

## Need Analysis for the Development of Electronic Students' Worksheet (E-LKPD) on Education Sustainable Development on the Use of Eco Enzyme

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**Abstract:** Sustainable development education requires innovation in learning methods that can support students' understanding of sustainable concepts comprehensively. Lack of learning media in facilitating learning to improve students' understanding of the use of eco enzymes. The purpose of this study is to describe the analysis of the need for the development of digital teaching materials based on Sustainable Development Education on the material on the use of eco enzymes. This type of research is qualitative research with a survey method. The focus of this research is on the need analysis stage. The instrument used in this study is a questionnaire to analyze the needs of teachers and students at elementary schools 19 Lahat. Data analysis is carried out quantitatively and then explained qualitatively to explain the meaning. Based on the results of the research conducted, it can be concluded that teachers expressed their desire to develop digital teaching materials based on sustainable development of education in the form of electronic student worksheets (ESW) on materials using eco enzymes. In addition, the results of the student perception questionnaire showed a score of 75. Students assessed that the learning methods used so far have not been able to create a good understanding of the material presented so the development of digital-based teaching materials in the form of electronic student worksheets (ESW) can be a solution to the problems that have occurred in learning so far.

**Keywords:** *electronic student worksheets, sustainable development education, eco-enzymes, digital learning media*

### INTRODUCTION

In the face of global environmental challenges, such as climate change, pollution, and biodiversity decline, education for sustainable development (ESD) is becoming increasingly important. The discourse on Education for Sustainable Development (ESD) arises from the issues of environmental and humanitarian crises faced today and future challenges. The term ESD in Indonesia is understood as Sustainable Development Education. Education for Sustainable Development is organized for the sake of relevant education that puts responsibility for the future as the main focus (UNESCO, 2020). ESD itself aims to equip individuals with the knowledge, skills, and values necessary to contribute to sustainable development. One



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of the relevant materials in this context is the use of eco enzymes, a fermentation product that has various benefits for the environment and health.

Eco enzyme is a solution of complex organic substances produced from the fermentation process of organic waste. This eco-enzyme solution is dark brown and has a strong sour/fresh aroma. (Hemalatha and Visantini, 2020). Eco enzyme is a substance produced through the fermentation process of organic waste with the help of microorganisms. Its use not only reduces waste but also supports eco-friendly practices in daily life. Although the benefits of eco enzymes are widely known, there is still a lack of understanding and application of this concept among students and the public. The use of Eco Enzyme aims to teach students about environmental sustainability issues, one of which is utilizing the manufacture of Eco Enzyme, the reason why elementary school 19 Lahat chose this theme in the implementation of the Pancasila Student Profile Strengthening Project (P5). Given that the world's population continues to grow, and the amount of waste continues to increase which causes the ozone layer to deplete.

On the other hand, the role of teachers is no less important in preparing the media. The function of the media is an integral part of learning as a tool to help teachers communicate messages so that the communication process runs well and perfectly so that mistakes can be avoided. (Wina, 2011). Learning media is an intermediary in the learning process. (Daryanto, 2015). Learning media in the teaching and learning process can arouse new desires and interests, generate motivation stimulate learning activities, and even bring psychological influences on students. (Sadiman., 1993).

One of the commonly used learning tools is the student worksheet (ESW). The function of electronic student worksheets is, activating students in the learning process, helping to develop concepts, practicing finding and developing process skills, as a guideline for educators and students in the learning process, including the use of ESW during covid 19 called ESW.

However, teaching materials that support learning, especially the understanding of eco enzymes and ESD principles, are still limited. Currently, students are still experiencing difficulties in understanding the material regarding the use of eco enzymes. The limitations of the media currently used by teachers are one of the obstacles to learning. Therefore, it is important to develop innovative digital-based media to make the learning process more effective. Many existing materials have not been integrated with digital technology that can facilitate access and interaction with students. The results of the study (Suryaningsih and Nurlita, 2021) Show that the development of innovative electronic student worksheets (ESW) is very important to meet the demands of 21st-century learning as teaching materials, practicums, reasons for boredom, technological developments, and the impact of the pandemic. Likewise, another study with the theme of electronic student worksheets (ESW) with the help of the Google Meet application shows that the use of electronic student

worksheets (ESW) increases the completeness of student learning outcomes. (Adawiyah *et al.*, 2021). Adawiyah, R., Amin, S. M., Ibrahim, M., & Hartatik, S. (2021). The results of this research are expected to be used in the development of innovative E-LKPD in the science learning process. In addition, Mispa. *et. al.*, (2022) In his research on the use of Live Worksheet-Based ESW on the Protist Concept on Learning Outcomes concluded that the use of live worksheet-based ESW affects students' cognitive learning outcomes. With the rapid development of information technology, there is an urgent need to develop engaging and informative digital teaching materials, which can improve students' understanding of the use of eco enzymes in the context of sustainability.

