

Development of E-worksheets Integrated Profil Pelajar Pancasila on Human Circulatory System Materials Grade XI

Dewanto Dewanto^{1*}, Elfa Oprasmani², Nevrita Nevrita³

^{1, 2, 3}Biology Education Department, Maritime Raja Ali Haji University, Indonesia

*Corresponding Author: dewantohuang@gmail.com

ABSTRACT

An e-worksheets can guide students in their activities in science learning and also develop the personality “Profil Pelajar Pancasila” (Pancasila characters). This study aims to develop and describe the eligibility of e-worksheets integrated “Profil Pelajar Pancasila” on Human Circulatory System materials grade XI in terms of the validity, practicality, and effectiveness aspects. E-worksheets developed based on the development model proposed by Thiagarajan et al. (1974) known as 4-D model, consists of define, design, develop, and disseminate. Data collected from the instrument consists of quantitative and qualitative. All data in this research will be described with descriptive approach analysis. Results showed that the validation by material expert obtained with very valid interpretation, media expert obtained with very valid interpretation, practicality by student grade XI IPA 4 at SMA Negeri 2 Tanjungpinang obtained very practical interpretation also by 6 Biology teacher obtained very practical interpretation. Furthermore, effectiveness assesment carried out using N-gain obtained 0,629 value with very effective interpretation categorized medium. In conclusion, e-worksheets integrated “Profil Pelajar Pancasila” on Human Circulatory System materials grade XI stated to be very valid, practical, and effective used in Biology learning.

Keywords: e-worksheets, human circulatory system, profil pelajar Pancasila.

INTRODUCTION

The 21st-century civilization brings very significant changes. These things include the transformation of knowledges, informations, also to technologies (Muyambo-Goto et al., 2023). To be adaptive in the 21st-century civilization, we are required to be able to understand technology and information systems according to the trends (Suryaningsih & Nurlita, 2021). It is unavoidable and has become a characteristic (Sudarma, 2021). The presence of technology is expected to facilitate the resolution of problems in human life which became known as the concept of society 5.0. This is an idea that describes how technology coexists with humans to improve the quality of life in a sustainable manner (Sugiono, 2020). In aspect of the education especially on Indonesia, utilizing technology in sciences learning has increased rapidly during the pandemic of Covid-19 to present. This is a major transformation in education on Indonesia because the previous learning is face-to-face learning system changed into online learning (Lathifah et al., 2021; Mutaqinah & Hidayatullah, 2020; Sholichin et al., 2021). The

transformation causes changes and challenges for teacher or pre-teacher in design to evaluate learning that impact to learning outcomes consists of 3 domain, i.e. cognitive, affective, and psychomotor (Farida, 2017). One of the learning tools that affect learning outcomes is student worksheet (Y.-H. Lee et al., 2014; Suprihatin & Manik, 2020; Zukmadini et al., 2022).

Student worksheets is a learning media in the form of sheets containing tasks that must be done by students related to the material being studied and followed by instructions for use (Aditama et al., 2019; Kosasih, 2021; Tim Prodi Pendidikan Sosiologi FIS UNR & Forum MGMP Sosiologi D. I. Yogyakarta, 2019; Turama, 2022). There is 2 type of science student worksheets, i. e. experimental and non-experimental (Fadiawati & Fauzi, 2016). Student worksheets can be presented digitally, which is called e-worksheets. There are many influences in utilizing e-worksheets for students on learning, e. g. enhance learn interest, attention, and student argue ability (Koderi et al., 2020; Witri & Hasibuan, 2020), enhance student motivation (Fina et al., 2022; Lathifah et al., 2021), facilitate students in the formation of concepts independently and train critical thinking skills (Lestari & Muchlis, 2021), save times for teacher (Syafitri, 2020), used in learning anytime and everywhere (JK & Yuliani, 2021), and develop 21st-century skills (Kusno & Setyaningsih, 2021).

E-worksheet becomes a learning guide that can also facilitate to grow students' character. Currently, the “Profil Pelajar Pancasila” is the goal of Indonesian national education, therefore e-worksheet developed by teachers in schools needs to facilitate students in forming the character of “Profil Pelajar Pancasila”. It consists of 6 dimensions, i. e. 1) have faith, fear the almighty God, and have good morals glorious (*beriman, bertakwa kepada Tuhan Yang Maha Esa, dan berahlak mulia*), 2) global diversity (*berkebhinekaan global*), 3) cooperate (*bergotong royong*), 4) independent (*mandiri*), 5) critical thinking (*bernalar kritis*), and 6) creative (*kreatif*) (Kepala Badan Standar, Kurikulum, dan Asesmen Pendidikan Kemdikbudristek, 2022). Profil Pelajar Pancasila aim to form Indonesian students who are globally competitive and apply the values of Pancasila ideology.

