BIO-INOVED : Jurnal Biologi-Inovasi Pendidikan
Volume 3, Issue 3, October 2021 page. 210-215
https://ppjp.ulm.ac.id/journal/index.php/bino

OPEN ACCESS JOURNAL
P-ISSN : 2684-9062 | E-ISSN : 2714-9803
DOI: 10.20527/bino.v3i3.11099

The Practicality of E-LKPD Materials on Environmental Pollution to Practice Critical Thinking

Maria Magdalena [(1)]*, Aminuddin Prahatama Putra [(2)], Atiek Winarti [(3)]

[(1)] Master Program of Biology Education, Postgraduate Program, Lambung Mangkurat University, Banjarmasin, South Kalimantan, Indonesia
[(2)] Study Program of Biology Education, Faculty of Teacher Training and Education Faculty, Lambung Mangkurat University, Banjarmasin, South Kalimantan, Indonesia
[(3)] Study Program of Chemistry Education, Faculty of Teacher Training and Education Faculty, Lambung Mangkurat University, Banjarmasin, South Kalimantan, Indonesia

**Corresponding Author Email:* riia12mariamagdalena@gmail.com

Article Information

Keyword:
Development Electronic-Student Worksheets
Environmental Pollution
Critical thinking skills

Kata Kunci:
Pengembangan e-LKPD
Pencemaran Lingkungan
Keterampilan Berpikir Kritis

History:
Received : 09/07/2021
Accepted : 10/10/2021
Published : 28/10/2021

Abstract

Critical thinking skills are very important to deal with problems in the life of the 21st era. Students' critical thinking skills are honed to help solve a problem that will affect student achievement. The low critical thinking skills of students in solving and analyzing a problem shows that students have not been trained in critical thinking so that learning innovations are needed, one of which is the LKPD student activity sheet in electronic form. The purpose of this study was to describe the practicality of e-LKPD environmental pollution materials developed to train critical thinking skills. The type of research used is formative test based on the Tessmer model. The results showed that the implementation of the E-LKPD got a score of 90.4 with very good criteria and the results of student responses got a score of 98.0 with the criteria of strongly agreeing. This shows that the developed E-LKPD is practical to practice critical thinking skills.

Abstrak

Keterampilan berpikir kritis sangat penting untuk menghadapi permasalahan dalam kehidupan era ke 21. Keterampilan berpikir kritis peserta didik yang terasah dapat membantu dalam memecahkan suatu permasalahan yang akan berpengaruh terhadap prestasi peserta didik. Rendahnya keterampilan berpikir kritis peserta didik dalam menyelesaikan dan menganalisis suatu permasalahan menunjukkan peserta didik belum terlatih dalam berpikir kritis sehingga diperlukan inovasi pembelajaran salah satunya dengan lembar kegiatan peserta didik LKPD dalam bentuk elektronik. Tujuan penelitian ini adalah untuk mendeskripsikan kepraktisan E-LKPD materi pencemaran lingkungan yang dikembangkan untuk melatihkan keterampilan berpikir kritis. Jenis penelitian yang digunakan ialah uji formatif berdasarkan model Tessmer. Hasil penelitian menunjukkan bahwa hasil respon peserta didik mendapatkan nilai 98,0 dengan kriteria sangat setuju dan keterlaksanaan E-LKPD mendapatkan nilai sebesar 90,4 dengan kriteria sangat baik. Hal tersebut menunjukkan bahwa E-LKPD yang dikembangkan praktis untuk melatihkan keterampilan berpikir kritis.

© 2021 BIO-INOVED : Jurnal Biologi Inovasi Pendidikan

How to cite: Magdalena, M., Putra, A. P., & Winarti, A. (2021). The Practicality of E-LKPD Materials on Environmental Pollution to Practice Critical Thinking. *BIO-INOVED : Jurnal Biologi-Inovasi Pendidikan, 3*(3), 210-215.

