LKPD that has been developed is improved and responded to again by students until the E-LKPD has been interesting based on student responses.

▪ RESULTS AND DISCUSSION

This research was conducted at SMA Swasta Nurani Belawan involving one class to be given learning using E-LKPD based on Problem Based Learning that has been developed on Acid Base material. This PBL-based E-LKPD was developed using a modification of the ADDIE research and development steps: analysis, design, development, implementation, and evaluation. The presentation of e-LKPD is made with a design, with the presence of colored animated images and learning videos that can help students understand the material. In addition, e-LKPD is also equipped with interactive activities that actively involve students in the learning process, thereby increasing student involvement and understanding of the material presented (Audina & Syuhada, 2024).

E-LKPD Validity Test by Expert Validator

Validation of E-LKPD based on Problem Based Learning was conducted on April 2, 2024 – April 18, 2024. The validator assessed the eligibility of E-LKPD to be used as research material by assessing several aspects, namely the aspect of content feasibility, the aspect of language feasibility, and Problem Based Learning, while based on the media assessment aspect, namely the size of E-LKPD, E-LKPD cover design and E-LKPD content design. The following graph of the results of the validation of material and media experts by the validator can be seen in Figures 1 and 2.

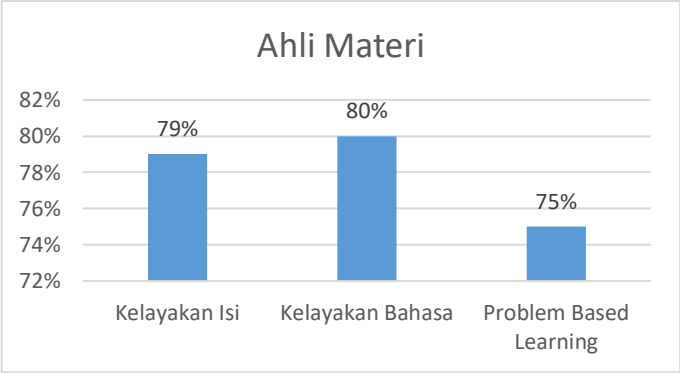


Figure 1. Material Expert Validation Results Graph

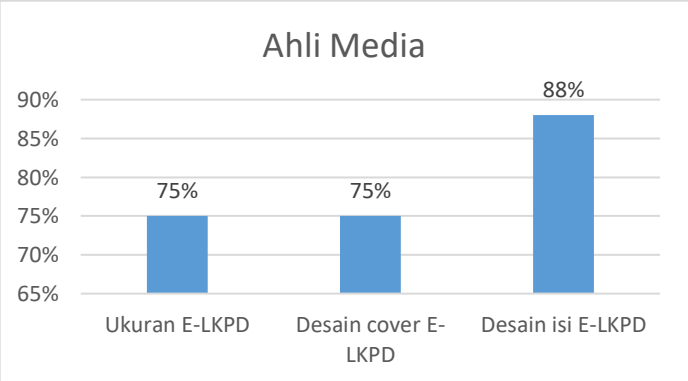


Figure 2. Media Expert Validation Results Graph

E-LKPD is said to be valid if it meets the valid and very valid criteria. Based on the calculation results of the values given by the validator for the material assessment aspect, an average percentage of 78% was obtained which can be said to be "valid" for the media

assessment aspect, an average percentage of 79% was obtained which can be said to be "valid".

E-LKPD Practicality Test

Analysis of student responses to determine whether the developed E-LKPD can be used practically. Student response data was obtained from the results of filling out the questionnaire sheets that had been given after students used E-LKPD. The researcher asked for responses from grade XII students of Nurani Private High School who had studied acid-base material. Students who responded were 30 people. The following graph of student response results is shown in Figure 3.

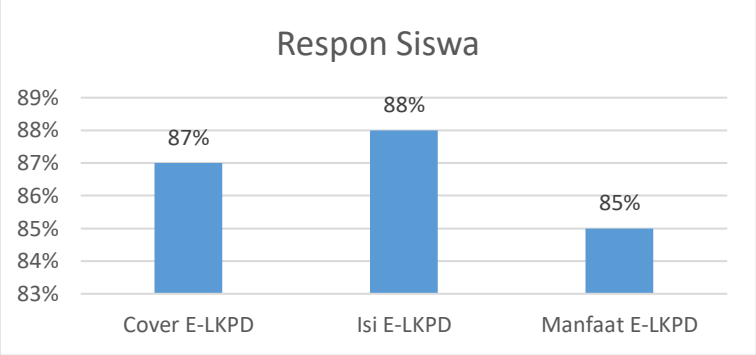


Figure 3. Student Response Assessment Results Graph

E-LKPD is said to be practical if it meets the criteria of interesting and very interesting. Based on student responses, an average percentage of 87% was obtained, which is included in the criteria of "very interesting".

E-LKPD Effectiveness Test

To determine the effectiveness of E-LKPD based on Problem Based Learning developed using test instruments in the form of pretest and posttest questions, an N-Gain test was conducted. After the treatment and giving pretest and posttest questions, the N-Gain score data was obtained with an average pretest value of 48.25 and an average posttest value of 85.25. From these results, it can be seen that the N-Gain score obtained was 72.29 which can be categorized as high. The following graph shows the results of the E-LKPD effectiveness test based on the pretest and posttest data, which can be seen in Figure 4.