SMA Negeri 2 Tanjungpinang is one of the senior high school in Tanjungpinang City, Riau Islands Province that applies technology for post-pandemic of Covid-19 learning recovery. Based on the post-pandemic of Covid-19 observation, the school has facilities to support electronic-based learning activities, students are allowed to use mobile phone, the internet network (WiFi) is available evenly, and the learning has been integrated into the learning management system (LMS). However, electronic-based learning has not been utilized optimally. Based on interviews with the vice principal in curriculum, the school has been implemented Curriculum of *Merdeka* for the grade X and Curriculum of 2013 (*Kurtilas*) for the grade XI also XII. They reveal that after pandemic Covid-19, students tend to be in groups, showing an insensitive attitude towards the environment and reduced mutual cooperation between individual. Furthermore, one of the biology teacher known teach in grade XI reveal that students more interested when learning is packaged concisely and based on electronics as her experienced during teaching biology learning at that school.

To get more information for this research, distribution questionnaire about the needs of teaching materials has distributed to 40 students at grade XI IPA. The results showed that 19 students (47.5%) very interested, 15 students (37.5%) interested, 6 students (15%) quite interested, and no one answered not interested with using electronic teaching materials in biology learning. Based on the biology materials analysis, it showed the students respond that biology learning materials are often difficult to understand studied sequentially from the human circulatory system (25%), cells and theory of development (20%), structure and function of animal tissue (20%), structure and function of plant tissues (17.5%), human movement system (12.5%), and the rest of the human digestive system. Data shows the order of the material which is difficult for students to understand according to what is stated by Sudarisman (2015), Rustaman (2017), and Momsen et al. (2022) that in addition to studying concrete phenomena, learning biology also examines abstract phenomena so that it requires an understanding referring to systems and systems thinking. Organ systems is material in biology learning that requires ability think critically, logically, and analytically, e. g. human circulatory system.

There is some reports from other researcher that relevance with this paper, Nadhiroh (2018) with her research on the development of student worksheets based on higher order thinking skills (HOTS) on Thermodynamics material. The results show the feasibility aspect of the material with a percentage of 92% (very valid), the media feasibility aspect with a percentage of 100% (very valid), and the feasibility test with a percentage of 89% (very practical). Furthermore, Arifin (2022) with his research on the development of interactive e-worksheets Liveworksheets based on Contextual Teaching and Learning (CTL) on Petroleum materials.

The results show from the aspect of student user response with a percentage of 88% (very practical) while teachers with a percentage of 84% (very practical), aspects of content and appearance with a percentage of 87% (very valid), and CTL aspects with a percentage of 82% (very valid). Last, Mumtaza (2021) with his research on the development of student worksheets based on science process skills on the Excretion System concept. The results show the validation aspect with a percentage of 85.4% (very valid), the readability aspect with a percentage of 92.01% (very valid), and the testing aspect with a percentage of 87.42% (very practical).

Based on the description that has been described, the aim of the research is to develop and describe the eligibility of e-worksheets integrated “Profil Pelajar Pancasila” on Human Circulatory System materials grade XI in terms of the validity, practicality, and effectiveness aspects. Several things need to know that the worksheets integrated with the “Profil Pelajar Pancasila” are not only oriented towards cognitive outcomes but also psychomotor and affective outcomes. The profile integrated in the e-worksheets consists of 6 dimensions of the “Profil Pelajar Pancasila” the learning steps in the e-worksheets. So, it becomes a good and positive habit for students.

METHOD

The type of study is research and development (R & D). This type of research is carried out with the aim of producing a product, test its effectiveness, and provide benefits (Neolaka,

2016; Sa`adah & Wahyu, 2022; Sugiyono, 2013). Research was conducted from September 2022 to December 2022 in Tanjungpinang City, Riau Islands Province. The population of the research is all students in grade XI IPA at SMA Negeri 2 Tanjungpinang with sampling technique used is simple random sampling.

The research procedure consist of 4 stages, namely define, design, develop, and disseminate. It also known as 4-D model proposed by Thiagarajan et al. (1974). Define, first stage that carried out the aim of establishing and defining requirement of analytical learning. The define stage consist of front-end analysis, learner analysis, concept analysis, task analysis, and specifying instructional objectives. Design, second stage that carried out for design prototypes of teaching materials. The design stage consists of constructing criterion-referenced test, media selection, format selection, and initial design. Develop, third stage that implemented to produce the product of development. The develop stage consists of expert appraisal and development testing. Disseminate, last stage that can be continue if the product has achieved consistent results and positive comments from the experts. The disseminate stage consists of validation testing, packaging, diffusion and adoption.

Instruments form of this research is validity of learning media expert questionnaire sheets, validity of materials expert questionnaire sheets, e-worksheets practical questionnaire sheets, and e-worksheets effectiveness sheets. All data in this research collected by using Likert's scale (see Table 1 and Table 2). Futhermore, in effectiveness sheets also use test by multiple choice and essay. The data collected from the instrument consists of quantitative and qualitative. All data in this research will be described with descriptive approach analysis.

