

Development of e-LKPD Assisted by Liveworksheets Based on HOTS in Chemistry Materials of Grade X Senior High School Even Semester of Merdeka Curriculum

1st Aisyatur Radhwa Marpaung¹, 2nd Zainuddin Muchtar², 3rd Nurfajriani³

{aisyaturrd@gmail.com¹, muchtar.zai@unimed.ac.id², nurfajriani@unimed.ac.id³}

Master of Chemistry Education, Postgraduate School, Medan State University, Indonesia¹, Chemistry Department of Medan State University, Indonesia^{2,3}

Abstract. This study aims to develop electronic worksheet teaching materials for chemistry class X even semester that are valid, practical and effective. The method used in this study is Research and Development (R&D) with the ADDIE development model. The data analysis technique used is a quantitative and qualitative descriptive analysis technique. The results of this study are e-LKPD assisted by Liveworksheet based on HOTS which has been developed based on the design that has been designed. According to a review of three material experts, media experts, and three chemistry teachers, the average four aspects of validation value are belonging to the valid category with a percentage 89.75% , 91.8% , and 94.5% . The conclusions from the e-LKPD assisted by Liveworksheet research are said to be valid, practical and effective and can be implemented for the learning process.

Keywords: e-LKPD; Liveworksheets; Chemistry.

1 Introduction

Learning is a process to obtain motivation in knowledge, skills, habits and behavior. The purpose of the learning process is the occurrence of changes, both from the cognitive aspect and the attitude aspect of the individual after the learning process is carried out. The learning process is certainly closely related to the learning process. Learning as a set of actions designed to take into account external events that play a role in a series of internal events that take place within students [1]. Implementation of learning provides its own challenges for educators, students, institutions and even the wider community such as parents.

Chemistry learning material is an abstract science so students assume that chemistry is included in learning material that is difficult because it requires imagination to understand the concept [2]. The concept of chemistry which is considered complex because it requires

mastery of basic knowledge as well as application in everyday life becomes a problem when the learning process takes place [3][4]. In the learning and learning process, one of the results to be obtained from this process is whether or not the indicators of student learning outcomes are achieved. In order for this to be achieved, a teaching material is needed to support the achievement of student learning outcomes indicators, one of which is the Student Worksheet (LKPD). In accordance with the General Guidelines for the Development of Teaching Materials compiled by the Ministry of National Education student worksheets can be interpreted in the form of sheets containing tasks that must be done by students [5]. Student Worksheets (LKPD) are needed to determine the success of students in understanding and mastering the knowledge given [6].

In today's digital era, everything uses technology and information which is growing very rapidly and has entered the world of education even up to the stage of the learning process [7]. The benefits of digital learning in supporting the implementation of the learning process are increasing students' absorption in understanding the context of learning materials, encouraging independent learning abilities, increasing active student participation, and increasing the ability to display information with technological devices to develop skills in facing the 21st century, namely creative, critical thinking, collaborative and communicative [8]. Of course educators really need teaching materials that are interesting and interactive so as not to make students bored, including by utilizing technological sophistication [9]. The use of technology in the learning process can be implemented through Liveworksheet teaching materials to attract more students' attention and motivate students in participating in the learning process. Liveworksheet-assisted teaching materials can be seen as learning and communication tools or devices, bearing in mind that with teaching materials we can learn a topic, material, and learning content. The general purpose of using teaching materials in education is to construct meaningful and understandable knowledge, construct knowledge that can be applied, and construct knowledge about learning, these important competencies enable students to become experts in the learning process independently [10].

Based on the results of observations made in class X Private Senior High School Al-Azhar Medan, that the learning and learning process still uses commonly used media, where the teacher explains material using power point (PPT), printed books and teaching modules but not every day this is done, after that the teacher distributes printed Student Worksheets (LKPD) to students directly. Then students do the assignments given by the teacher on the LKPD paper directly. Occasionally students do exercises through the Google form application by typing back the link on the LKPD paper and sending it via WhatsApp. From the results of observations made, it is possible that over time it will cause boredom.

Seeing this phenomenon, researchers feel the need to develop the use of more interactive learning media or can be referred to as interactive multimedia, to support the effectiveness of learning and learning both directly and online in order to achieve meaningful learning for students at Private Senior High School Al-Azhar Medan. Thus the use of the liveworksheet platform is expected to increase students' motivation and interest in learning. The liveworksheet platform is an online container that can turn traditional printable worksheets (documents, pdf, and jpg) into interactive online exercises because they can contain videos, images, and audio (Liveworksheets) [11].

