JPPIPA 9(12) (2023)

Jurnal Penelitian Pendidikan IPA

Journal of Research in Science Education

http://jppipa.unram.ac.id/index.php/jppipa/index

Validity of E-module Based on Cognitive Conflict Integrated Augmented Reality for Improving Students Physics Science Literacy

Wulanda Tri Emilya[1], Fatni Mufit[1*]

[1] Physics Education Study Program, Universitas Negeri Padang, Padang, Indonesia

Received: October 18, 2023
Revised: November 12, 2023
Accepted: December 20, 2023
Published: December 31, 2023

Corresponding Author:
Fatni Mufit
fatni_mufit@fmipa.unp.ac.id

DOI: 10.29303/jppipa.v9i12.5739

Abstract: Achieving 21st century skills is anticipated by managing learning based on scientific literacy. This literacy is the life skills of students, so they can solve existing problems by collaborating in thinking scientifically. Scientific literacy is defined as an understanding of the characteristics of science as a form of knowledge, awareness, intellect, and culture that involves science. Low science learning can be indicated by students' low scientific literacy. To increase students' scientific literacy, a learning model that supports this is needed. One learning model that can be used is the cognitive conflict-based learning model. Considering the phenomena and demands of students, researchers want to develop an e-module based on cognitive conflict integrated with augmented reality to increase students' physical literacy in physics materials. The type of research conducted was Design Research (Design Research). The development model used in this study was the Plomp model. The data analysis technique used a validation sheet questionnaire, analyzed using presentation techniques, and the V-Aiken formula. The results of data analysis obtained a validity value of 0.93 with the valid category, this was obtained because the e-module developed was in accordance with material substance, learning design, visual communication display, and software utilization.

Keywords: Augmented Reality; Cognitive Conflict; E-Module; Scientific Literacy; Teaching Materials.

Introduction

For students to become great human resources (HR) and become competitive in the workforce in the twenty-first century, they must master a variety of abilities. A balance between knowledge and skills and the ability to collaborate with technology is key to becoming a human being who is ready to face the era of revolution leading to the era of society 5.0. (Muliaman et al., 2022)

The management of learning based on scientific literacy anticipates the acquisition of 21st century capabilities. Scientific literacy is the capacity of pupils to work together to solve scientific issues. (Muliaman et al., 2022). According to the National Science Education Standard, scientific literacy is defined as the capacity to apply science to real-world situations. Students must be literate in science to identify and apply the knowledge they have learned. The development of pupils' scientific literacy skills through education is necessary. (F. Mufit et al., 2020)

Students with scientific literacy skills will be able to develop thought patterns and behaviors, as well as personalities that are caring and responsible for themselves, society, and the universe. (Mukti, 2018) Apart from that, scientific literacy can build a new generation that has scientific views and attitudes and can share knowledge and research results with the community (Febrianti, 2021). Thus, scientific literacy skills play a role in preparing a generation that is able to solve challenges and problems in society scientifically and responsibly. (Dirman & Mufit, 2022)

Low scientific literacy abilities can indicate low science learning (Rusilowati et al., 2016). The scientific literacy ability of students in Indonesia has always been

How to Cite:
Emilya, W. T., & Mufit, F. (2023). Validity of E-module Based on Cognitive Conflict Integrated Augmented Reality for Improving Students Physics Science Literacy. *Jurnal Penelitian Pendidikan IPA*, *9*(12), 11010–11017. https://doi.org/10.29303/jppipa.v9i12.5739

low since 2000, and in 2015, it was ranked 62nd out of 70 countries. Difficulty in learning science in some physics materials causes many students to lack understanding and make conceptual errors (Sari et al., 2013). Students have an initial conception in the form of daily experiences and knowledge that they have received, and then bring them into the classroom. Students' initial conceptions that are not in accordance with theories formulated by scientists are referred to as misconceptions. As long as they are not disproven or challenged by other ideas, misconceptions constitute a severe problem in science that must be addressed.