Table 1. Media and materials assesment criteria of validity

Interpretation	Score	Percentage
Very Valid	4	75 % - 100%
Valid	3	50% - 74%
Not Valid	2	25% - 49%
Very Not Valid	1	0% - 24%

Source: modification from Sugiyono (2013)

Table 2. E-worksheets assesment criteria of practicality

Interpretation	Score	Percentage
Very Practical	4	75 % - 100%
Practical	3	50% - 74%
Not Practical	2	25% - 49%
Very Not Practical	1	0% - 24%

Source: modification from Sugiyono (2013)

The results of media and material validation by experts and the results of practicality by students and teachers will be calculate for the feasibility according to Riduwan (2016) as follows:

$$K = \frac{F}{N \cdot I \cdot R} \times 100\%$$

Annotation:

K = feasibility percentage

F = total of respondents' answers

N = highest score in the questionnaire

I = total of questions in the questionnaire

R = total of respondents

Calculation of the validity and practicality results will interpret according to Table 1 for media and material validity. Then, Table 2 also used to interpret the students and teachers practicality results.

Effectiveness of the e-worksheets will used the N-gain formula to analysis. Researchers will have pre-test for the students before using the e-worksheets. Besides, after students using the e-worksheets will have the post-test. Data collected from pre-test and post-test will calculate with N-gain formula according to Sundayana (2015) as follows:

$$N - gain = \frac{\text{Post test} - \text{Pre test}}{\text{Max Score} - \text{Pre test}}$$

Annotation:

N-gain = results of N-gain formula score

Post test = post test score (after using e-worksheets)

Pre test = pre test score (before using e-worksheets)

Max score = total maximum score from test

Calculation of the effectiveness will interpret according to Table 3

Table 3. E-worksheets assesment criteria of effectiveness

N-gain Score Range	Interpretation
$N\text{-gain} \geq 0,7$	High
$0,3 < N\text{-gain} < 0,7$	Medium
$N\text{-gain} \leq 0,3$	Low

Source: Sundayana (2015)

RESULT AND DISCUSSION

Define, first stage that carried out the aim of establishing and defining requirement of analytical learning. Front-end analysis revealed that learning at SMA Negeri 2 Tanjungpinang provides internet access evenly in every class (WiFi), allows students to access smartphones, the school is in transition from the 2013 Curriculum to the *Merdeka* Curriculum, learning has been integrated with the learning management system (LMS), teachers still using PowerPoint media and YouTube videos in learning which creates a lack of variety in learning, and post-pandemic Covid-19 has changed social interactions among fellow students. In addition, most students

stated that they were very interested in using digital teaching materials in learning that were packaged in a concise form, e. g. e-worksheets.

E-worksheets can display a combination of text, animation, video, images and navigation that can attract attention and optimize the learning process (Koderi et al., 2020). Apriyani et al. (2022) revealed that e-worksheets are increasingly in demand because there is no longer any reason for students not to bring worksheets because they can be accessed via smartphones (e-worksheets), can be an emergency media like during the previous Covid-19 pandemic, and can increase students' interest in reading because of variations. Analysis of the needs for the development of teaching materials on the material aspect, students stated that the circulatory system is material that has a level of difficulty to understand from other biology material studied in odd semesters.

Learner analysis carried out showed the distribution of students in grade XI with an age range of 16-18 years. They have used education technology during the Covid-19 pandemic until present. According to Meriyati (2015) that the age range of 16 to 18 years can be categorized in the stage of the formal operational development period. This stage of development is characterized by children being able to think abstractly and logically, hypothetico-deductive and inductive types of scientific thinking have begun to develop, children have been able to draw conclusions, interpret and develop hypotheses. The concepts included in the e-worksheets are based on decree of the Head of Education Standards, Curriculum and Assessment Agency, Indonesia Republic Ministry of Education, Culture, Research and Technology number 008/H/KR/2022 concerning learning outcomes in early childhood education, primary education levels, and secondary levels in the *Merdeka* Curriculum. The biology learning outcomes achieved in e-worksheets can be seen in Figure 2. The assignments contained in the e-worksheets use activities with a scientific approach that are integrated with the “Profil Pelajar Pancasila”. Specifying instructional objectives of the e-worksheets also can be seen in Figure 3.

