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The Validity of Student Worksheet Oriented Blended Learning to Improve Science Literacy Skills in Redox Material

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Abstract: The validity of Student Worksheet Oriented Blended Learning to Improve Scientific Literacy Skills in Redox Material. Student worksheets (LKPD) are a series of learning tools that affect the learning process's optimization. This study aims to describe student worksheets' validity with blended learning orientation to improve students' scientific literacy skills in oxidation-reduction reaction material. The research used is development research with the Nieveen development method with two stages: preliminary research and prototyping. The validity of the LKPD was obtained from the validation assessment of three expert validators in chemistry, namely two chemistry lecturers and one chemistry teacher. The instrument used was a LKPD validation sheet. The evaluation of the validation results of the LKPD showed that the percentage of content validity was 81.7%, and the construct validity was 84.7%. LKPD is declared valid if the contents' validity and constructs' validity is on valid and very valid criteria with percentage ≥ 61%. Thus, this study's results indicate that student worksheets with blended learning orientation to training scientific literacy skills can be declared valid.

Keywords: validity of student worksheet, blended learning, scientific literacy skills

Abstrak: Validitas LKPD Berorientasi *Blended Learning* untuk Meningkatkan Keterampilan Literasi Sains pada Materi Reaksi Redoks. Lembar Kerja Peserta Didik (LKPD) merupakan salah satu rangkaian perangkat pembelajaran yang berpengaruh pada pengoptimalan proses pembelajaran. Penelitian ini bertujuan untuk mendeskripsikan validitas LKPD berorientasi *blended learning* untuk meningkatkan keterampilan literasi sains peserta didik pada materi reaksi reduksi oksidasi. Jenis penilitian yang digunakan adalah penelitian pengembangan dengan metode pengembangan Nieveen dengan dua tahapan, yaitu *preliminary research* dan *prototyping stage*. Validitas LKPD diperoleh dari penilaian validasi tiga validator ahli pada bidang kimia, yaitu dua dosen kimia dan satu orang guru kimia. Instrumen yang digunakan berupa lembar validasi LKPD. Penilaian hasil validasi LKPD menunjukkan bahwa persentase validitas isi yaitu 81,7% dan validitas konstruk sebesar 84,7%. LKPD dinyatakan valid apabila validitas isi dan validitas konstruk berada pada kriteria valid dan sangat valid dengan persentase skor ≥ 61%. Dengan demikian, hasil penelitian ini menunjukkan bahwa LKPD berorientasi *blended learning* untuk melatihkan keterampilan literasi sains dapat dinyatakan valid.

Kata kunci : Validitas LKPD, *blended learning*, keterampilan literasi sains

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▪ INTRODUCTION

The essence of chemistry learning in the 2013 curriculum is the learning process is not to master chemical knowledge as a product, but students must master scientific attitudes, scientific processes, and chemistry in daily life(Kemendikbud, 2016). In the learning process, students' knowledge must be able to provide skills to connect concepts with phenomena in everyday life so that the learning process becomes meaningful. That means the learning process can be obtained if the learner has good science literacy skill (Haristy et al., 2013).

Students are stated to have science literacy skills if they can perform competencies, such as: explaining scientific phenomena, identifying questions, drawing conclusions based on facts, and being aware that science and technology shape the natural, intellectual, and cultural environments, as well as a willingness to engage and care about science-related issues. (OECD, 2016). cience literacy skills are essential to master because they can help the mindset, behavior and build the character of learners to care, be responsible, and also be able to solve the problems faced by modern society (Hidayati et al., 2018; Widodo et al., 2019).

In measuring the science literacy of 15-year-old learners, an international study called PISA releases its research results every three years starting in 2000. Pisa 2018 results show that Indonesia's science literacy score is 396, down from 2015 with 403. In 2018, the OECD country's average science literacy score was 489 (OECD, 2019). It shows that there are gaps in treating science education.