The results of preliminary research carried out by researchers by distributing questionnaires to physics teachers in senior high schools 2 and 7 Padang show that only 50% of teachers have used a learning model that focuses on students or student centres, while the rest still use lecture or teacher-centred learning models. The minimal use of learning models that focus on students in schools results in learning being centred on teachers, resulting in students being inactive. Apart from that, educators see that many students experience misconceptions in the learning process.

After analyzing the results of the researcher's interviews with teachers and students, several problems were found: 1) lack of a variety of teaching materials in physics subjects, 2) insufficient existing teaching materials to help students understand the lessons, 3) the need for IT-based teaching materials, and 4) low student literacy. Judging from existing problems, researchers feel that there is a need for improvements in the physics learning process. Improvements can start from 1) adding to the skills that teachers already have in planning and implementing physics learning, and 2) using more diverse teaching materials to create or foster students' interest in learning so that they can motivate them to be more diligent in learning physics, one of which is with materials. IT-based teaching.

From the results of the interviews, teachers and students stated that they were happy with the development of teaching materials, especially IT-based teaching materials in physics learning. IT-based teaching materials can explain learning material in more detail to students and can make learning centered on students, so that students are more active and motivated in learning.

The next data pertain to the use of teaching materials used by educators in the learning process. Judging from the table, it is stated that 75% of educators still use printed teaching materials and only 25% of educators use ICT- or non-printed teaching materials based on learning models. Regarding the use of augmented reality in learning, educators said they had never used it. This is not in accordance with the demands of the 21st century; namely, that learning must involve technology. Solutions to the above problems must be found so that students can meet the demands of the 21st century and better understand concepts, thereby reducing misconceptions.

Teaching resources in the form of augmented reality-enhanced cognitive conflict-based e-modules is one way to address this issue. The term "e-module" refers to a method of presenting independent teaching materials that are organized systematically into the smallest learning units to achieve specific learning objectives. These materials are presented in an electronic format, with each learning activity connected by links, such as navigation, forcing students to engage with the program and enhancing their learning experience. (Hakim et al., 2020)

The use of e-modules in learning has many advantages, including being able to motivate students, being able to determine the extent of their knowledge of certain subject matter, being able to study the chronology of each subject by looking at and studying descriptions and examples, students being able to determine the results of their own learning by answering questions, matching the results of their work with the answers provided in the module and reflecting, and students being able to master the learning material optimally, namely with a mastery level of 80%. (Suparyanto & Rosad, 2020)

The learning models were added to the e-module. The first is a learning model that is based on cognitive conflict. A cognitive conflict-based learning model is a learning activity carried out to prevent a mismatch in students' perceptions between the initial knowledge obtained in the surrounding environment and the actual knowledge. Cognitive conflict is defined as a conflict that arises in a person's mind when phenomena are observed to find the correct concept (Fatni Mufit & Fitri, 2022). The cognitive conflict learning model has many advantages, one of which is that it can increase student understanding (Atmam & Mufit, 2023). In previous research conducted by Mufit, it was found that cognitive conflict-based teaching materials are valid and practical to use in learning because they can help eliminate misconceptions in students, both in the form of e-books and learning media. (F. Mufit et al., 2022)

Making physics teaching materials using cognitive conflict has been developed by (Aini & Mufit, 2022; Arifin et al., 2021; Atmam & Mufit, 2023; Dhanil & Mufit, 2021) and the results of this research state that the teaching materials developed are valid and practical for use in the learning process. From previous research, it can be seen that there is no cognitive conflict-based e-module integrated with augmented reality. Augmented reality (AR) is a technology that combines virtual and real worlds by projecting virtual objects into 3D objects

in real time using a camera (Wahid et al., 2017). According to authoritative organizations, such as the American Times Weekly, AR is one of the top ten most promising technologies for the future. (Chen et al., 2019)

AR has significant potential as a teaching tool. An increasing understanding of the object being studied is an advantage that can be attained by using AR applications for educational reasons. AR is more effective than conventional learning. One benefit of augmented reality is that it can more naturally visualize abstract subjects to increase pupils' understanding.. (Pangestu et al., 2017)

Syifa Nabila Basyir had previously created an augmented reality e-module for physics classes with the title "Development of an Augmented Reality-Based Marine Physics Enrichment Book to Improve Critical Thinking Abilities." According to the study's findings, teachers and students can utilize this e-module with confidence, because it is reliable and useful. (Basyir et al., 2020) Considering the phenomena and problems above, researchers want to develop and assess the level of validity of a cognitive conflict-based e-module integrating augmented reality to increase students' physical literacy.