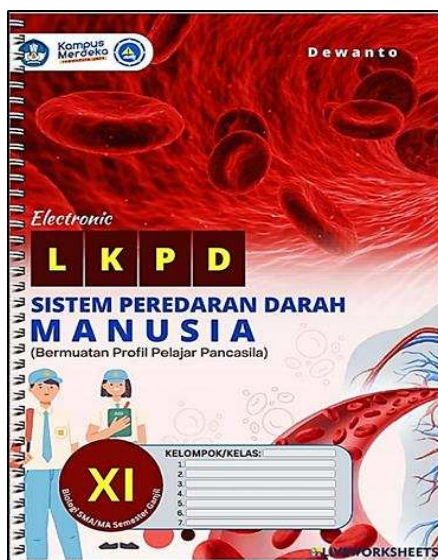


Figure 1. Cover of E-worksheets

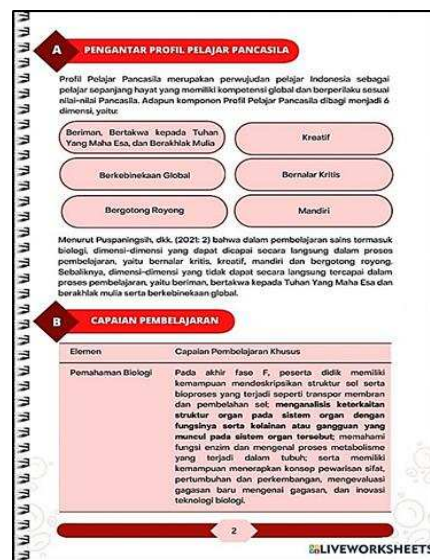


Figure 2. Define “Profil Pelajar Pancasila”

Design, second stage that carried out for design prototypes of teaching materials. Before developing e-worksheets, it is necessary to carry out a constructing criterion-referenced test which will be used as an instrument for product effectiveness at the end of the research which consists of 20 questionnaire forms, 10 multiple choice forms, and 1 essay form. The selection of media used for development is Canva (designing worksheets templates) and Liveworksheets (interactive e-worksheets display). Format selection for e-worksheets includes design concepts, selection of strategy, approach, methods to learning resources. E-worksheets are developed with a scientific approach that is integrated with the “Profil Pelajar Pancasila” based on the *Merdeka Curriculum*. Type of the e-worksheets is non-experimental with format consists of cover (see Figure 1), introduction of “Profil Pelajar Pancasila”, learning outcomes, learning objectives, user directions for use, learning activities (observing, questioning, experimenting, associating, and communicating), and assessment.

Implications of integrated “Profil Pelajar Pancasila” according to Rusnaini et al. (2021) have implications for the formation of students' personal resilience with the aim of maintaining the nation's noble and moral values, readiness to become global citizens, realizing social justice, and achieving 21st-century competence. Furthermore, learning activities in the e-worksheets are carried out in heterogeneous groups in the form of discussions to solve a problem. In addition, the learning resources used in the development of e-worksheets come from books, ebooks, articles, internet sources, and YouTube videos. The initial design is carried out and then prepared for the validation process with experts.

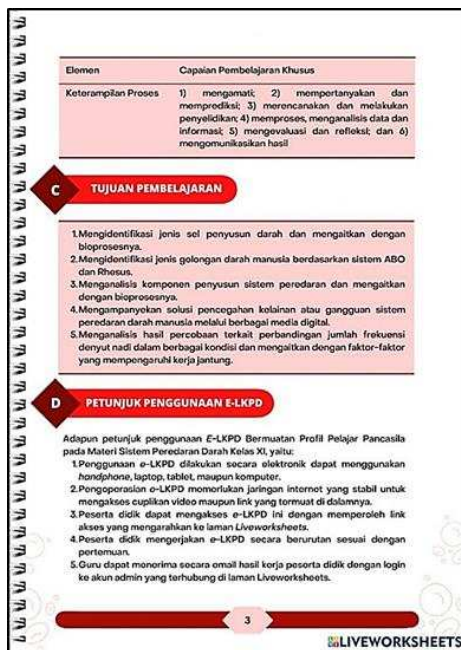


Figure 3. Learning objectives and Using E-worksheets Instruction



Figure 4. E-worksheets

Develop, third stage that implemented to produce the product of development, i.e. e-worksheets integrated “Profil Pelajar Pancasila” on Human Circulatory System materials grade XI. Results of expert appraisal consists of media and materials experts, known as validation. Media validation based on 3 aspects of assessment. Simplicity aspects get a percentage of 97.92% (very valid), technical and integration aspects get a percentage of 97.22% (very valid), and aspects of emphasis and balance get a percentage of 96.67% (very valid). Overall, the media validation results obtained a final score of 97.27% (very valid). There are suggestions and comments for product revision developed by researchers from media experts consist of changing the color of the page number section, the neatness of interactive boxes when displayed on Liveworksheets, activating access links to be able to submit assignments externally, and adding instructions for working on questions. According to Arsyad (2015) that determination of color in visuals is very vital because it can give the impression of separation or emphasis and can build integration.