The preliminary research results at SMA Negeri 15 Surabaya also indicate that learners' science literacy is still relatively low. Evidenced-based on science literacy skills test on oxidation-reduction reaction material, where there are only one in 31 learners who achieve minimum completeness criteria. Learners have not mastered the concept of redox well, so they have difficulty applying it in life. In line with this, the teacher also stated that it has not been maximal in associating the material with the interview activity's daily context. Therefore, learners cannot solve everyday problems that should be related to redox reaction material in school as the output of science literacy skills.

A way to improve students' science literacy skills is to use teaching materials to lead learners to practice science literacy skills (Zainia et al., 2016). One of the teaching materials used in the learning process is a student worksheet or LKPD (Dermawati et al., 2019). LKPD is a printed teaching material in the form of sheets containing materials, summaries, and instructions carried out by learners. In this case, the tasks have been adjusted to the necessary competencies that must be achieved (Prastowo, 2012). Research conducted by Nur & Hidayah (2018) shows that learners experience improved science literacy skills after using LKPD in the learning process. The average value of learners before using LKPD is 50.37, where it has not reached the completion of minimum, then there is an increase in the average value to 87.90, which belongs to the complete category. Therefore, LKPD must train science literacy skills effectively.

LKPD is designed according to learning objectives so that in the preparation and use of LKPD to train science literacy skills, it must be adapted to the domain or aspects of science literacy. Aspects of science literacy include aspects of context, aspects of knowledge, aspects of competence, and aspects of attitudes (OECD, 2016). Context aspects include personal, national/local, and global contexts; aspects of knowledge include content knowledge, procedural knowledge, and epistemic knowledge; competence aspects include the ability to explain scientific phenomena, evaluate and design science research, and interpret scientific data and evidence; aspects of a person's attitude to science are demonstrated by interest, attention, and response in science and technology as well as issues affecting them in the real world (OECD, 2014, 2016).

In the learning process to improve science literacy, a practicum is required. Practicum activities are essential because they can generate learning motivation, fulfill curiosity encouragement, and train students' experiment skills (Emda, 2014). Practicum can train learners to understand a phenomenon by preparing practicum procedures and interpreting the data or scientific evidence obtained, which is included in the competency aspect of science literacy. Based on interviews with teachers, time constraints are an obstacle experienced in practicum activities due to labor absence. Time constraints result in a lack of discussion or clarification after the practicum. One of the strategies in solving this problem is to conduct discussions outside of learning face-to-face or offline. Therefore, advanced learning can be done online to discuss and clarify the results of practicum. This strategy is called blended learning.

Blended learning can be interpreted as a learning model that combines face-to-face learning with e-learning so that in addition to learning by meeting in person, learning can also be accessed at any time through online media. This merging of learning can be due to limited time and the demands of more comprehensive technological developments. Blended learning composition between offline and online activities can have a ratio of 50/50 or 75/25 and can apply otherwise. Comparison of blended learning usage can be adjusted to teachers and learners (Afandi et al., 2013; Dwiyogo & Wasis, 2018; Husamah, 2014).

In the learning process, it is essential to apply a learning model to clarify the procedures, relationships, and overall state of what is designed (Siahaan, 2018). Research conducted by Winata & Wonorahardjo (2015) showed that a blended learning strategy accompanied by the learning cycle 5E model is an innovation that helps learners in understanding abstract chemical concepts. Therefore, blended learning strategies can be included in the 5E learning cycle learning synth consisting of engagement; exploration; explanation; elaboration; and evaluation. (Acisili et al., 2011).

Based on the background above, this research aims to develop and know the validity of LKPD that uses blended learning strategies in practice to train science literacy skills.

▪ METHOD

This research is included in the type of Research and Development (R&D) research that uses Nieveen development model with two stages, namely (1) Preliminary Research and (2) Development and Prototyping stage (Akker et al., 2006). This research develops blended learning-oriented LKPD that can improve science literacy skills. The research data is sourced from expert assessment, namely two chemistry lecturers and one chemistry teacher on LKPD products that have been compiled. In the preliminary research stage, an analysis of known problems from chemical learning has been carried out, identifying needs as a solution to the problem and harmony between models and learning devices that support the achievement of learning objectives.