Method

Research and development (R&D) techniques were employed in this study. The Plomp model development methodology was employed in this study and consisted of three stages: basic research, development, prototyping, and assessment (Plomp, 2013). The procedures in this study were completed only up to the second phase, which evaluated the e-module's degree of validity. The instructor's completed validation sheet served as the main instrument of the research. Aiken's formula was employed by researchers for the validity analysis. The flowchart of this study is shown in Figure 1.

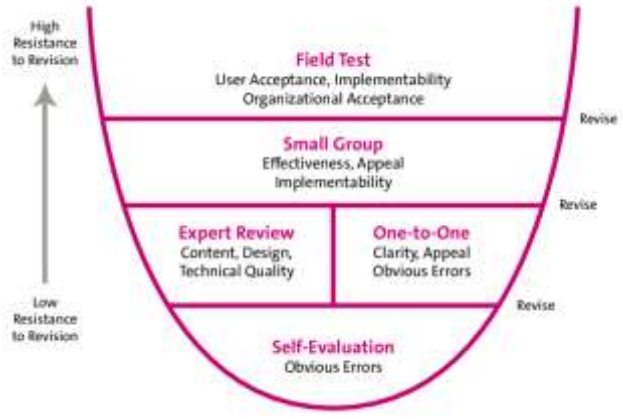

Figure 1. Flowchart (Plomp, 2013)

Result and Discussion

The results of the preliminary research stage show that students need teaching materials that can increase their scientific literacy and achieve 21st century learning goals. Based on this, the researcher developed an e-module based on cognitive conflict-integrated augmented reality to improve students' physics literacy. The researcher created an emodule that was developed at this point. The Unity program was used to create an instructional tool. The material is intended for offline usage on android-powered devices. The display pages, which comprise this medium, are characterized as follows on Figure 2 and 3.

The first page that will appear after the unity logo is the cover of the e-module being developed. This cover page can be seen in Figure 2. Then after the cover page, the next page that appears is the foreword page, this page contains the researcher's foreword. This page can be seen in Figure 3.

Figure 2. Cover

Figure 3. Foreword Page

Figure 4. Instructions Page

After that the instructions page will appear. The instructions page contains brief instructions for using the electronics of this module. The instructions page can be seen in Figure 4. The page that appears after the instructions page is the main menu page. This main menu page contains 4 buttons, namely, competency button, material button, augmented reality button, and

profile button. The main menu page can be seen in Figure 5. When the user clicks the competency button, the page will immediately move to the learning objectives page. This page contains the learning objectives that students will study. The competency page is illustrated in Figure 6.

Figure 5. Main Menu

Figure 6. Competency Page

Figure 7. Material Menu Page

If the material button is clicked, the user will be taken to the material menu page. The material menu contains 3 buttons, namely the material button for energy and work, impulse and momentum, Newton's law. The material page is illustrated in Figure 7. On the material page, if one of the buttons is clicked, the user is taken to the material page. can be seen in Figure 8 when the user clicks the energy and effort buttons. On this page, there are four sub-menu options: "konsep usaha dan energi, hubungan usaha dan energi, hukum kekekalan energi dan praktikum usaha dan energi."

Figure 8. Submaterial Page

When the sub-material button was clicked, the user was directed to the material description page. The material description was delivered using cognitive conflict, as shown in Figure 9.