Materials validation based on 3 aspects of assessment. The content and construction aspects get a percentage of 95.83% (very valid), the “Profil Pelajar Pancasila” aspect gets a percentage of 95.83% (very valid), and the language aspect gets a percentage of 87.5% (very valid). Overall, the materials validation results obtained a final score of 93.05% (very valid). There are suggestions and comments for product revision developed by researchers from material experts consisting of typos on several pages, displaying information about the dimensions of the “Profil Pelajar Pancasila”, activating links for external reference materials, simplifying the language used in e-worksheets, and adjusting to the level. According to Fadiawati & Fauzi (2016) that for good e-worksheets, it is necessary to fulfill 3 requirements, i. e. didactic, construction and technical elements.

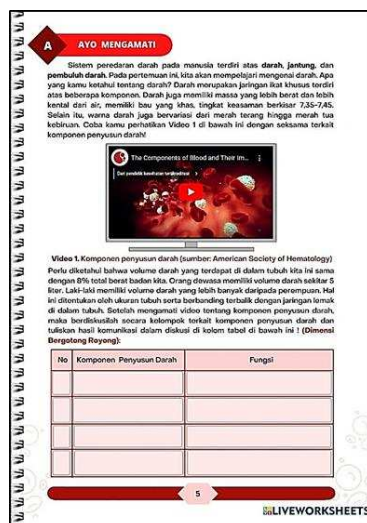


Figure 5. Interactive form for filling words



Figure 6. Youtube on E-worksheets

Products that have been stated valid, then carried out development trials on students and biology teachers with 4 aspects of assessment. Tests on students were carried out on 42 students

of class XI IPA 4 SMA Negeri 2 Tanjungpinang. Based on the ease of use aspect, the percentage is 82.73% (very practical), the compatibility aspect with school facilities is 85.71% (very practical), the durability and repair aspects are 83.33% (very practical), and grammatical aspects and the attractiveness of the presentation get a percentage of 83.43% (very practical). Overall, development testing for students obtained a final score of 83.80% (very practical). There are suggestions and comments for further consideration to researchers from students, e. g. e-worksheets can be further developed on other biology material, the Youtube videos are shown in Indonesian, reproduce pictures or illustrations, the video duration is standard, the product makes it easier for students because it is quite accessible from smartphone, and assessments can be made in more variations, not only in the form of essays. The reasons for researchers using YouTube videos (see Figure 5 and Figure 6) in e-worksheets are in line with the results of research by Mujianto (2019) that the use of YouTube videos increases motivation and interest in learning.

The trial was also carried out on 6 teachers with 2 teachers from SMA Negeri 2 Tanjungpinang, 1 teacher from SMAIT Taruna Ar Risalah, 1 teacher from MAN Bintan, 1 teacher from SMA Negeri 2 Singkep, and 1 teacher from SMA Negeri 3 Batam. Based on the ease of use aspect, the percentage is 89,58% (very practical), the compatibility aspect with school facilities is 88% (very practical), the durability and repair aspects are 100% (very practical), and grammatical aspects and the attractiveness of the presentation get a percentage of 91,67% (very practical). According to Arifin (2022) in product trials (development testing), if the more respondents are obtained, the results of processing the data obtained will also be better. Overall, development testing for teachers obtained a final score of 92,19% (very practical). There are suggestions and comments for further consideration to researchers from teachers, e. g. the language used can be adapted to the development of students, if using English in the video. It is necessary to include subtitles, researchers can develop and continue on other biological material, and also can work together with Biology MGMP (Biology Teacher Working Group) in Tanjungpinang.

Disseminate, last stage that can be continue if the product has achieved consistent results and positive comments from the experts. Validation testing at this stage is to determine the achievement of the learning objectives that have been designed, whether there is an increase in learning outcomes as proposed by Thiagarajan et al (1974) referring to the meaning of product development effectiveness. The effectiveness of using e-worksheets is carried out using the N-gain formula by comparing the results of the pre-test with the post-test. The results show the value obtained is 0.629 with a medium categorized interpretation. It shows that the use of e-worksheets integration of “Profil Pelajar Pancasila” on Human Circulatory System materials in grade XI stated to be effectively used in biology learning. It means the e-worksheets enhance the cognitive, affective, and psychomotor.

Based on the 4D development research model, products that have been done developed need to be packaged before being distributed in the education community. The packaging of e-worksheets is using the Liveworksheets platform (<https://www.liveworksheets.com>) in the form

of a workbook, so it requires a username and password to access it. It means the product packaged in database form. Liveworksheets is a web-based and mobile-based service platform that allows the transformation of printed worksheets to be packaged in an online interactive form and autocorrection (Prabjandee, 2023). Some of the advantages of using Liveworksheets, i. e. students don't need to bring printed materials, just use a smartphone, there are interactive features, work online in real time (Dewanto, 2023), a simple platform and doesn't spend a lot of internet network quota with good accessibility (Rhosyida et al., 2021), add videos from Youtube as well as be able to load interactive fill fields directly (Arifin, 2022). The final stage ends in the diffusion and adoption of e-worksheets. Products distributed in several schools in Riau Islands Province, e. g. SMA Negeri 2 Tanjungpinang, SMA Negeri 4 Tanjungpinang, SMAIT Ar Risalah, MAN Bintan, SMA Negeri 2 Singkep, dan SMA Negeri 3 Batam. In addition, researchers also facilitate the diffusion and adoption of e-worksheets by posting on personal blogs with the address <https://www.dewanto-edu.my.id/2022/12/e-lkpd-bermuatan-profil-pelajar.html>. Dissemination using personal blogs can also be controlled by researchers and blogs can be used for researcher feedback to readers and further researchers who are interested in the same topic as this research.