The prototyping stage consists of two parts, namely, development planning and validity evaluation. In the development planning section, LKPD products are blended learning oriented to train science literacy skills. The design of LKPD was examined and given input by experts, namely chemistry lecturers. The data of the study results were analyzed descriptively qualitatively for the improvement of LKPD.

Validity evaluation is carried out to determine whether or not the LKPD is valid based on experts' assessment. Experts who act as validators are two lecturers of The Department of Chemistry Unesa and one chemistry teacher at SMA Negeri 15 Surabaya. The instrument used is a validation sheet reviewed based on the validity content and the validity construct. Validator evaluates LKPD by providing a score range of 1-5 on the validation sheet by Table 1.

Table 1. Validity Assessment Scale

Scale score	Criteria
1	Very Invalid
2	Invalid
3	Quite Valid
4	Valid
5	Very Valid

(Riduwan, 2013)

Furthermore, the validation assessment score is analyzed descriptively quantitatively to obtain percentages that are then interpreted through the Likert scale. The percentage is obtained from the total validator assessment score calculated through the formula (Riduwan, 2013):

$$\text{Validity (\%)} = \frac{\sum Overall\ score}{\sum Criteria\ score}\ x\ 100\%$$

Description:
∑Criteria score: skor tertinggi tiap item x jumlah validator

The validity of LKPD products can be known by interpreting the percentage obtained into the criteria stated in Table 2. Following:

Table 2. Score Interpretation Criteria

Percentage (%)	Criteria
0 – 20	Very Invalid
21 – 40	Invalid
41 – 60	Quite Valid
61 – 80	Valid
81 – 100	Very Valid

(Riduwan, 2013)

In this case, the LKPD developed can be said to be feasible if the percentage score is on valid and very valid criteria so that the validity of the contents and validity of the LKPD construct must have a percentage of ≥ 61%.

▪ RESULT AND DISCUSSION

Following the stages of development research by Nieveen, the process of obtaining the results of research and its discussion is as follows:

Preliminary Research Stage

Preliminary studies or pre-research activities are conducted by conducting interviews with high school chemistry teachers, distributing questionnaires to learners, and conducting science literacy tests. Instruments were used in preliminary research in teacher interview sheets, questionnaire sheets of learners, and science literacy skills test sheets. Interviews with chemistry teachers and questionnaires are conducted to identify learning problems that have been done and identify the needs as the solution to the problem. In comparison, science literacy-based tests are carried out to find out the science literacy skills of learners.

Based on an interview conducted with one of the chemistry teachers at SMA Negeri 15 Surabaya, he agreed that science literacy skills are an essential competency to be trained to learners. Associating chemicals with everyday life can train learners on content aspects and aspects of knowledge as a hallmark of science literacy skills (OECD, 2016), but teachers say they are not yet at their best in doing so. The learning model is discovery learning and using UKBM compiled by a group of teachers. For practicum activities, it is entirely consistent because the school has good facilities. However, teachers find it difficult in the absence of labor, so they must independently prepare and reorganize the tools and practicum materials. This resulted in insufficient time for discussion or clarification after the practicum. The teacher stated that the learning process has been done online but has never done a combination of online and offline learning. Therefore, learning has never been done in blended learning, but offline or online only.

Questionnaires and science literacy skills tests were given to 31 students in grade XI-4 at SMA Negeri 15 Surabaya. Science literacy skills can lead learners to be more open-eyed about natural events or events resulting from human activities associated with concepts studied in schools (Adawiyah & Wisudawati, 2017). In other words, indications that learners have mastered science literacy skills can associate the material studied with daily life. However, questionnaire results showed that as many as 70% of learners could not provide examples of chemical applications in life. Students' science literacy skills are also reviewed based on test scores, where the obtained science literacy test scores must exceed the minimum completeness criteria or KKM of the school, which is ≥ 80. In this case, there is only one student who reaches KKM with a score of 90.4. Therefore, 96.7% of students do not yet have science literacy skills, while students with science literacy skills are only 3.3%.