Figure 9. Learning Material Page

If you click the augmented reality button on the main menu, you will be directed to the camera display, which is useful for scanning the markers that have been provided. If the camera is pointed at the marker, a 3D image of the scanned image will appear. This is illustrated in Figure. 10. The profile button was the last

button on the main menu. The profile button contained a brief profile of the researcher, as shown in Figure 11.

Figure 10. Augmented Reality

Figure 11. Profil Page

After completing the e-module design, the researcher entered the next stage: conducting an assessment. First, the assessment was performed independently. This self-evaluation is important before entering the validity stage with the aim of checking completeness, identifying product deficiencies, and correcting weaknesses. (Haviz, 2016) This assessment aims to reevaluate the e-module that has been developed. This is in accordance with the self-evaluation who repaired and added parts that they felt needed to be repaired or added by rechecking the product that had been made previously (Ina & Mufit, 2022). The result of this self-assessment was that the researcher revised several aspects, namely, improving the writing system, changing several designs, and adding several materials. An assessment of the cognitive conflict model in the e-module is also conducted. After the assessment, the e-module was found to be in accordance with cognitive conflict syntax. (Fatni Mufit & Fauzan, 2019)

The next stage was the assessment of the validators, and there were four validators to assess the level of validation of the e-module being developed. Validity is an assessment of the product design that has been created. A product is said to be valid if the instrument measures what it should measure (Sukardi, 2012: 121). Product validity was assessed by the lecturer. Several experts or experienced experts can carry out product validity assessments of the weaknesses and strengths of the products produced. A product was considered valid if the average score of the assessed aspects was 0.667 (Sugiyono, 2014). The assessment was carried out on four aspects: material substance, learning design, visual communication display, and use of software. The assessment results can be described as follows:

The material substance aspect consists of 11 assessment components that contain assessment items regarding the material, from the suitability of the e-module to the curriculum to the concept of the material. Writing equations and terms in physics, as well as the display of images, videos, and animations, is also one of the assessments in this component. The results of the 4 validators' assessment of these components by the four validators are shown in Figure 12.

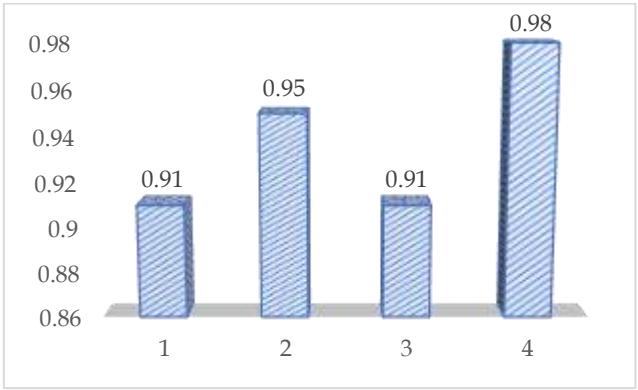

Figure 12. Material Substance

This component obtained a validation value of 0.94 with a valid category. a product is said to be valid if the average score of the aspects assessed is 0.667. (Sugiyono, 2019) This is achieved because the material in the e-module is in accordance with the independent curriculum (Hidayati et al., 2022). which is in accordance with developments in science, the use of symbols and terms is correct, the writing is in accordance with Indonesian language rules, and the images are useful for accommodating students' weak level of understanding and slow to accept and understand the content of the lesson. (Dahar & Faize, 2011)

The second aspect assessed was the learning design. In this aspect, there are 15 components were assessed by the validator, including the use of the cognitive conflict learning model in the e-module. Another item concerned augmented reality in e-modules, which can help students learn. The results of the 4 validators' assessment of these components by the four validators are shown in Figure 13.