The analysis of the need for the development of digital teaching materials aims to identify challenges and opportunities in integrating eco-enzyme utilization materials with a continuing education approach. Through surveys and discussions with educators and students, it is hoped that the most effective formats and content can be found to increase awareness and knowledge about eco enzymes. Thus, the development of these digital teaching materials will not only contribute to learning but also encourage real action for environmental sustainability.

Research related to the use of digital teaching materials has been carried out before. According to several researchers, one of the teaching materials, namely ESW, is a series of activities used by students in conducting investigations and solving problems (Trianto, 2013). Electronic student worksheets (ESW), can be a working guide for students to younger students in understanding learning materials in an electronic form whose application uses computer scopes, notebooks, smartphones, and mobile phones. (Umriani, 2020).

Regarding research on sustainable education, Vilmala (2022) Explained it as a concept that carries a new vision in the world of education, namely empowering people from all walks of life to take responsibility for creating a sustainable future. (Vilmala *et al.*, 2022). Sustainable education also has a function and goal to build sustainable development in meeting the needs of the current generation without harming future generations and improving the quality of life of the community. (Amran *et al.*, 2020).

The novelty of this study compared to previous studies is related to the synergy between the concept of continuing education, technology integration, project-based learning, and increasing environmental awareness. Continuing education is a holistic approach. The teaching materials developed not only focus on the utilization of eco enzymes, but also relate them to broader sustainability issues, such as waste management, resource conservation, and the impact of climate change.

The development of digital-based learning applications or platforms that allow students to access materials anytime and anywhere, as well as collaborating online is adaptive to the times and by the digital native character of students. The inclusion of real projects also encourages students to practice making eco enzymes at home or school, so they can see the impact firsthand. In addition, the selection of eco-enzyme

materials allows teaching materials to be developed by integrating elements of environmental awareness campaigns to encourage students to actively participate in sustainability efforts in their communities.

Based on the description above, the author wants to analyze the need for the development of digital teaching materials based on Education Sustainable Development on Eco Enzyme Utilization Material. The teaching material developed is electronic student worksheets (ESW) with eco enzyme material for Strengthening the Profil Pelajar Pancasila in elementary school so that students are expected to be able to learn and understand this Eco Enzyme material independently and can increase their knowledge of Eco Enzyme.

## **METHOD**

Creswell (2023) defines qualitative research as a survey method. The survey method collects data from respondents through questionnaires or open interviews. The focus of this method is to reveal the meaning experience, and perception of the respondent about a particular social situation. Qualitative research with survey methods aims to study and understand social phenomena by collecting data directly from primary sources. Using flexible research instruments and inductive data analysis Sugiyono (2022) Explained this method. According to Denzin & Lincoln (2023), The survey method in qualitative research is a data collection technique that allows researchers to gain a better understanding of social phenomena through the implementation of questionnaires or in-depth interviews with many respondents. This quantitative descriptive research analyzes the need for teachers and students to develop Electronic Student Worksheets (ESW) in the Sustainable Development Education course, with an emphasis on the use of eco-enzymes.

The data collection technique used is a literature study with books and journals relevant to the research. Literature studies are conducted by collecting relevant research and sources and examining concepts. The literature study was carried out by collecting relevant research and examining the concept of continuing education, digital teaching materials, electronic student worksheets (LKS), and eco enzymes as the basis for the development of digital teaching materials based on sustainable development education on the use of eco enzymes. The survey was conducted by distributing a media needs analysis questionnaire using a questionnaire instrument.

The respondents in this study were 4 teachers and 15 students of SD Negeri 19 Lahat. The instruments used are interview guidelines and questionnaires. Data analysis is carried out quantitatively and then described qualitatively to explain its meaning. The data is interpreted by looking at the score/percentage of respondents' needs for learning media and supporting information about the type of learning media used.