The library analysis was also conducted as part of a preliminary study, where Indonesia's science literacy score was 396 based on PISA 2018 results. The OECD country's average PISA score in 2018 is 489, meaning a gap in treating science education (OECD, 2019). Previous research conducted by Ramdaniyah and Dwiningsih also supports this, where students' science literacy ability at SMA Negeri 1 Driyorejo is still low with the highest result of 27.5 (Ramdaniyah & Dwiningsih, 2017).

Development and Prototyping Stage

Development Planning

The process of LKPD preparation is carried out at this stage of planning and development. The drafted LKPD aims to train science literacy skills and blended learning strategies on oxidation-reduction reaction materials. The learning model used in LKPD is learning cycle 5E. LKPD must contain the domain or aspects of science literacy, i.e., context domain, knowledge domain, competency domain, and attitude domain (OECD, 2016). In this case, the domain of attitude is not trained directly, but rather only adapted to learners' activities. The use of blended learning strategies is presented in LKPD by dividing the learning done offline and online (Husamah, 2014). In practice, lkpd offline learning will be done directly in schools, while LKPD online learning section is used when conducting virtual meetings. Syntax of the learning cycle 5E model, namely engagement, exploration, explanation, elaboration, and evaluation, is prepared to complement the blended learning strategy (Acisili et al., 2011). There are three sub-materials of oxidation-reduction reaction in LKPD that are reviewed based on the concept of a redox reaction, namely, binding and release of oxygen, reception and release of electrons, and changes in oxidation numbers.

The LKPD feature's design consists of the outer cover and covers each sub material of the oxidation-reduction reaction. The outer cover is designed with the title LKPD, the author's identity, and a place to write the user's identity. The inside cover is given an illustration of an image related to the phenomenon to be discussed as well as the title of the sub-material.

Figure 1. Main cover and cover in each sub-material on LKPD

In facilitating the use of blended learning-oriented LKPD, it is attached instructions for use to understand the stages of offline learning and online learning. Offline learning is used to practice, while online learning can be discussed and clarified related to practicum activities.

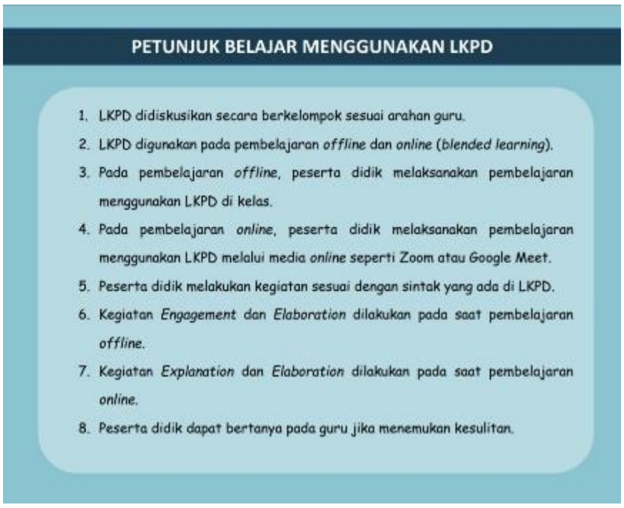

Figure 2. Learning Instructions for Using LKPD

In the content section of LKPD, offline learning is carried out in the first two phases of the learning cycle 5E syntax, namely engagement and exploration. The engagement phase is carried out to generate the interest and curiosity of learners (Bybee et al., 2006). Therefore, the LKPD section is given a phenomenon that gives rise to aspects of science literacy. In the example of LKPD sub-material two, phenomena are included in the local context and are knowledgeable content, intending to practice the competence of learners in explaining scientific phenomena.