The second component is learning design, in which the developed e-module received a score of 0.87 in the valid category. This assessment was obtained from an e-module that has implemented the cognitive conflict learning model correctly in accordance with the syntax which can help increase students' scientific literacy and attractive augmented reality presentation so that it can motivate students to learn and select questions. appropriate and easy for the students to understand. (Fatni Mufit & Fauzan, 2019)

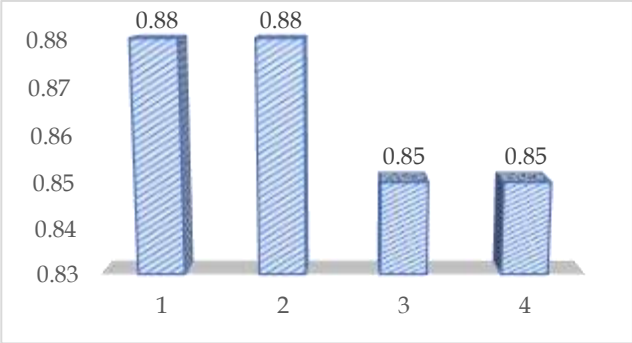

Figure 13. Learning Design

Cognitive conflict aims to make it easier for students to change concepts (Puspitasari, 2022).who stated that cognitive conflict has an effect on increasing understanding of concepts and reducing misconceptions in physics material. Therefore, the ease of syntax of the learning model must always be considered. (Mufit, 2018). The third aspect assessed is the visual communication display of the e-module. Eight components must be assessed by the validator, including the ease of use, grammar, and design used in the e-module. of the four validators' assessment of these components are shown in Figure 14.

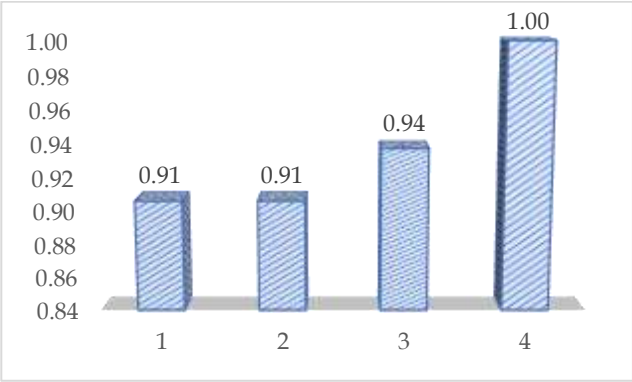

Figure 14. Visual Communication Display

The next assessment component was the visual communication display. For this component, the validator gives a value of 0.94 in the valid category. This level of validity was obtained because the e-module developed has instructions for use that are easy to understand. In terms of navigation, which functions well, it is very helpful to move between pages, making it easier to use. Choosing the correct font makes the e-module more attractive. A good layout can create a special attraction for student interest in learning. (Zahro, 2017)

The final aspect to be assessed was software utilization. There are 3 components were assessed in terms of the interaction effect between the e-module and the user. The results of the 4 validators' assessment of these components by the four validators are shown in Figure 15.