BIO-INOVED : Jurnal Biologi-Inovasi Pendidikan
Volume 3, Issue 3, October 2021 page. 210-215
https://ppjp.ulm.ac.id/journal/index.php/bino

OPEN ACCESS JOURNAL
P-ISSN : 2684-9062 | E-ISSN : 2714-9803
DOI: 10.20527/bino.v3i3.11099

A. Introduction

Critical thinking skills are needed in meeting the challenges of 21st century life. Critical thinking is a thought or method of thinking to master problems comprehensively, be able to think openly to the thoughts and decisions of others accompanied by a deep effort to master and evaluate data when making decisions, and can relate the impact in uncovering cases contained in upgrading activities and daily life (Wahyuni, 2015). There are five skills that are assessed in critical assumptions are: (1) Interpretation is the activity of interpreting data from reading after that formulate appropriate case problems, (2) Assumptions are ways to identify facts to ensure problem solving and share assumptions in the right way from solutions, (3) Deduction is formulating problem solving from the ordinary to the special in a precise and sequential manner, (4) Inference is drawing conclusions and solving cases in an appropriate way, (5) Evaluation and argument is assessing case solving by providing reinforcement based on facts and arguments (Watson, 1980).

Sharpened critical thinking skills can facilitate students in building knowledge, activeness and assisting in solving a problem, thus students are smarter in learning and skilled. The relationship of critical thinking skills in solving a problem will affect learning outcomes and student achievement. However, the reality is that students' critical thinking skills are still low. Adnyani et al. (2018) explains the factors that cause low learning achievement, namely students' low critical thinking skills in solving a problem to be able to determine and analyze the right answer.

The solution to overcome the weakness of students' critical thinking skills Laili et al. (2021) used a Contextual Teaching and Learning (CTL) strategy, and in addition Sanjaya et al. (2021) explained that the PBL model can train critical thinking skills. Strategies and models used to overcome these solutions need to use learning tools to support the smooth teaching and learning process. Learning tools that can play a role in learning activities are LKPD. According to Suratmi et al. (2019) learning with the help of LKPD makes students learn actively. Students feel happy to learn science when they are involved through problem solving activities, starting from formulating problems, making designs, and solving these problems (Putra et al., 2019). The knowledge that students gain by exploring and building knowledge itself will be easy to remember and keep in mind because in general students will remember things they find independently longer.

Saputra (2019) stated that the LKPD currently used by students is monotonous because the contents of the LKPD are only a summary of the material and some questions intended for practice. Based on this description, it is necessary to develop LKPD in electronic form. This electronic student activity sheet can be run with a computer or cellphone that meets the standards. The learning process using the E-LKPD is considered more effective, in line with Andriyani's (2018) statement that the completion of tasks carried out by students in the learning process mostly utilizes internet access via electronic devices, resulting in students rarely using books and worksheets in the learning process printed form. LKPD is also said to be usually ineffective because most students do not have these books and even though they have them they are lazy to bring them. In addition, during the pandemic situation, distance learning resources are needed that can be used by teachers for the learning process.

The use of E-LKPD can increase interest in learning and can be used to train students' critical thinking skills. E-LKPD is an innovation in learning and has advantages over conventional learning. Conventional learning requires direct interaction in the classroom between teachers and students, in contrast to the E-LKPD which can be accessed at any time and place.

Learning using E-LKPD makes students more active in doing skills. E-LKPD with image display and video links that can be played makes learning more interesting and can be accessed by anyone via a PC/laptop or smartphone. The display of the E-LKPD which is supported by pictures and videos as well as questions makes it easier to answer questions and the results of working on the E-LKPD by students can be sent to the educator's email. Internet networks and software in the form of computers synergize with each other to help improve the quality of learning (Sole & Anggraeni, 2018).

Samawati et al. (2021) explained that efforts to develop flipbook-type E-LKPD to be more innovative and electronic-based by connecting to a *google form link* to make it easier for students to work on and collect the worksheets. The advantages of the E-LKPD are expected to make students feel happy and the concepts that they want to instill in students are maximized. The developed e-LKPD is connected with a *google form link* that can be accessed using smartphones by students so that it can save paper usage and is equipped with images and video animations.