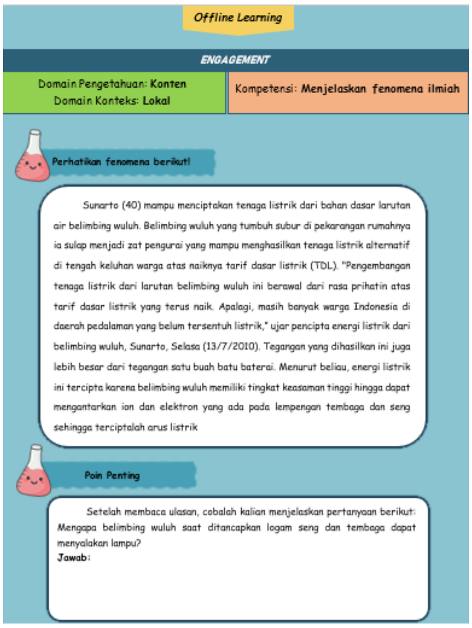

Figure 3. Offline learning section that shows aspects of science literacy in the engagement phase in LKPD

Phenomena that show aspects of science literacy are also presented in the exploration phase. In this phase, learners conduct practicum activities by aspects of science literacy, namely training competencies in designing scientific investigations. In the example of LKPD sub-material two, the phenomenon is an aspect of personal context with aspects of procedural knowledge.

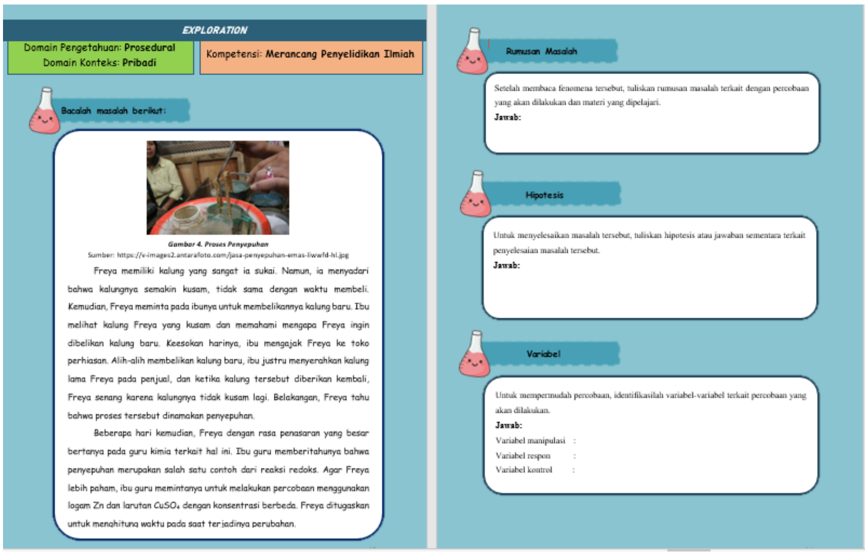

Figure 4. Offline learning section that shows aspects of science literacy in the exploration phase in LKPD

The online learning section is done in the explanation and elaboration phase. The explanation phase is used to discuss the results of practicum activities. Learners are trained to interpret data and use scientific evidence, which is an aspect of science literacy competency.