CONCLUSION

E-worksheets integrated “Profil Pelajar Pancasila” on Human Circulatory System materials grade XI stated to be very valid, practical, and effective. This e-worksheets were developed to improve learning outcomes in 3 domains consists of cognitive, affective and psychomotor. Utilizing this type of e-worksheet requires an internet connection because it is designed to be done online in real time. So the factor of internet connection availability and devices (min. smartphone) is a consideration using Liveworksheets-based electronic worksheets. Furthermore, to develop Indonesian students who are globally competitive and behave in accordance with Pancasila values, it is also necessary to apply other biology learning materials in a sustainable manner.

REFERENCES

- Aditama, H. S., Zainuddin, M., & Bintartik, L. (2019). Pengembangan LKPD Berbasis HOTS pada Pembelajaran Matematika Materi Volume Bangun Ruang Kelas V SDN Sentul 1. *Wahana Sekolah Dasar*, 27(2), 66–72. <https://doi.org/http://dx.doi.org/10.17977/um035v27i22019p66-72>
- Apriyani, L., Distrik, I. W., & Rosidin, U. (2022). Creative Inquiry-Based E-Worksheet: A Way to Improve Student’s Self-Efficiency and Scientific Communication Skills. *Indonesian Journal of Science and Mathematics Education*, 5(1), 53–64. <https://doi.org/https://doi.org/10.24042/ijsme.v5i1.10269>
- Arifin, M. (2022). *Pengembangan E-LKPD Interaktif Liveworksheets Berbasis Contextual Teaching and Learning (CTL) pada Materi Minyak Bumi*. Skripsi, Universitas Islam Negeri Syarif Hidayatullah. <https://repository.uinjkt.ac.id/dspace/handle/123456789/61778>
- Arsyad, A. (2015). *Media Pembelajaran* (Revisi). Jakarta: Rajawali Pers.

- Dewanto, D. (2023). *Pengembangan Bahan Ajar Digital Berbantuan Liveworksheets* (1st ed.). Magelang: CV. Tidar Media.
- Direktorat Pembinaan SMA. (2010). *Juknis Pengembangan Bahan Ajar SMA*.
- Fadiawati, N., & Fauzi, M. M. (2016). *Merancang Pembelajaran Kimia di Sekolah Berbasis Hasil Riset Pengembangan*. Yogyakarta: Media Akademi.
- Farida, I. (2017). *Evaluasi Pembelajaran Berdasarkan Kurikulum Nasional*. Bandung: PT Remaja Rosdakarya.
- Fina, I. D., Raharjo, R., & Purnama, E. R. (2022). The Development of Electronic-Worksheets (E-Worksheets) Based on Crosswords Games with Sub-Materials of The Excretory System to Improve The Motivation of High School Students. *Berkala Ilmiah Pendidikan Biologi (BioEdu)*, 11(3), 691–698. <https://doi.org/10.26740/bioedu.v11n3.p691-698>
- JK, A. K. R., & Yuliani, Y. (2021). Pengembangan Lembar Kerja Peserta Didik Elektronik (E-LKPD) Berbasis Inkuiri pada Submateri Fotosintesis untuk Meningkatkan Kemampuan Argumentasi Peserta Didik. *Berkala Ilmiah Pendidikan Biologi (BioEdu)*, 10(3), 663–673. <https://doi.org/https://doi.org/10.26740/bioedu.v10n3.p663-673>
- Keputusan Kepala Badan Standar, Kurikulum, dan Asesmen Pendidikan Kemdikbudristek Nomor 009/H/KR/2022 tentang Dimensi, Elemen, dan Subelemen Profil Pelajar Pancasila pada Kurikulum Merdeka.
- Koderi, K., Latifah, S., Fakhri, J., Fauzan, A., & Sari, Y. P. (2020). Developing Electronic Student Worksheet Using 3D Professional Pageflip Based on Scientific Literacy on Sound Wave Material. *Journal of Physics: Conference Series*, 1467(1), 1–8. <https://doi.org/https://doi.org/10.1088/1742-6596/1467/1/012043>
- Kosasih, E. (2021). *Pengembangan Bahan Ajar* (B. S. Fatmawati (ed.)). Jakarta: Bumi Aksara.
- Kusno, K., & Setyaningsih, E. (2021). Self-Regulated Learning of Mathematics for Teacher Prospectives in the Development of Student E-Worksheets. *JTAM (Jurnal Teori Dan Aplikasi Matematika)*, 5(1), 205–215. <https://doi.org/10.31764/jtam.v5i1.3911>
- Lathifah, M. F., Hidayati, B. N., & Zulandri, Z. (2021). Efektifitas LKPD Elektronik sebagai Media Pembelajaran pada Masa Pandemi Covid-19 untuk Guru di YPI Bidayatul Hidayah Ampenan. *Jurnal Pengabdian Magister Pendidikan IPA*, 4(2), 25–30. <https://doi.org/https://doi.org/10.29303/jpmpmi.v4i2.668>
- Lee, L.-S. (2023). New Challenges of Teaching Materials in STEM-Related ESD/SDG Activities in Taiwan. In *Paper Prepared for the UNESCO Associated Schools ESD/SDG Activity Results Presentation, ESD Consortium Aichi*. ERIC. <https://eric.ed.gov/?q=teaching+material&id=ED626291>
- Lee, Y.-H., Hsiao, C., & Ho, C.-H. (2014). The Effects of Various Multimedia Instructional Materials on Students' Learning Responses and Outcomes: A Comparative Experimental Study. *Computers in Human Behavior*, 40, 119–132. <https://doi.org/10.1016/j.chb.2014.07.041>
- Lestari, D. D., & Muchlis, M. (2021). E-LKPD Berorientasi Contextual Teaching And Learning Untuk Melatihkan Keterampilan Berpikir Kritis Siswa Pada Materi Termokimia. *Jurnal Pendidikan Kimia Indonesia*, 5(1), 25–33. <https://doi.org/https://doi.org/10.23887/jpk.v5i1.30987>
- Meriyati. (2015). *Memahami Karakteristik Anak Didik*. Bandar Lampung: Fakta Press.
- Momsen, J., Speth, E. B., Wyse, S., & Long, T. (2022). Using Systems and Systems Thinking to Unify Biology Education. *CBE—Life Sciences Education*, 21(2), es3. <https://doi.org/10.1187/cbe.21-05-0118>