Based on the problems stated above, it can be seen that LKPD using the liveworksheet platform has great potential to be developed as a learning medium. Therefore, researchers developed worksheets assisted by the HOTS-based liveworksheet platform for class X Private Senior High School Merdeka Curriculum. The researcher focused this research on the development of Student Worksheets (LKPD) assisted by the liveworksheet platform on chemistry material for class X even semester because chemistry learning is designed on a HOTS basis to strengthen students' high-order thinking skills.

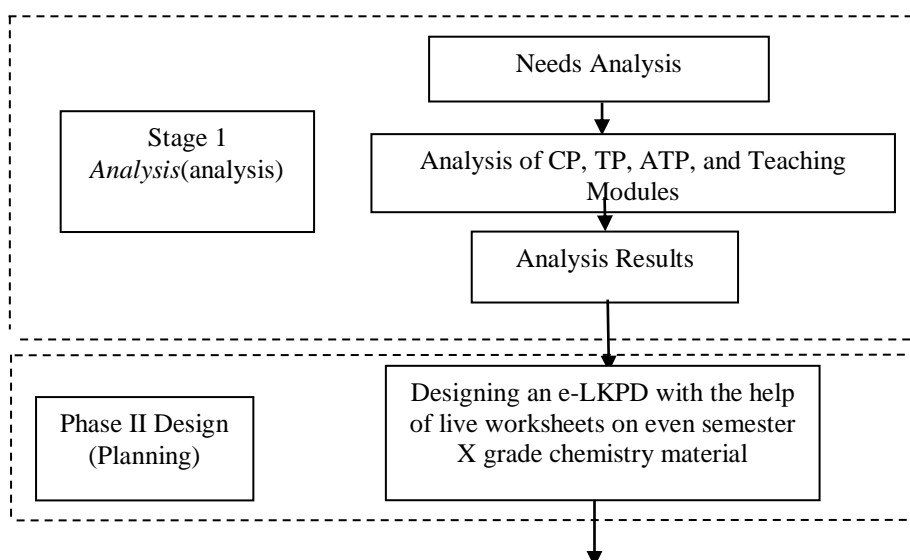
Research that has been conducted shows that learning outcomes using the developed e-LKPD obtain cognitive learning outcomes that are greater than the KKM score. On the other hand, Hardiyanti stated that the use of e-LKPD can increase student learning activities. Likewise, the research conducted by Handayani shows that the development of interactive worksheets to train HOTS is very feasible and gets positive responses to be used as learning media [12] [13] [14].

The results of these research activities become a reference for researchers to develop worksheets assisted by the liveworksheet platform on chemistry with the advantage of being able to increase the activeness of students in learning because they can support one of the objectives of learning chemistry to shape the character of students to become individuals and good citizens in accordance with the character profile of Pancasila students on the independent curriculum, as well as being more motivated to take part in chemistry lessons.

The purpose of this study was to develop, to determine the feasibility, of developing Student Worksheets (LKPD) with the help of liveworksheets on chemistry material for class X even semester.

2 Method

The research method used in this study is the Research and Development (R&D) development research method. Research and development methods are research that can be used to produce products, as well as test product effectiveness [15]. In this research process using the ADDIE development procedure, this model consists of five steps, namely: (1) analysis, (2) design, (3) development, (4) implementation and (5) evaluation [16]. Of the five stages of the ADDIE model, only 3 steps were adapted in this study which are more fully presented in Figure 1.