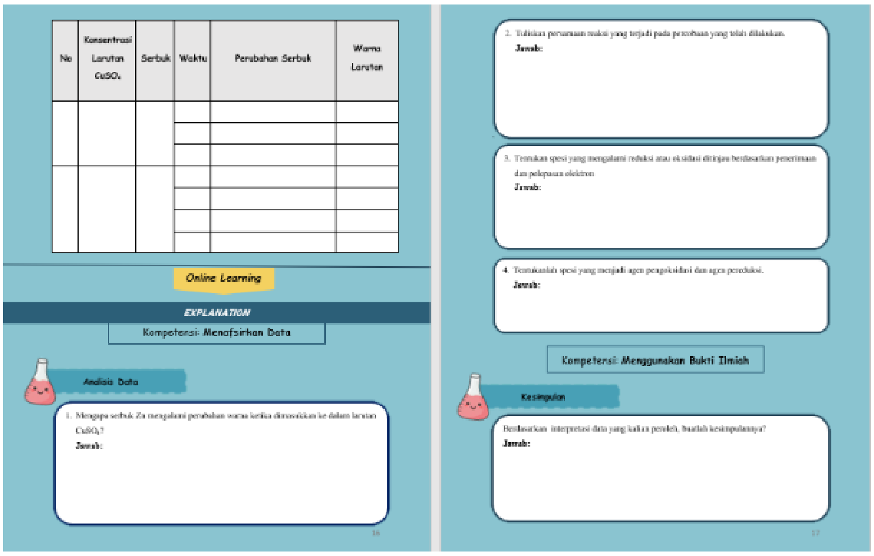

Figure 5. Online learning section that shows aspects of science literacy in the explanation phase in LKPD

The elaboration phase is defined as the application stage of concepts and skills that have been learned in different or new situations (Bybee et al., 2006). Therefore, this phase is given a new phenomenon that can train science literacy competence, namely using scientific evidence. The phenomenon is in a personal context, with aspects of content knowledge. While the evaluation phase is not written in the LKPD because it is an evaluation activity carried out in the learning process.

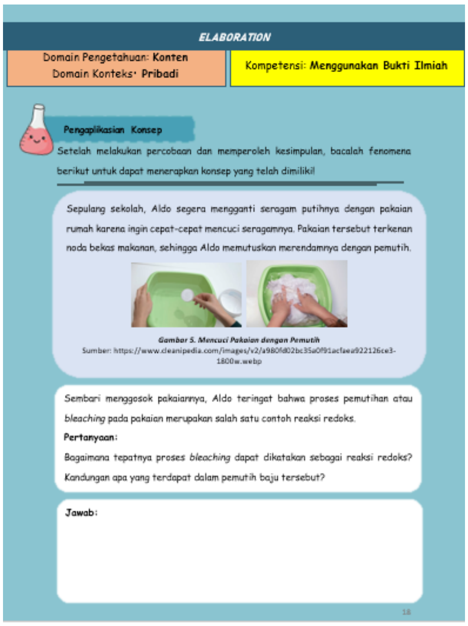

Figure 6. Online learning section that shows aspects of science literacy in the elaboration phase in LKPD

Evaluation of Validity

Blended learning-oriented LKPD that has been compiled, assessed feasibility at the evaluation stage of validity by three chemists. There are two parts to validation, namely the validity of the contents and the construction's validity. LKPD is declared valid or feasible if the percentage on the criteria for interpretation ≥ is 61% (Riduwan, 2013). The following is the description of the results of blended learning-oriented LKPD validation used to train science literacy skills:

The validity Content of LKPD

The validity of the content includes four aspects of assessment, namely (1) Conformity of the material with KD, (2) Truth of the substance of the subject matter, (3) Conformity of LKPD with blended learning strategy and (4) Conformity of LKPD with science literacy domain. The feasibility of the material can be determined based on the assessment of the validity of the content. The following recapitulation of the validity assessment of the content of the validator is displayed in Table 3.

Table 3. Recapitulation of LKPD Content Validation

No	Assessed Competencies	Percentage Validation Result (%)
1	Suitability of material with KD	80
2	The truth of the substance of matter	73,3
3	Conformity of LKPD with blended learning strategy	86,7
4	Conformity of LKPD with science literacy domain	86,7

Based on Table 3 related to validation of LKPD content, the results obtained that the four aspects of LKPD are valid criteria and very valid. The average validity of the content is 81.7% with very valid criteria.

The suitability of the material with KD is one aspect of the content's validity, which can be re-edified as the completeness of the material, the breadth of the material, and the depth of the material (Muslich, 2010). Completeness of oxidation-reduction reaction material on validity sheet is assessed based on KD's learning indicators and material description. Simultaneously, the breadth and depth of the material are judged based on the truth of facts, concepts, and illustrations of images. The feasibility percentage of the material conformity aspect with KD is 80%, as stated in Table 3.