The data obtained were then analyzed qualitatively. The needs analysis stage is carried out by; 1). Identify the possible causes of the gap between expectations and actual reality or facts in the field, 2). Determine

the learning objectives and relevant materials, 3). Process identification of the required data. This step aims to collect, research, and record data and information about the content of teaching materials needed in the development of digital teaching materials based on sustainable development education on eco-enzyme utilization materials.

## RESULTS

Survey analysis is the initial stage in the scheme of developing a product in the form of learning media. The analysis stage of the development of digital teaching materials based on education sustainable development on the use of eco enzymes aims to analyze the problems experienced by educators and students. (Robert Maribe Branch, 2009). In this analysis stage, the researcher conducts a needs analysis to determine the availability of teaching materials used by educators to carry out learning. The result of the needs analysis is that the researcher can design the right product according to the needs of educators and students. Needs analysis was carried out by collecting data using questionnaire techniques and interviews with teachers and students.

Literature study is the basis for the development of digital teaching materials based on education sustainable development on the use of eco enzymes. This stage is the initial activity before developing learning media based on education sustainable development. From the review of the literature, a research instrument was formulated to see what the real conditions are in learning and analyze students' needs for the media to be developed.

The following is a grid of instruments used to conduct a needs analysis for teachers.

**Table 1.** Teacher Needs Analysis Grid

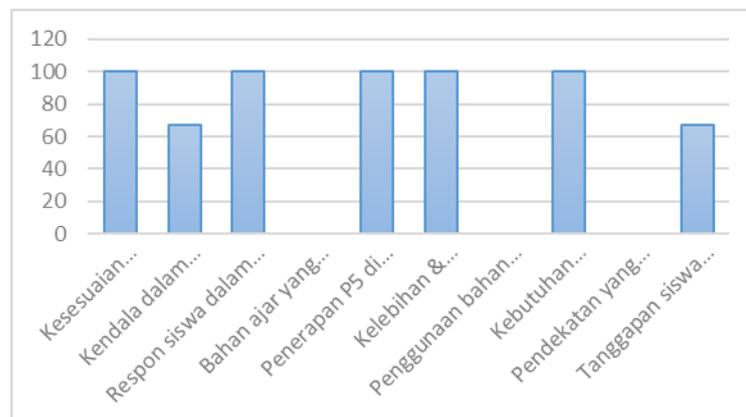
No	Aspect	Indicator
1	Curriculum Analysis and Material Constraints	Curriculum used
		Obstacles in the delivery of material
		Student response in learning Eco Enzyme material
2	Teaching materials used	Teaching materials used by teachers
		Implementation of P5 in schools
		Advantages & disadvantages of the teaching materials used
3	Teaching materials in the form of ESW	The use of teaching materials in the form of ESW
		The need for the development of digital ESW
4	Approach used	Approach used in the learning scheme
		Student responses in the learning scheme use the approach used.
		Advantages and disadvantages of the approach used

The grid of instruments used to analyze the needs of students regarding learning is as follows.

**Table 2.** Needs Analysis Questionnaire Grid

No	Aspect	Indicator
1	Learning Aspects of P5	P5 is a difficult subject for me
		I have difficulty relating P5 Eco Enzyme material to daily life.
		I have difficulty understanding the Eco Enzyme material in Lesson P5.
2	Aspects of Teaching Materials	The existing teaching materials are still not interesting to me.
		I want interesting electronic teaching materials in Eco Enzyme material.
3	Aspects of Electronic-based Teaching Materials	I wanted electronic-based teaching materials that could feature pictures, animations, explainer videos, and engaging interactive features.
4	Aspects of Computer Use/Laptop/handphone	In my school, some computers/laptops and facilities support the use of electronic teaching materials.
		I have a laptop/mobile phone at home.
5	Aspects of the Use of Electronic Teaching Materials	I have never used electronic teaching materials.
		I am interested in using electronic teaching materials in Eco Enzyme learning.

The identification of needs in the development of digital teaching materials based on education sustainable development on the use of eco enzymes is measured from four aspects: Curriculum Analysis and Material Constraints, Teaching Materials Used, Teaching Materials in the form of electronic student worksheets (ESW) and Approaches Used in Learning Currently Used. From the interviews conducted with three teachers who teach, the identification results shown in the following image are obtained.