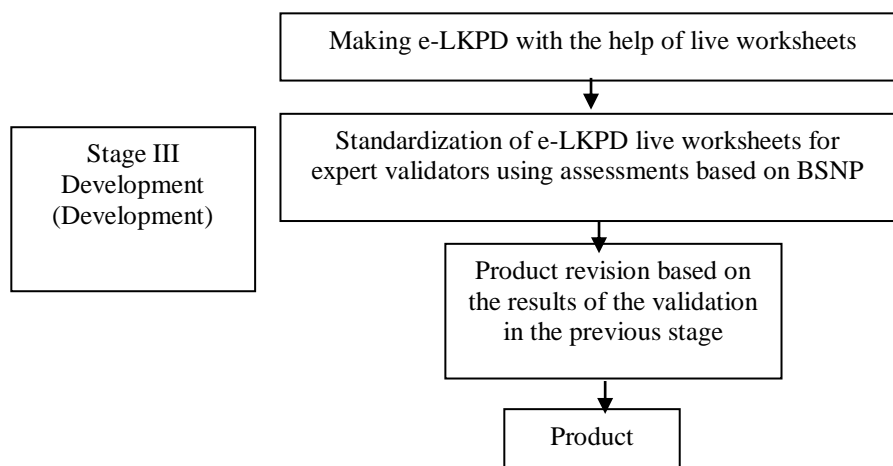


Fig 1. Research Chart

The data collection instrument used in this study was a validation questionnaire sheet based on eligibility standards according to the National Education Standards Agency (BSNP). Questionnaires were given to expert lecturers in the field of material and media as well as chemistry teachers. The scale used in the LKPD feasibility questionnaire assisted by the HOTS-based liveworksheet platform is a Likert scale with a range of 1-4 where the answers given strongly disagree to strongly agree. The data analysis technique used is a quantitative descriptive analysis technique and a qualitative descriptive analysis technique. To interpret the eligibility category of the LKPD assisted by the HOTS-based liveworksheet platform, it can be seen in Table 1.

Table 1. Criteria for the validity of the average value analysis

| Average | Interpretation |
|-------------|--|
| 3.26 - 4.00 | Valid and does not need to be revised (feasible) |
| 2.51 – 3.25 | Valid enough and does not need to be revised (decent enough) |
| 1.76 – 2.50 | Invalid, some multimedia content needs to be revised (less feasible) |
| 1.00 – 1.75 | Invalid and needs to be totally revised (not feasible) |

3. Results and Discussion

This research is a Research and Development (R&D). This development research process only uses 3 steps adapted in this study consisting of analysis (Analyze), design (Design), development (Development).

a. Analysis (Analyze)

At this analysis stage, an initial analysis is carried out first to collect the information needed as material for consideration in research development. The initial analysis carried out was a needs analysis by analyzing the curriculum materials and teaching materials used by the teacher. Researchers conducted interviews with teachers and conducted an analysis of teaching materials that are often used in the learning process. Information obtained through interviews, namely the condition of students when the teacher does not use teaching materials when teaching as much as 75% will cause students' learning interest to be still low and 25% more, the learning activities of students are still less active, shown in Figure 2.

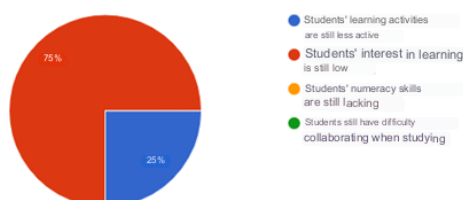


Fig 2. Conditions of Students

Based on the results of interviews in the process of developing teaching materials especially with the help of the liveworksheet platform, it was found that teachers still experience difficulties or obstacles in developing interesting and interactive teaching materials, especially in making teaching materials assisted with the liveworksheet platform. The results of the analysis of teacher interviews regarding the development of teaching materials assisted by the liveworksheet platform are in the form of: the obstacles that are often faced in making teaching materials such as making interesting teaching material designs digitally and choosing the right teaching materials and combining them with the needs of students in class according to the material. shown in Figure 3.

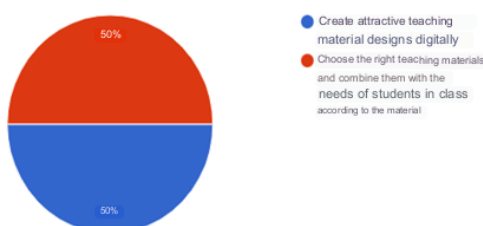


Fig. 3 . Obstacles in the Development of Teaching Materials

The solution to this problem is that the teacher wants tutorials in making, developing and using chemistry teaching materials so that they are able to make their own teaching materials.

b. Design (Design)

At the design stage, researchers collected relevant sources including learning outcomes, teaching modules, teacher's books, student books, and the internet, especially journals as reference material in making LKPD, as well as discussions with the chemistry teacher. Then a flow of learning objectives and content of the worksheet based on the liveworksheet platform is compiled, namely instructions for use, a summary of the material, activities or assignments. After the LKPD with the help of the liveworksheet platform has fulfilled all the learning objectives, the next step is to make cover designs, backgrounds and learning videos using Youtube and Canva. Youtube is needed to create learning videos, while Canva is a useful online design and publishing tool to create any design and publish it anywhere. This application was launched in 2013.

c. Development

At this development stage, the product to be developed was made, namely the e-LKPD assisted by a HOTS-based liveworksheet. The activities carried out are making designs, questions and games, compiling material so that it is systematic and in accordance with predetermined indicators, making animated videos and including pre-designed learning videos. After everything has been done with the help of Canva Design, then combine all the materials that have been prepared using the liveworksheet platform to become an innovative HOTS-based liveworksheet-assisted e-LKPD. LKPD assisted by the liveworksheet platform can be accessed via the link <https://www.liveworksheets.com/5-ok382119jkor> can be seen in Figure 2.