The development of E-LKPD for environmental pollution materials that contains the implementation of cognitive learning and learning experiences for students is very necessary,

BIO-INOVED : Jurnal Biologi-Inovasi Pendidikan
Volume 3, Issue 3, October 2021 page. 210-215
https://ppjp.ulm.ac.id/journal/index.php/bino

OPEN ACCESS JOURNAL
P-ISSN : 2684-9062 | E-ISSN : 2714-9803
DOI: 10.20527/bino.v3i3.11099

especially in overcoming the limitations of electronic learning tools to practice critical thinking skills. Therefore, it is necessary to develop E-LKPD practical environmental pollution materials to train students' critical thinking skills.

B. Materials and Method

This research is a formative evaluation development research that uses Tessmer's (1998) design. The stages of development include (1) self-evaluation; (2) expert test; (3) individual test; (4) small group test; and (5) field test. The development of e-LKPD is based on the results of research on environmental pollution found in South Kalimantan. The e-LKPD design refers to the Ministry of National Education (2008) which was developed to train critical thinking skills according to Watson (1980) including; 1) Interpretation 2) Assumption 3) Deduction, and 4) Inference.

The practicality of the expectations of the e-LKPD that was developed was obtained from the observer's assessment of the implementation of learning and the practicality of expectations in using the e-LKPD on the Small Group test. While the practicality of the developed e-LKPD was obtained from the observer's assessment include the implementation of learning and the practicality of using e-LKPD in the Field Test. The instrument for assessing the implementation of the use of E-LKPD learning materials is obtained by filling out an implementation questionnaire, by giving a tick (√). The instrument for assessing student responses to the use of E-LKPD learning materials in order to get the practicality of expectations (individual test) and actual practicality (field testing) is obtained by filling out the student response questionnaire, check list (√).

Data on the results of the implementation of product use were analyzed descriptively by means of averaging the results of the scores of each aspect of the assessment by observers with the following formulas and criteria:

$$X = \frac{\sum X}{n}$$

Table 1 Score of E-LKPD Implementation

Range score	Criteria
80 < PP ≤ 100	Very good
60 < PP ≤ 80	Good
40 < PP ≤ 60	Not good
0 < PP ≤ 40	Very not good

(Source: Modified from Arikunto, 2012)

Expected and actual practicality data were obtained at the end of the lesson based on the results of student response questionnaires. The percentage results obtained show how positive the response of students to the use of E-LKPD is. The responses in the questionnaire were analyzed descriptively.

Table 2 Catagories of E-LKPD Practicality

Range score	Description
80 < PK ≤ 100	Very practical
60 < PK ≤ 80,00	Practical
40 < PK ≤ 60,00	Less practical
0 < PK ≤ 40,00	Impractical

(Source: Modified from Arikunto, 2012)

Information:
X : Average score
$\sum X$: Total score
n : Number of aspects
PP : Usage Percentage
PK : Practical Presentation

C. Result and Discussions

The practicality data of E-LKPD on environmental pollution materials is divided into two, namely the practicality of expectations obtained from the results of the Small Group Test and the actual practicality obtained from the results of the Field Test.

Very practical criteria obtained from the results of practicality in small group tests and field tests, it is suspected that E-LKPD is easy to learn and easy to understand, E-LKPD uses *google form* which is digital so it is easier to access. Rusnilawati & Gustiana, (2017) state that teaching materials are practically practical, the minimum criteria obtained are good based on student response questionnaires and teacher assessments. Agree with (Setiawati et al., 2017) which states that teaching materials are practical if the products produced are easy to use by users, in this case are students and opinions (Kurniasih & Rahayu, 2017) state that the practicality aspect can be known from the questionnaire analysis of participant responses students to learning tools include responses to use, material, appearance, and language. Andriyani (2018) that the completion of tasks carried out by students in the learning process mostly utilizes internet access via electronic devices, resulting in students rarely using books and worksheets in printed form, it is also said that ordinary worksheets are not effective because most students do not have these books and even though they have, they are lazy to bring them.