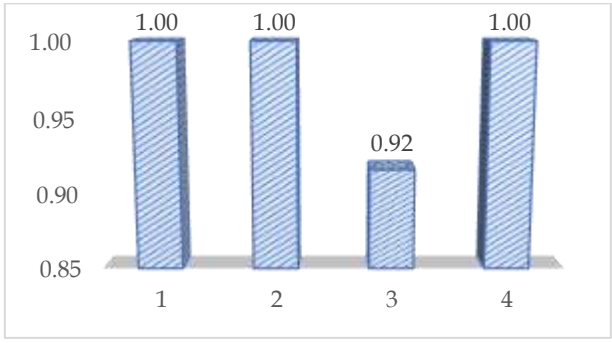

Figure 15. Use of Software

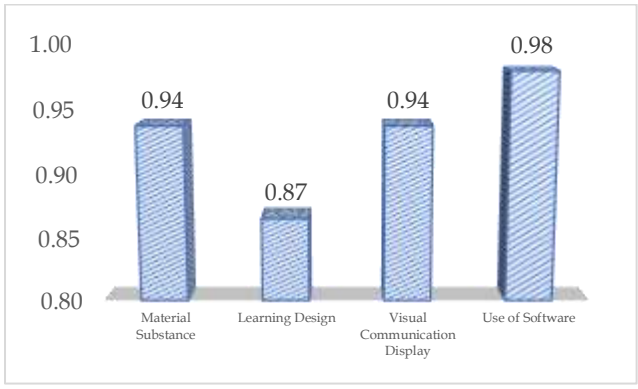

Figure 16. validation Level

The last component assessed by the validator is the utilization software. In this assessment, a value of 0.98 was obtained in the valid category. This high validation value was obtained from the nature of the e-module, which can generate feedback from students because the e-module is interactive. In addition, the use of good supporting software and the authenticity of the work in the form of e-modules add value to the e-modules being developed. From the assessment of the four aspects by the four validators, data were obtained, as shown in Figure 16. It can be seen that the values for the four aspects range from 0.84-0.98, with an average value of 0.93 in the valid category. From this value, it can be concluded that the developed e-module is valid.

Conclusion

An e-module based on cognitive conflict integrated with augmented reality has been produced to increase students' physical science literacy, with a validity value of 0.93.

Author Contributions

W.T.E: writing-original draft preparation, result, discussion, methodology,conclusion; dan F.M : designing research, monitoring research, proofreading, review, and editing,

Funding
This researchreceived no external funding.

Conflicts of Interest
The authors declare no conflict of interest.

References

Aini, S., & Mufit, F. (2022). Using Adobe Animate CC Software in Designing Interactive Multimedia Based on Cognitive Conflict in Straight Motion. *Jurnal Penelitian Pendidikan IPA*, *8*(5), 2350–2361. https://doi.org/10.29303/jppipa.v8i5.2048

Arifin, F. A., Mufit, F., & Asrizal. (2021). Validity and practicality of interactive multimedia based on cognitive conflict integrated new literacy on thermodynamic and mechanical waves material for class xi high school students. *Journal of Physics: Conference Series*, *1876*(1). https://doi.org/10.1088/1742-6596/1876/1/012052

Atmam, P. L., & Mufit, F. (2023). Using Adobe Animated CC in Designing Interactive Multimedia Based on Cognitive Conflict on Parabolic Motion Materials. *Jurnal Ilmu Pendidikan Fisika (JIPF)* , *8*(1), 64–74. Retrieved from https://journal.stkipsingkawang.ac.id/index.php/JIPF/article/view/3597/pdf

Basyir, S. N., Rustana, C. E., & Wibowo, F. C. (2020, December). Pengembangan Buku Pengayaan Fisika Kelautan Berbasis Augmented Reality untuk Meningkatkan Kemampuan Berpikir Kritis. In *Prosiding Seminar Nasional Fisika (E-Journal)*, 9, Pp. SNF2020PF-97. https://doi.org/10.21009/03.SNF2020.02.PF.15

Chen, Y., Wang, Q., Chen, H., Song, X., Tang, H., & Tian, M. (2019). An overview of augmented reality technology. *Journal of Physics: Conference Series*, *1237*(2). https://doi.org/10.1088/1742-6596/1237/2/022082

Dhanil, M., & Mufit, F. (2021). Design and Validity of Interactive Multimedia Based on Cognitive Conflict on Static Fluid Using Adobe Animate CC 2019. *Jurnal Penelitian & Pengembangan Pendidikan Fisika*, *7*(2), 177–190. https://doi.org/10.21009/1.07210

Dahar, M.A, & Faize, F.A. (2011). Effect of the Availability and the use of Science Laboratories on Academic Achievement of Students in Punjab (Pakistan). *European Journal of Scientific Research*, *51*(2),193–202. Retrieved from http://www.eurojournals.com/ejsr.htm

Dirman, H. M., & Mufit, F. (2022). Analisis Penggunaan Instrument Penilaian Pemahaman Konsep dan Literasi Sains di SMA Kabupaten Solok. *Jurnal Penelitian Pembelajaran Fisika*, *13*(2), 251–256. https://doi.org/10.26877/jp2f.v13i2.12923

Febrianti, F. A. (2021). Pengembangan Digital Book Berbasis Flip PDF Professional untuk Meningkatkan Kemampuan Literasi Sains Siswa. *Caruban: Jurnal Ilmiah Ilmu Pendidikan Dasar*, *4*(2), 102-115. https://dx.doi.org/10.33603/caruban.v4i2.5354