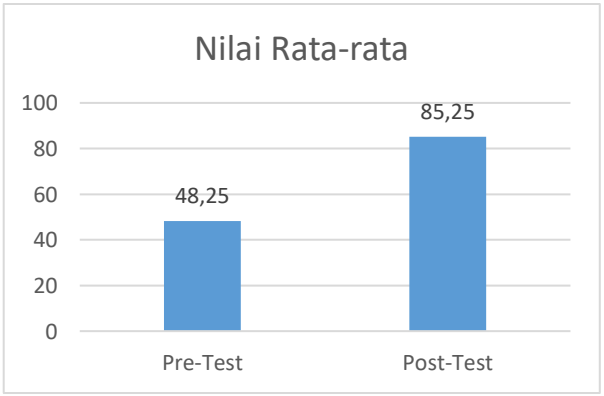


Figure 4. Results of the E-LKPD effectiveness

The development research conducted using the Research and Development method type with the ADDIE research model consisting of 5 research stages, namely analysis, design, development, implementation, and evaluation. The ADDIE model is a dynamic and flexible guideline for building an effective learning system (Sembiring and Arisandy, 2016). In line with Syahid et al., (2024) the ADDIE model helps in identifying learner needs, selecting learning methods and materials, product development, to evaluation and improvement. This model can be used as a guide and design to help teachers choose the right methods, media, and materials, and facilitate the learning process. This ADDIE model can be used in various forms of product development, one of which is the development of teaching materials. The ADDIE model is a model that is still very relevant to use because this model can adapt very well to various conditions and there are revisions and evaluations at each stage (Safitri et al., 2022)

E-LKPD based on Problem Based Learning that was developed, its feasibility can be seen from the results of its validity, practicality, and effectiveness. The validation results obtained from the validator are then analyzed, validation carried out by lecturers as material and media experts that cover several aspects of material assessment, namelyaspects of content feasibility, aspects of language feasibility, and Problem Based Learning, while based on the media assessment aspects, namely the size of E-LKPD, E-LKPD cover design and E-LKPD content design. The quality assessment of E-LKPD carried out by the validator obtained an average percentage of material assessment of 78% which was said to be "valid" and an average percentage of media assessment of 79% which was said to be "valid". Based on the validation results carried out by the validator, it can be concluded that the E-LKPD teaching material media based on Problem Based Learning developed on acid-base material is feasible to use.

The results of the practicality test were obtained from the responses of grade XII students of SMA Swasta Nurani who after learning using E-LKPD based on Problem Based Learning. By providing an assessment that includes the cover design of E-LKPD, the contents of E-LKPD, the benefits of E-LKPD, the results of student responses obtained an average percentage of 87% which was said to be "very interesting". Based on the eligibility criteria, the results of student responses to this development are in the "very interesting" criteria as a media for E-LKPD teaching materials based on Problem Based Learning on acid-base material. In line with research (Khairani et al., 2022) states that the PBL model has an effect on improving student learning outcomes, because the PBL model makes it easier for students to think independently in finding solutions to problems in everyday life that are raised in learning.

Then to test the effectiveness of E-LKPDobtained from the results of the N-Gain test. From the results of the N-Gain test, the average pretest score was 48.25 and the average posttest score was 85.25, so that the N-Gain score was 72.29. Based on the results obtained, it is concluded that the results of the N-Gain test with E-LKPD based on Problem Based Learning on acid-base material have increased with an N-Gain score of 72.29, so that it is categorized as "High". The learning outcomes of students in this N-Gain test show that all students have achieved the KKM with an average class score of 85.25. This means that learning is considered successful because the completeness of student learning outcomes reaches ≥85%. Overall, students have achieved the KKM because they feel helped to understand the material by using E-LKPD based on Problem Based Learning on acid-base material in the learning process.

This is supported by (Firtsanianta andKhofifah, 2022) which states that the Electronic Student Worksheet based on the liveworksheets application can be used as an alternative to using teaching materials in classroom learning. This product has advantages compared to LKPD, namely it is more efficient because it does not need to use paper, and is more effective because it can contain various types of exercises, so that students do not get bored in participating in learning and attract students' interest in studying further the material that has been learned. This E-LKPD can be accessed in link format and does not have a specific time limit to access it, only requiring an internet network. The use of E-LKPD based on liveworksheets software can be used as a meansto make it easier for students to understand the material, especially to make it easier for students to understand material that they consider boring.

▪ CONCLUSION

Based on the research that has been conducted, it can be concluded that the validity of the teaching materials that have been developed, E-LKPD based on Problem Based Learning on acid-base material at SMA Swasta Nurani shows that E-LKPD is categorized as valid based on BSNP. For the practicality of teaching materials related to student responses to the developed E-LKPD, E-LKPD based on Problem Based Learning on acid-base material shows that E-LKPD is categorized as "practical" to be used as teaching materials in the learning process at school. While the effectiveness of the developed teaching materials, E-LKPD based on Problem Based Learning on acid-base material shows "effective" which can be categorized as "high" after being taught to students.

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