Attractive designs and colors will increase students' interest in operating the E-LKPD, the right title will provide an overview of the material to be studied during learning, the right time allocation will maximize the use of time so that it is efficient, the learning objectives are listed to determine the achievement of the abilities to be achieved obtained by students, instructions for use will make it easier

BIO-INOVED : Jurnal Biologi-Inovasi Pendidikan
Volume 3, Issue 3, October 2021 page. 210-215
https://ppjp.ulm.ac.id/journal/index.php/bino
OPEN ACCESS JOURNAL
P-ISSN : 2684-9062 | E-ISSN : 2714-9803
DOI: 10.20527/bino.v3i3.11099

to understand each step that will be taken by students, and a coherent presentation systematic will guide students in learning. This is in line with the opinion of Wulandari et al. (2018) learning media with good presentation are able to provide benefits to students, including easy to operate because they are arranged systematically, generate interest in learning because of an attractive appearance, efficient time during the learning process, and facilitate understanding of concepts that will be accepted by participants educate. In addition, all questions contained in the E-LKPD are answered through a *google form* so that the use of this E-LKPD can be used online.

The data on the E-LKPD is supported by pictures and videos as well as questions on the E-LKPD that can be answered instantly by students and the results of working on the E-LKPD by students after clicking the "SEND" menu are automatically sent to the educator's email. Khan et al. (2017) stated that the availability of access to learning anytime and anywhere provides benefits and increases accessibility.

Table 3 Results of Student Response Tests for Practicality of E-LKPD on Environmental Pollution Materials

No.	Statment	Small Group Test	Field Test
		Yes	Yes
1.	This e-LKPD motivates me to study.	100,0	100,0
2.	I can learn actively and independently with this e-LKPD.	100,0	100,0
3.	I can understand the material presented easily.	100,0	100,0
4.	With this e-LKPD, I get additional material on environmental care, especially environmental pollution from quartz sand mining, diamond mining, red soil C excavation, and coal mining.	100,0	100,0
5.	With this e-LKPD, I can classify environmental pollution due to mining activities such as quartz sand mining and diamond mining	100,0	100,0
6.	I can read the text in the e-LKPD easily because the type and size of the font chosen is right.	85,7	100,0
7.	I like the overall look of the e-LKPD because it has the right color composition.	100,0	90,0
8.	I can understand the material with the help of good quality pictures.	100,0	90,0
9.	I can study according to my own learning needs.	100,0	100,0
10.	I can use the menu button on the media easily.	100,0	100,0
Total		**985,7**	**980**
Average		**98,57**	**98,00**
Criteria		**Very Practical**	**Very Practical**

Table 4 Results of the E-LKPD Implementation Test for Environmental Pollution Materials

No.	Statment	Small Group Test	Field Test
		Yes	Yes
1.	Read the instructions for use and the introduction of teaching materials well, so that they know the contents of the E-LKPD, the benefits to be obtained, and how to operate this E-LKPD.	100	93
2.	Operate teaching materials in a sequential manner, starting from the initial menu to doing the pretest in the "E-LKPD for environmental pollution materials"	100	96
3.	Finding words that are difficult to understand or new about environmental pollution material"	86	88
4.	Asking friends or teachers important words or sentences that attract attention and which are not understood. Quartz sand, diamond mine, red soil C excavation, coal mine	89	84
5.	Read the contents of the environmental pollution material in the E-LKPD carefully.	93	96
6.	Conduct discussions with friends to better understand the material contained in the "E-LKPD material on environmental pollution"	93	86
7.	E-LKPD environmental pollution material makes it possible to make observations or observations around and record them	89	95
8.	E-LKPD environmental pollution material allows for easy classification of material obtained when conducting observations and observations	93	75
9.	Work on the available "E-LKPD for environmental pollution materials" seriously.	93	95
10.	Asking things or materials that have not been understood to the teacher.	93	96
Average		**92,9**	**90,4**
Criteria		**Very Good**	**Very Good**

The practicality data is also supported by data on the implementation of the E-LKPD conducted by the observer in the small group test and field tests. From the data obtained in the small group test, there are students who have difficulty implementing the E-LKPD to classify the material being studied, allegedly the material contained in the E-LKPD-Few LKPDs to enable classifying problems that exist in E-LKPD. Such conditions are suspected because each student has different

OPEN ACCESS JOURNAL
P-ISSN : 2684-9062 | E-ISSN : 2714-9803
DOI: 10.20527/bino.v3i3.11099

interests and ways of learning. As stated by Sudjana (2002) that each individual student is unique, each has their own intellectual abilities, talents, interests, and characters in terms of learning.