**Figure 1.** Identification of Learning in Eco Enzyme Utilization Materials

From the picture, it is known that the analysis of the curriculum used, and the learning carried out has entirely used the independent curriculum. However, in its implementation, as many as 67% of teachers stated that they still experienced difficulties in implementing it and were still adapting to this new curriculum. In terms of student response, all teachers stated that students were very enthusiastic about participating in learning

because students were aware of the importance of caring for the environment as part of supporting the continuing education program.

In terms of teaching materials, it is known that so far learning has used teaching materials in the form of practical instructions for making eco enzymes and using lecture methods in its delivery. All teachers (100%) have never used digital-based teaching materials in the form of ESW. According to the new respondents, 67% of students showed a positive response to learning. Therefore, 100% of teachers expressed their desire to develop digital teaching materials based on education sustainable development in the form of ESW on the use of eco enzymes.

The following are the results of the questionnaire given to students to identify the need for the development of digital teaching materials based on education sustainable development in the form of ESW on the use of eco enzymes from the student's perspective.

**Table 3.** Analysis of the need for the development of digital teaching materials based on education sustainable development in the form of electronic student worksheets (ESW) on the use of eco enzymes from the perspective of students

No	Aspect	Indicator	Students																		
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	Learning Aspects of P5	1	4	5	4	3	4	3	3	3	5	3	3	5	5	3	3	1	4	3	4
		2	5	5	3	4	5	5	4	4	5	4	4	5	3	4	4	5	5	5	5
		3	3	4	5	3	5	3	3	5	4	4	4	5	4	3	3	1	4	5	3
2	Aspects of Teaching Materials	4	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1
		5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3	Aspects of Electronic-based Teaching Materials	6																			
		2	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	2	2
4	Aspects of Using Computers/Laptop/Mobile Phones	7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		8	5	5	4	3	5	5	5	5	5	5	5	5	5	5	5	4	5	4	4
5	Aspects of the Use of Electronic Teaching Materials	9																			
		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Score			79	83	72	62	83	72	69	79	86	72	72	86	76	69	69	55	79	79	76
Score Average			75																		

**Legend:**

- Aspect 1: P5 is a difficult subject for me
- Aspect 2: I find it quite difficult to relate the material of P5 Eco Enzyme to daily life
- Aspect 3: I have difficulty understanding the Eco Enzyme material in Lesson P5
- Aspect 4: The existing teaching materials are still not interesting to me.
- Aspect 5: I want interesting electronic teaching materials in Eco Enzyme material.
- Aspect 6: I want electronic-based teaching materials that can display pictures, animations, explainer videos, and interesting interactive features
- Aspect 7: In my school, there are computers/laptops and facilities that support the use of electronic teaching materials.
- Aspect 8: I have never used electronic teaching materials.
- Aspect 9: I am interested in using electronic teaching materials in Eco Enzyme learning

The next stage is an analysis of students' needs regarding learning so far. At this stage, an initial analysis was carried out, namely by distributing questionnaires used to find out students' perceptions of the

current learning, actual learning conditions, media used, and learning needs using electronic student worksheets (ESW) to foster students' environmental awareness. The researchers conducted a field study to find out the need to develop learning media in the form of electronic student worksheets (ESW) to foster students' environmental awareness with the use of eco enzymes. The results of the questionnaire regarding students' perception of the defense showed an average score of 75.

The results of the questionnaire showed that students expressed their interest in learning the material on the use of eco enzymes and felt that the material presented was very useful for daily life. However, students stated that the learning methods used so far have not been able to make a good understanding of the material presented, teachers still use conventional learning media and digital teaching materials are still limited. Regarding facilities, schools already have devices that can support digital-based learning. Thus, the development of digital-based teaching materials in the form of electronic student worksheets (ESW) can be a solution to problems that occur in learning. For this reason, all parties must work together by utilizing local resources, using teaching materials that are easily accessible and can solve environmental problems, and developing innovative learning strategies.