Fig. 4. Liveworksheet-based LKPD design

After the liveworksheet-assisted LKPD has been completed, the next step is to conduct a feasibility test to material and media experts and teachers to determine whether the HOTS-based liveworksheet-assisted e-LKPD developed is feasible or not used in chemistry learning class X even semester and aims to find out one of the aspects of product development quality, namely the aspect of validity. At this stage the researcher only carried out the validation test stage by experts and for small group trials, namely the teacher.

And to calculate the percentage of validity assessment responses can be calculated using the formula:

$$\% \text{ Response} = \frac{n}{N} \times 100$$

Information:

% = Percentage Response

n = Total criterion scores

N = Maximum total score

The eligibility validation of LKPD media assisted by liveworksheets in chemical material "Basic Law of Chemistry" has received an assessment from material experts and media experts using instruments with a score of 1 - 4 according to the percentage interval of the result score and predetermined interpretation criteria, as can be seen in Table 1 [17].

Table 1. Interpretation Categories of Validity Scores

| Value Scale | Score (%) | Category Level |
|-------------|-----------|-----------------|
| 1 | 0 – 25 | Totally Invalid |
| 2 | 26-50 | Invalid |
| 3 | 51 - 75 | Valid Enough |
| 4 | 76 -100 | Valid |

Based on the results of the feasibility assessment of the experts can be seen in Table 2.

Table 2. LKPD assessment assisted by the liveworksheet platform

| Evaluation | Final Score Presentation | Criteria |
|-----------------|--------------------------|----------|
| Material Expert | 89.75% | Valid |
| Media Expert | 91.8% | Valid |
| Teacher | 94.5% | Valid |

Details of the material expert validation results can be seen in Table 3

Table 3. Results of material and teacher validation

| Aspect | Number of Questions | Material Expert | Teacher |
|---------------------|---------------------|-----------------|---------|
| Content Eligibility | 9 | 89.75% | 92.5% |
| language | 5 | 86.75 | 90% |
| Serving | 3 | 91.75 | 100% |
| graphic | 4 | 91.75% | 93.75% |

Material feasibility validation consists of 4 aspects, namely: (1) content feasibility, (2) Linguistics, (3) Presentation, and (4) Graphic [18]. Validation of the feasibility of the material aims to determine the compatibility between the contents of the developed media content and the needs of students. The results of the feasibility of material experts show that LKPD assisted by the liveworksheet platform obtains an average percentage of 89.75% with valid criteria, and teachers of 94.5% with valid criteria, from the aspect that has the highest percentage, namely 100%. This criterion is obtained after carrying out guidance and revision by material experts and teachers first. There are several suggestions from experts for adding material and changing sentences in the material into sentences that are easy for students to understand.

Following are the results of media expert validation which can be seen in table 4

Table 4. Media validation results

| Aspect | Number of Questions | Gain Score | Max Score | % | Category |
|---|---------------------|------------|-----------|-------|----------|
| Guide and Information | 3 | 14 | 15 | 93.4 | Valid |
| Program Performance | 10 | 47 | 50 | 94 | Valid |
| Systematics, Aesthetics, and Design Principles | 18 | 79 | 90 | 87.77 | Valid |

Meanwhile, media feasibility validation consists of 3 aspects, namely: (1) Guidelines and Information, (2) Program Performance, and (3) Systematics, Aesthetics, and Design Principles. This validation aims to determine the quality and effectiveness of the media that has been developed. The feasibility results of media experts show that LKPD assisted by the liveworksheet platform obtains an average percentage of 91.8% with Valid criteria. The advice given by media experts is to pay attention to the style of letters used in the media, namely the style of letters that are easy to see from a distance, not thick or thin, and make the colors more contrasting. In line with the function of Student Worksheets (LKPD), namely as teaching materials that can minimize the teacher's role, but make students play an active role, as instructions for students in doing assignments, and facilitate the implementation of learning [19]. Types of teaching materials such as student worksheets are student guides that can be used as a guide to train the development of cognitive aspects as well as guidelines for all aspects of learning including demonstration guides [20]. Another opinion says that the use of LKPD in the learning process can significantly improve student learning outcomes [21]. In general, students responding to worksheets assisted by the liveworksheet platform is something new. An attractive LKPD display can make it easier for students to understand the material [22]. However, it cannot be denied that there are some students who are still difficult to apply the LKPD assisted by the liveworksheet platform because they do not understand the instructions for use that have been given.