The results of the average score obtained as a whole show that the implementation of the E-LKPD is very well done, this shows that the E-LKPD is easy to use and implement by students. The teaching and learning process is carried out well because the learning objectives achieved are conveyed to students through the E-LKPD being studied. This is in accordance with the statement that learning that integrates scientific literacy can be applied through innovative, interactive, and fun methods so that student activity increases in learning activities (Kristyowati & Purwanto, 2019).

The advantages and disadvantages of E-LKPD environmental pollution materials developed to train critical thinking skills are:

1) Excess
   a) Save paper usage, because E-LKPD can be done electronically.
   b) E-LKPD can be used repeatedly because it is available in electronic form so that it does not have to be printed.
   c) The tasks contained in the E-LKPD are in accordance with the critical thinking indicators.
   d) Contains an assessment rubric to make it easier for students to work on the E-LKPD.
   e) Contains examples of how to work on each question in the E-LKPD.
   f) Evaluation questions contain indicators of critical thinking achievement
2) Deficiency
   a) Requires an internet network to access the E-LKPD link.
   b) Requires initial training preparation before working on the E-LKPD in order to achieve the expected critical thinking indicators.

D. Conclusion

The E-LKPD developed environmental pollution material is stated to be very practical to use based on the results of student responses in the small group test with a score of 98.5 and the field test with a value of 98.0 with very practical criteria and the implementation of E-LKPD getting a score in the small group test of 92.9 and in the field test of 90.4 with very good criteria

E. References

Adnyani, I. W., Pujani, N. M., & Juniartina, P. P. (2018). Pengaruh Model Learning Cycle 7E Terhadap Keterampilan Berpikir Kritis Siswa. *Jurnal Pendidikan dan Pembelajaran Sains Indonesia (JPPSI)*, *1*(2), 56-67.

Anggraini, W., Anwar, Y., & Madang, K. (2016). Pengembangan lembar kerja peserta didik (LKPD) berbasis learning cycle 7E materi sistem sirkulasi pada manusia untuk kelas XI SMA. *Jurnal Pembelajaran Biologi: Kajian Biologi Dan Pembelajarannya*, *3*(1), 49-57.

Antika, L. T. (2021). Hubungan antara minat baca, keterampilan metakognitif, dan keterampilan berpikir kritis dengan hasil belajar biologi siswa yang diajar dengan model reading concept map-Think Pair Share (TPS). *SKRIPSI Mahasiswa UM*.

Depdiknas. (2008). Panduan Pengembangan Bahan Ajar. Jakarta: Departemen Pendidikan Nasional Direktorat Jenderal Manajemen Pendidikan Dasar dan Menengah Direktorat Pembinaan Sekolah Menengah Atas.

Griffin, P. & Care, E. (2013). *Assessment and Teaching of 21st Century Skills: Methods and Approach. Springer.*

Halpern, D. (2014). *Thought and knowledge: An Introduction to Critical Thinking*. New York: Pshychology Press.

Hidayati, H., Zaini, M., & Kaspul, K. (2020). Effectivity of Worksheet of Biology Student of High School Based On Critical Thinking Skills in Virus Concept. *BIO-INOVED : Jurnal Biologi-Inovasi Pendidikan*, *2*(1), 41-46.

Ilaah, Y.F. & B. Yonata. (2015). Keterampilan Berpikir Kritis Siswa SMA Kemala Bhayangkari 1 Surabaya pada Materi Laju Reaksi melalui Penerapan Model Pembelajaran Inkuiri. *UNESA Journal of Chemical Education, 1*(1).

Istiningrum, R., Amin, M., & Lestari, U. (2016). Pengembangan Buku Ajar Biologi Sel Berbasis Bioinformatika. *Jurnal Pendidikan: Teori, Penelitian, dan Pengembangan*, *1*(9), 1693-1699.

Khan, A., Egbue, O., Palkie, B., & Madden, J. (2017). Active Learning: Engaging Students To Maximize Learning In An Online Course. *The Electronic Journal of e-Learning*, *15*(2), 107-115.