## **DISCUSSION**

Based on the results of the analysis, shows that learning today demands innovation in its implementation. This also encourages every teacher to always develop innovative learning by using various technology-based media. One of the teachers' efforts to develop innovative media is to develop electronic student worksheets (ESW). If so, far student worksheets have been presented more in paper form, then the presentation in innovative digital form is expected to have a significant impact on students understanding the material about the use of eco enzymes. Currently, teachers still have limitations in providing technology-based learning media. That way, teachers consider it necessary to use innovative technology-based learning media to support the learning process. This finding is in line with research that states that the factors that cause effectiveness in the learning process are influenced by the type of media chosen and the learning methods applied in the learning process (Qistina, M., Alpusari, M., Noviana, E., & Hermita, 2019; Muhammad, R. Eka Murtinugraha and Sittati Musalamah, 2020).

Based on the results of questionnaires and interviews, teachers often use lecture methods in the learning process, namely by using student worksheets as a learning medium. (Widiyastuti *et al.*, 2018; Firdaus, Suryanti, and Azizah, 2020). Based on this, teachers need technology-based learning media in the learning process. In other studies, it has also been proven that the use of learning media and PowerPoint-based textbooks supports students in learning independently, but innovation is also needed in creating interactive learning media. In addition, other research on the use of digital-based media shows that the use of Google

sites in learning can increase students' motivation and learning independence. (Noviano, Riyanto, and Setyaedhi, 2023) Another study conducted by Feri (2021) Also shows the same thing that the use of technology-based interactive learning media (ICT) in the learning process is urgently needed as a medium that supports the learning process. The implementation of this research is that the results of this research can be used as an analysis of media development needs that can be continued at the development stage, especially to develop. Several studies summarized from Google Scholar (Adiati, Firdaus and Nurwahidin, 2023) Show findings that research on the implementation of innovative media in the form of animated videos has an average feasibility of 89.3% when used in science learning and has a positive impact on student learning outcomes.

## CONCLUSION

Based on the results of the analysis of the need for the development of digital teaching materials based on Education Sustainable Development on the Utilization of Eco Enzyme Material. The teaching material developed is electronic student worksheets (ESW) with eco enzyme material for Strengthening the Pancasila Student Profile in Elementary Schools, it can be concluded that so far learning has used teaching materials in the form of practical instructions for making eco enzymes and using the lecture method in its delivery. All teachers (100%) have never used digital-based teaching materials in the form of electronic student worksheets (ESW). According to the new respondents, 67% of students showed a positive response to learning. Therefore, 100% of teachers expressed their desire to develop digital teaching materials based on education sustainable development in the form of electronic student worksheets (ESW) on eco-enzyme utilization materials.

On the other hand, the results of the questionnaire on student perception showed a score of 75. Students consider that the learning methods used so far have not been able to make a good understanding of the material presented, teachers still use conventional learning media and digital teaching materials are still limited. Regarding facilities, schools already have devices that can support digital-based learning. Thus, the development of digital-based teaching materials in the form of electronic student worksheets (ESW) can be a solution to problems that occur in learning.

## REFERENCES

- Adawiyah, R. *et al.* (2021). Peningkatan Ketuntasan Hasil Belajar Siswa Sekolah Dasar Pada Pembelajaran Tematik Melalui E-LKPD dengan Bantuan Aplikasi Google Meet. *Jurnal Basicedu*, 5(5), 3393–3398. Available at: <https://doi.org/10.31004/basicedu.v5i5.1339>