4. Conclusion

LKPD assisted by the liveworksheet platform is declared to have met the eligibility criteria, and can be used as an alternative use of media in student learning. This product has advantages compared to other worksheets, 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 such as drag and drop, join with arrows, multiple choice, essays, and learning videos, so students don't feel bored. in participating in chemistry lessons and attracting students' interest in learning more about chemistry. This LKPD can be accessed in a link format and does not have certain restrictions. Accessing it only requires an internet network.

From the results of validation tests that have been carried out by material experts and media experts as well as from the responses of students, it can be seen that this product obtained a percentage of 91.8% according to media experts with good criteria, and 89.75% according to material experts with very good criteria. The development of worksheets assisted by the liveworksheet platform can be used as a means to make it easier for students to understand the material, especially to make it easier for students to understand even semester chemistry material which is often considered boring.

References

- [1] Ihsana El Khuluqo, *Problematika dan Inovasi Pendidikan Dasar: Metode dan Aplikasi Dalam Proses Pendidikan*. Yogyakarta: Pustaka Pelajar, 2021. [Online]. Available: <https://opac.perpusnas.go.id/DetailOpac.aspx?id=1545681>
- [2] E. M. ZAM, "Peran Literasi Teknologi Informasi Dan Komunikasi Pada Pembelajaran Jarak Jauh Di Masa Pandemi Covid-19," *EDUTECH J. Inov. Pendidik. Berbantuan Teknol.*, vol. 1, no. 1, pp. 11–20, 2021, doi: 10.51878/edutech.v1i1.176.
- [3] Nurfajriani, H. Wildayani, and A. W. Nugraha, "Pengembangan Bahan Ajar Inovatif dan Interaktif Berbasis Konseptual Pada Materi Termokimia di SMA/MA," *Prosiding Seminar Nasional Kimia dan Terapan*, 2021, pp. 44–49.
- [4] S. Yudha, N. Nurfajriani, and R. Silaban, "Analisis Kebutuhan Guru Terhadap Pengembangan Media Pembelajaran Kimia Berbasis Android," *J. War. Desa*, vol. 5, no. 1, pp. 1–6, 2023, doi: 10.29303/jwd.v5i1.219.
- [5] N. Andriyani, Y. Hanafi, I. Y. B. Safitri, and S. Hartini, "Penerapan Model Problem Based Learning Berbantuan Lkpd Live Worksheet Untuk Meningkatkan Keaktifan Mental Siswa Pada Pembelajaran Tematik Kelas VA SD Negeri Nogopuro," *Pros. Pendidik. Profesi Guru*, no. September, pp. 122–130, 2020, [Online]. Available: http://eprints.uad.ac.id/21216/1/12_NoviAndriyani-PGSD%28122-130%29.pdf
- [6] S. Widodo, "Pengembangan Lembar Kegiatan Peserta Didik (LKPD) berbasis Pendekatan Saintifik untuk Meningkatkan Keterampilan Penyelesaian Masalah Lingkungan Sekitar Peserta Didik di Sekolah Dasar," *J. Pendidik. Ilmu Sos.*, vol. 26, no. 2, p. 189, 2017.
- [7] L. Hamimi and R. Sari, "The Development Of Proof Teaching Materials For High School Students," vol. 488, no. Aisteel, pp. 113–119, 2020, doi: 10.4108/eai.17-10-2018.2294081.
- [8] A. Sutiani, Z. Muchtar, R. E. Dibyantini, M. Sinaga, and J. Purba, "Analisis Kemampuan Guru-Guru Kimia SMA Sumatera Utara Dalam Mengintegrasikan TPACK," *J. Inov. Pembelajaran Kim.*, vol. 4, no. 2, p. 112, 2022, doi: 10.24114/jipk.v4i2.39259.