- Mujianto, H. (2019). Pemanfaatan Youtube sebagai Media Ajar dalam Meningkatkan Minat dan Motivasi Belajar. *Jurnal Komunikasi Universitas Garut: Hasil Pemikiran Dan Penelitian*, 5(1), 135–159. <https://doi.org/http://dx.doi.org/10.10358/jk.v5i1.588>
- Mumtaza, M. F. (2021). *Pengembangan Lembar Kerja Peserta Didik Berbasis Keterampilan Proses Sains pada Konsep Sistem Ekskresi*. Skripsi, Universitas Islam Negeri Syarif Hidayatullah.
<https://repository.uinjkt.ac.id/dspace/handle/123456789/58865>
- Mutaqinah, R., & Hidayatullah, T. (2020). Implementasi Pembelajaran Daring (Program BDR) Selama Pandemi Covid-19 di Provinsi Jawa Barat. *Jurnal Petik*, 6(2), 86–95. <https://doi.org/https://doi.org/10.31980/jpetik.v6i2.869>
- Muyambo-Goto, O., Naidoo, D., & Kennedy, K. J. (2023). Students' Conceptions of 21st Century Education in Zimbabwe. *Interchange*, 54(1), 49–80. <https://doi.org/10.1007/s10780-022-09483-3>
- Nadhiroh, N. (2018). *Pengembangan Lembar Kerja Peserta Didik (LKPD) Berbasis Higher Order Thinking Skills (HOTS) pada Materi Termodinamika*. Skripsi, Universitas Islam Negeri Raden Intan. <http://repository.radenintan.ac.id/5096/>.
- Neolaka, A. (2016). *Metode Penelitian dan Statistik*. Bandung: PT Remaja Rosdakarya Offset.
- Nevrita, N. (2018). The Use of Learning Media by Junior High School Teachers of Science in Tanjungpinang and Bintan. *Science, Engineering, Education, and Development Studies (SEEDS): Conference Series*, 2(1). <https://doi.org/10.20961/seeds.v2i1.23912>
- Prabjandee, D. (2023). A Review of the Website Liveworksheets. com. *Computer Assisted Language Learning*, 24(1), 269–279.
- Rhosyida, N., Muanifah, M. T., Trisniawati, T., & Hidayat, R. A. (2021). Mengoptimalkan Penilaian dengan Liveworksheet pada Flipped Classroom di SD. *Taman Cendekia: Jurnal Pendidikan Ke-SD-An*, 5(1), 568–578. <https://doi.org/10.30738/tc.v5i1.9749>
- Riduwan. (2016). *Skala Pengukuran Variabel-Variabel Penelitian*. Bandung: Alfabeta.
- Rusnaini, Raharjo, Suryaningsih, A., & Noventri, W. (2021). Intensifikasi Profil Pelajar Pancasila dan Implikasinya Terhadap Ketahanan Pribadi Siswa. *Jurnal Ketahanan Nasional*, 27(2), 230–249. <https://doi.org/https://doi.org/10.22146/jkn.67613>
- Rustaman, N. Y. (2017). Mewujudkan Sistem Pembelajaran Sains/Biologi Berorientasi Pengembangan Literasi Peserta Didik. *Research Report*. <http://research-report.umm.ac.id/index.php/research-report/article/view/944>
- Sa`adah, R. N., & Wahyu. (2022). *Metode Penelitian R & D (Research and Development): Kajian Teoritis dan Aplikatif*. Malang: CV. Literasi Nusantara Abadi.
- Sholichin, M., Zulyusri, Z., Lufri, L., & Razak, A. (2021). Analysis of the Obstacles of Online Learning During the Covid-19 Pandemic on IPA Subjects at SMPN 1 Bayung Lencir. *Biodik*, 7(2), 163–168. <https://doi.org/https://doi.org/10.22437/bio.v7i2.12926>
- Smaldino, S. E., Lowther, D. L., & Russell, J. D. (2014). *Instructional Technology and Media for Learning* (10th ed.). United States: Pearson Education, Inc.
- Sudarisman, S. (2015). Memahami Hakikat dan Karakteristik Pembelajaran Biologi dalam Upaya Menjawab Tantangan Abad 21 serta Optimalisasi Implementasi Kurikulum 2013. *Florea: Jurnal Biologi Dan Pembelajarannya*, 2(1). <https://doi.org/http://doi.org/10.25273/florea.v2i1.403>
- Sudarma, M. (2021). *Merdeka Belajar Menjadi Manusia Autentik*. Jakarta: PT Elex Media Komputindo.
- Sugiono, S. (2020). Industri Konten Digital dalam Perspektif Society 5.0 (Digital Content