Items assessing the correctness of the substance of the material are reviewed based on the accuracy of concepts and definitions and the accuracy of images and illustrations (Muslich, 2010). This aspect's feasibility percentage is in the valid category of 73.3%, where the phenomenon in the LKPD has been accurate enough to avoid misconceptions. The images and illustrations presented are also authentic to understand verbalizes knowledge (Hayati & Rahmawati, 2016).

Aspects of LKPD's suitability with blended learning strategies fall into a very valid category with a percentage of 86.7%. In LKPD, the online learning and offline learning phase have emerged as a blended learning feature (Husamah, 2014). Blended learning complements and overcome materials that have not been delivered in offline learning (Bibi & Jati, 2015). Therefore, learners can complete the practicum in the offline phase, while clarification and discussion can be done online. The advantages of blended learning are that it can increase the motivation of learners and the quality of education, as well as make one of the ways in the use of technology in the era of industrial revolution 4.0 (Damanik, 2019; Usman, 2018).

The last aspect of LKPD content's validity is the suitability of LKPD with the domain or aspects of science literacy. The LKPD contains questions that train learners to explain scientific phenomena, evaluating and designing scientific investigations, and interpret data and scientific reactions on oxidation-reduction as part of the competence aspect. The phenomena presented in the LKPD have also been adapted to aspects of context and aspects of knowledge (OECD, 2016). Aspects of attitude are adapted to the activities of learners. The percentage of LKPD following the science literacy domain is 86.7% in the very valid category.

The validity of LKPD Construction

The construct's validity concerning the use of language, sentence order, vocabulary, and clarity must be understandable to learners (Umbaryanti, 2016). Recapitulation of the validity of the content is presented in Table 4. Following:

Table 4. Recapitulation of Validity of LKPD Construction

No	Assessed Competencies	Percentage Validation Result (%)
1	The suitability of LKPD with linguistic aspects	80
2	Suitability of LKPD with presentation criteria	84,7
3	Compatibility of LKPD with graphic criteria	84,7

There are three aspects of assessment on the construction's validity, namely the language criteria, presentation criteria, and the criteria for graphing. Aspects of language are reviewed based on indications of the lack of information sentences that mean bias, conformity with the rules of teaching materials, and the effective and efficient use of language (Ali et al., 2019). Therefore, the linguistic criteria indicator listed on the validation sheet uses excellent and correct terminology, concise and clear language, and sentences that do not contain double meanings. Based on the table of interpretation of the construct's validity, the linguistic aspect has a percentage of 80%, so that it is in a valid category. This indicates that the linguistic elements of the LKPD meet the criteria.

Components of the presentation aspect should include clarity of purpose, the order of servings, attractiveness, and completeness of the information (Depdiknas, 2008). So in the presentation of LKPD is used assessment indicators in the form of attractive covers and must present LKPD, and have completeness of the order of servings and information in the form of the table of contents; KD and indicators; instructions for the use of LKPD; material in the form of phenomena; and evaluation where it provides a place to write answers as needed. Obtained percentage feasibility aspect presentation of 84.7%, which is in the category is very valid.

LKPD must be under the aspects of photography, where typography letters must be easy to understand, read, and attractive. Also, the appearance related to color, composition, size, and layout must match the functions of the LKPD. The illustrations provided should facilitate understanding (BSNP, 2010). Therefore, the main cover and cover of each LKPD sub-material are exciting and made different. The description of the image adjusts to the content. The font used makes it easier for the reader, and there is harmony between the layout of text, images, and tables. LKPD has fulfilled these criteria by obtaining a percentage value of 84.7% in the eligible category (very valid).

Based on the interpretation of LKPD construction's validity, it can be known that all three aspects of LKPD are valid and very valid criteria. The average construct validity is 83.1% with very valid criteria.

▪ CONCLUSION

Based on obtaining and analyzing the data, it can be concluded that the LKPD oriented blended learning LKPD is feasible with a validity percentage of 81.7% content validity and 84.7% construction validity. The acquisition of the validity contents and validity construct is in the criteria is very valid.

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