- [9] S. Rumahorbo and N. Nurfajriani, "Pengembangan Media E-Learning Berbasis Weblog dengan Pendekatan Contextual Teaching and Learning (CTL) pada Materi Laju Reaksi," *J. Indones. Sos. Sains*, vol. 3, no. 4, pp. 615–624, 2022, doi: 10.36418/jiss.v3i4.566.
- [10] M. Rusli, D. Hermawan, and N. . Supuwingsih, *Multimedia Pembelajaran yang Inovatif*. Andi, 2017.
- [11] N. Nurfajriani, "Tren Penelitian Pendidikan Proses Pembelajaran Daring Selama Pandemi Covid 19," *PROSIDING SEMINAR NASIONAL KIMIA*, 2021, pp. 31–37.
- [12] D. A. Zahroh and Y. Yuliani, "Pengembangan e-LKPD Berbasis Literasi Sains untuk Melatihkan Keterampilan Berpikir Kritis Peserta Didik pada Materi Pertumbuhan dan Perkembangan," *Berk. Ilm. Pendidik. Biol.*, vol. 10, no. 3, pp. 605–616, 2021, doi: 10.26740/bioedu.v10n3.p605-616.
- [13] P. C. Hardiyanti, S. Wardani, and C. Kurniawan, "Efforts to Increase Mathematical Logical Intelligence Through Development of Student Worksheets Based on Problem Based Learning," *J. Innov. Sci. Educ.*, vol. 9, no. 3, pp. 335–341, 2020, doi: 10.15294/jise.v9i1.36846.
- [14] Saverus, No 主観的健康感を中心とした在宅高齢者における健康関連指標に関する共分散構造分析Title, vol. 2, no. 1. 2019. [Online]. Available: http://www.scopus.com/inward/record.url?eid=2-s2.0-84865607390&partnerID=tZ0tx3y1%0Ahttp://books.google.com/books?hl=en&lr=&id=2LIMMD9FVXkC&oi=fnd&pg=PR5&dq=Principles+of+Digital+Image+Processing+fundamental+techniques&ots=HjrHeuS_
- [15] S. Haryati, "Sebagai Salah Satu Model Penelitian. Research and Development (R&D) Sebagai Salah Satu Model Penelitian Dalam Bidang Pendidikan," no. 37, pp. 11–26, 2012.
- [16] I. M. Tegeh and I. M. Kirna, "Pengembangan Bahan Ajar Metode Penelitian Pendidikan dengan ADDIE Model," *J. IKA*, vol. 11, no. 1, p. 16, 2013, [Online]. Available: <https://ejournal.undiksha.ac.id/index.php/IKA/article/view/1145>
- [17] A. Abdurrahman, G. Gardjito, and R. S. Budiarti, "Pengembangan Lembar Kegiatan Siswa Berbasis Penemuan Terbimbing Pada Materi Struktur Dan Fungsi Jaringan Tumbuhan Kelas Xi Sma.," *Biodik*, vol. 1, no. 1, pp. 1–8, 2016, doi: 10.22437/bio.v1i1.3346.
- [18] Z. F. Azizah, A. A. Kusumaningtyas, A. D. Anugraheni, and D. P. Sari, "Validasi preliminary product Fung-Cube pada pembelajaran fungsi untuk siswa SMA," *J. Bioedukatika*, vol. 6, no. 1, p. 15, 2018, doi: 10.26555/bioedukatika.v6i1.7364.
- [19] N. Fitriani, G. Gunawan, and S. Sutrio, "Berpikir Kreatif Dalam Fisika Dengan Pembelajaran Conceptual Understanding Procedures (CUPS) Berbantuan LKPD," *J. Pendidik. Fis. dan Teknol.*, vol. 3, no. 1, pp. 24–33, 2017, doi: 10.29303/jpft.v3i1.319.
- [20] D. . Julianti and R. Sumarmin, "The Development of Student Worksheet Based on Scientific Approach on Environmental Pollution Topic For Junior High School Student Grade VII," *Int. J. Progress. Sci. Technol.*, vol. 10, no. 1, pp. 11–18, 2018.
- [21] M. Society, "92-96," vol. 2, no. 1, pp. 91–96, 2015.
- [22] E. A. Munthe, S. Silaban, and Z. Mughtar, "Discovery Learning Based E-Module on Protein Material Development," vol. 384, no. Aisteel, pp. 604–607, 2020, doi: 10.2991/aisteel-19.2019.137.