- Industry in Society 5.0 Perspective). *JURNAL IPTEKKOM (Jurnal Ilmu Pengetahuan & Teknologi Informasi)*, 22(2), 175–191. <https://doi.org/http://dx.doi.org/10.33164/iptekkom.22.2.2020.175-191>
- Sugiyono. (2013). *Metode Penelitian Kuantitatif, Kualitatif dan R & D*. Bandung: Alfabeta.
- Sundayana, R. (2015). *Statistika Penelitian Pendidikan*. Bandung: Alfabeta.
- Suprihatin, S., & Manik, Y. M. (2020). Guru Menginovasi Bahan Ajar sebagai Langkah untuk Meningkatkan Hasil Belajar Siswa. *PROMOSI: Jurnal Program Studi Pendidikan Ekonomi*, 8(1). <https://doi.org/10.24127/pro.v8i1.2868>
- Suryaningsih, S., & Nurlita, R. (2021). Pentingnya Lembar Kerja Peserta Didik Elektronik (E-LKPD) Inovatif dalam Proses Pembelajaran Abad 21. *Jurnal Pendidikan Indonesia*, 2(7), 1256–1268. <https://doi.org/https://doi.org/10.36418/japendi.v2i7.233>
- Syafitri, R. A. (2020). The Importance of the Student Worksheets of Electronic (E-LKPD) Contextual Teaching and Learning (CTL) in Learning to Write Description Text During Pandemic COVID-19. *The 3rd International Conference on Language, Literature, and Education (ICLLE)* 2020), 284–287. <https://doi.org/https://doi.org/10.2991/assehr.k.201109.048>
- Thiagarajan, S., Semmel, D. S., & Semmel, M. I. (1974). *Instructional Development for Training Teachers of Exceptional Children: A Sourcebook*. Minnesota: Education Resources Information Center.
- Tim Prodi Pendidikan Sosiologi FIS UNR, & Forum MGMP Sosiologi D. I. Yogyakarta. (2019). *Intrumen Penilaian Keterampilan Mata Pelajaran Sosiologi SMA LKPD (Lembar Kerja Peserta Didik)* (A. Wardana, P. H. Pratiwi, & N. Hidayah (eds.)). Yogyakarta: UNY Press.
- Turama, D. (2022). LKPD Berbasis Majalah Elektronik dengan Model Pembelajaran Blended Learning pada Materi Sistem Reproduksi. *Jurnal Educatio*, 8(1), 98–103. <https://doi.org/https://doi.org/10.31949/educatio.v8i1.1654>
- Witri, E., & Hasibuan, M. (2020). Development of electronic student worksheets based on toulmin argumentation patterns to improve argumentation skills in basic acid materials. *Jurnal Pendidikan Kimia*, 12(3), 116–123.
- Zukmadini, A. Y., Murniati, N., Karyadi, B., Ansori, I., & Rochman, S. (2022). Pengembangan E-Modul Terintegrasi Informasi COVID-19 Untuk Meningkatkan Hasil Belajar Biologi. *Pedagogi Hayati*, 6(1), 20–33. <https://doi.org/10.31629/ph.v6i1.4289>