- Adiati, C.C., Firdaus, R. and Nurwahidin, M. (2023). The Effectiveness of Animation Video On Student Learning Outcomes. *Akademika*, 12(01),69–81. Available at: <https://doi.org/10.34005/akademika.v12i01.2663>
- Amran, A. *et al.* (2020). Implementation of education for sustainable development to enhance Indonesian golden generation character. *Journal of Physics: Conference Series*, 1521(4), 2–7. Available at: <https://doi.org/10.1088/1742-6596/1521/4/042102>
- Creswell, J. W. (2023). *Qualitative Inquiry and Research Design: Choosing Among Five Approaches*. SAGE Publications.
- Daryanto (2015) *Media Pembelajaran*. Bandung: CV. Yrama Widya.
- Denzin, N. K., & Lincoln, Y. S. (2023). *The SAGE Handbook of Qualitative Research*. Sage Publications.
- Feri, A. and Zulherman, Z. (2021). Analisis Kebutuhan Pengembangan Media Pembelajaran IPA Berbasis Nearpod. *Jurnal Imiah Pendidikan dan Pembelajaran*, 5(3), 418. Available at: <https://doi.org/10.23887/jipp.v5i3.33127>
- Firdaus, F.Z., Suryanti, S. and Azizah, U. (2020). Pengembangan Multimedia Interaktif Berbasis Pendekatan SETS Untuk Meningkatkan Kemampuan Berpikir Kritis Siswa Sekolah Dasar. *Jurnal Basicedu*, 4(3), 681–689. Available at: <https://doi.org/10.31004/basicedu.v4i3.417>
- Hemalatha, M. and Visantini, P. (2020). Potential use of eco-enzyme for the treatment of metal-based effluent. *IOP Conference Series: Materials Science and Engineering*, 716(1).
- Mispa, R., Prahatama Putra, A. and Zaini, M. (2022). Penggunaan E-Lkpd Berbasis Live Worksheet pada Konsep Protista terhadap Hasil Belajar Peserta Didik Kelas X Sman 7 Banjarmasin. *Jurnal Pendidikan Indonesia*, 3(01), 1–12. Available at: <https://doi.org/10.59141/japendi.v3i01.478>.
- Muhammad, H., R. Eka Murtinugraha and Sittati Musalamah (2020). Pengembangan Media Pembelajaran E-Learning Berbasis Moodle Pada Mata Kuliah Metodologi Penelitian. *Jurnal PenSil*, 9(1), 54–60. Available at: <https://doi.org/10.21009/Jpensil.V9i1.13453>.
- Noviano, F.G., Riyanto, Y. And Setyaedhi, H.S. (2023). Effectiveness of Using Google Sites-Based E-Learning Media In Photography Learning. *Akademika*, 12(01), 39–46. Available at: <https://doi.org/10.34005/akademika.v12i01.2670>
- Qistina, M., Alpusari, M., Noviana, E., & Hermita, N. (2019). Pengembangan Multimedia Interaktif Mata Pelajaran IPA Kelas IVC SD Negeri 034 Taraibangun Kabupaten Kampar. *Primary: Jurnal Pendidikan Guru Sekolah Dasar*, 8(2), 160–172. <https://doi.org/10.33578/jpfkip.v8i2.7649>.
- Robert Maribe Branch (2009). *Instructional Design : The ADDIE Approach*. London: Springer New York Dordrecht Heidelberg. Available at: <https://doi.org/10.1007/978-0-387-09506-6>.
- Sadiman., A.S. (1993). *Media Pendidikan*. Jakarta: PT Raja Grafindo Persada.

- Sugiyono. (2022). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D*. Alfabeta.
- Suryaningsih, S. and Nurlita, R. (2021). Pentingnya Lembar Kerja Peserta Didik Elektronik (E-LKPD) Inovatif dalam Proses Pembelajaran Abad 21. *Jurnal Pendidikan Indonesia*, 2(7), 1256–1268. Available at: <https://doi.org/10.36418/japendi.v2i7.233>.
- Trianto (2013). *Mendesain Model Pembelajaran Inovatif-Progresif konsep, Landasa, dan Implementasinya pada Kurikulum Tingkat Satuan Pendidikan (KTSP)*. Jakarta: Kencana Prenanda Media.
- Umriani (2020). Studi Pendahuluan: E-LKPD Berbasis PBL untuk Meningkatkan Kemampuan Literasi Matematis Peserta Didik. *JKPM (Jurnal Kajian Pendidikan Matematika)*, 6(1), 131. Available at: <https://doi.org/10.30998/jkpm.v6i1.8169>.
- UNESCO (2020). *Education for Sustainable Development: A Roadmap. Paris*. [https://unesdoc.unesco.org/ark:/482\\_23/pf0000374802](https://unesdoc.unesco.org/ark:/482_23/pf0000374802)
- Vilmala, B.K. et al. (2022). A Literature Review of Education for Sustainable Development (ESD) in Science Learning: What, Why, and How. *Journal of Natural Science and Integration*, 5(1), 35. Available at: <https://doi.org/10.24014/jnsi.v5i1.15342>
- Widiyastuti, N. et al. (2018). Pengembangan Media Pembelajaran Interaktif Menggunakan Software Adobe Flash Universitas Kristen Satya Wacana Using Adobe Flash Software. 32(1), 79–86. <https://doi.org/10.21009/pip.321.9>.
- Wina, S. (2011) *Perencanaan dan Desain Sistem Pembelajaran*. Jakarta: Kencana.