Kurniasih, D., & Rahayu, H. M. (2018). Pengembangan Perangkat Pembelajaran Kimia Analitik Materi Kromatografi Berorientasi Inkuiri Terbimbing. *Jurnal Pendidikan Matematika dan IPA*, *8*(2), 31-40.

Lestari, T. (2016). Pengembangan Lembar Kerja Peserta Didik (LKPD) Outdoor Learning System Berbasis Project Based Learning Untuk Meningkatkan Keterampilan Berpikir Kritis Tema "Kerusakan Lingkungan" Pada Pembelajaran IPA. *Skripsi*. Fakultas Matematika

OPEN ACCESS JOURNAL
P-ISSN : 2684-9062 | E-ISSN : 2714-9803
DOI: 10.20527/bino.v3i3.11099

dan Ilmu Pengetahuan Alam Universitas Negeri Yogyakarta. Yogyakarta.

Mardhatillah, A., Zaini, M., & Putra, A.P. (2020). Development of Worksheets for Biology High School Student-Based On Critical Thinking on the Concept of Biodiversity. *BIO-INOVED : Jurnal Biologi-Inovasi Pendidikan*, *2*(1), 31-35.

Nieveen. (1999). Prototyping to Reach Product Quality, In Alker, Jan Vander, "Design Approaches and Tools in Education and Training". *Kluwer Academic Publishers*. Dordrecht.

Purnomo, D., Indrowati, M., & Karyanto, P. (2013). Pengaruh Penggunaan Modul Hasil Penelitian Pencemaran di Sungai Pepe Surakarta Sebagai Sumber Belajar Biologi Pokok Bahasan Pencemaran Lingkungan Terhadap Hasil Belajar Siswa. *Pendidikan Biologi*, *5*(1), 59-69.

Putra, A. P., & Nikmah, B. (2017). Characteristics of Student Critical Thinking in Solving Microbiology Problems. *In Proceedings Conference: 1st International Conference on Social Sciences Education-" Multicultural Transformation in Education, Social Sciences and Wetland Environment"* (ICSSE 2017). Atlantis Press.

Putra, A. P., & Rahimah, H. (2017). Validity of Poster on the Characteristics of Candida sp. in the Water of Campus Toilet. *In 5th South East Asia Development Research (SEA-DR) International Conference*. Atlantis Press.

Rahimah, W., Zaini, M., & Halang, B. (2020). Work Sheet Development of High School Student Biology Based on Critical Thinking Skills on the Motion System Concept. *BIO-INOVED : Jurnal Biologi-Inovasi Pendidikan, 2*(2), 100-105**.**

Rusnilawati, & Gustiana, E. (2017). Pengembangan Bahan Ajar Elektronik (BAE) Berbantuan Flipbook Berbasis Keterampilan Pemecahan Masalah dengan 75 Pendekatan CTL pada Pembelajaran Matematika Kelas V Sekolah Dasar. *Jurnal Profesi Pendidikan Dasar*, *4*(2), 190–201.

Setiawati, E., Rahayu, H. M., & Setiadi, A. E. (2017). Pengembangan Media Pembelajaran Modul pada Materi Animalia Kelas X SMAN 1 Pontianak. *Jurnal Bioeducation*, *4*(1), 47-57.

Sudjana, N. (2002). *Penilaian Hasil Proses Belajar Mengajar*. Bandung: Remaja Rosdakarya.

Susanti, S., Masriani, M., & Hadi, L. (2017). Pengaruh model problem based learning terhadap sikap peduli lingkungan siswa SMP Negeri 6 Pontianak. *Jurnal Pendidikan dan Pembelajaran Khatulistiwa*, *6*(11).

Trianto. (2009). *Mendesain Model Pembelajaran Inovatif-Progresif*. Jakarta: Prenada Media.

Trianto. (2013). *Model-model Pembeljaran Inovatif*. Jakarta: Prestasi Pustaka Publisher.

Wulandari, T. A., Sibuea, A. M., & Siagian, S. (2018).Pengembangan Media Pembelajaran Berbasis Multimedia Interaktif pada Mata Pelajaran Biologi. *Jurnal Teknologi Informasi & Komunikasi dalam Pendidikan*, *5*(1), 75-86.