Haviz, M. (2016). Research and Development; Penelitian Di Bidang Kependidikan Yang Inovatif, Produktif Dan Bermakna. *Ta'dib*, *16*(1). Https://Doi.Org/10.31958/Jt.V16i1.235

Hakim, L. N., Wedi, A., & Praherdhiono, H. (2020). Electronic Module (E-Module) Untuk Memfasilitasi Siswa Belajar Materi Cahaya dan Alat Optik Di Rumah. *Jurnal Kajian Teknologi ,3*(3), 239–250. https://doi.org/10.17977/um038v3i32020p239

Hidayati, A, M., Tamrin, Arlina Yuza, & Ade Sri Madona. (2022). Pengembangan E-Modul Berbasis Nilai-Nilai Pendidikan Multikultural di Sekolah Dasar Islam. *Jurnal Pendidikan Agama Islam Al-Thariqah*, *7*(2), 409–427. https://doi.org/10.25299/al-thariqah.2022.vol7(2).10851

Ina, F. A., & Mufit, F. (2022). Penggunaan Aplikasi Adobe Animate CC dalam Mendesain Multimedia Interaktif Berbasis Konflik Kognitif Materi Alat-Alat Optik. *EduFisika: Jurnal Pendidikan Fisika*, *7*(2), 222–234. https://doi.org/10.59052/edufisika.v7i2.20814

Mufit, Fatni. (2018). *Model Pembelajaran Berbasis Konflik Kognitif (PBKK)*. 37. https://osf.io/preprints/inarxiv/zqvrd/

Mufit, F., Asrizal, Hanum, S. A., & Fadhilah, A. (2020). Preliminary research in the development of physics teaching materials that integrate new literacy and disaster literacy. *Journal of Physics: Conference Series*, *1481*(1). https://doi.org/10.1088/1742-6596/1481/1/012041

Mufit, F., Asrizal, Puspitasari, R., & Annisa. (2022). Cognitive Conflict-Based E-Book With Real Experiment Video Analysis Integration To Enhance Conceptual Understanding of Motion Kinematics. *Jurnal Pendidikan IPA Indonesia*, *11*(4), 626–639. https://doi.org/10.15294/jpii.v11i4.39333

Mufit, Fatni, & Fauzan, A. (2019). Model Pembelajaran Berbasis Konflik Kognitif (PbKK) (Disertai Penerapan Untuk Remediasi Miskonsepsi pada Sains dan Matematika). In *Cv Irdh*.

Mufit, Fatni, & Fitri, A. D. (2022). The Analysis of Experiment Video on Cognitive Conflict-Based

Teaching Materials to Enhance Momentum-Impulse Concepts Understanding. *Jurnal Penelitian & Pengembangan Pendidikan Fisika*, *8*(2), 293–304. https://doi.org/10.21009/1.08211

Mukti, F. D. (2018). Integrasi Literasi Sains dan Nilai-Nilai Akhlak di Era Globalisasi. *Abdau: Jurnal Pendidikan Madrasah Ibtidaiyah*, *1*(2), 311-329.

Muliaman, A., Sakdiah, H., & Ginting, F. W. (2022). Analisis Employability Skill Dan Literasi Sains Siswa Melalui Authentic Self-Assessment Pada Kurikulum. *Jurnal Pendidikan Fisika*, *11*(1), 24–32. https://doi.org/10.24252/jpf.v11i1.34010

Pangestu, G. Y. P., Mandenni, N. M. I. M., & Rusjayanthi, N. K. D. (2017). Aplikasi Web Augmented Reality Villa. *Jurnal Ilmiah Merpati (Menara Penelitian Akademika Teknologi Informasi)*, *5*(1), 29. https://doi.org/10.24843/jim.2017.v05.i01.p04

Plomp, T. N. N. (2013). *Educational Design Research:An Introduction.* Enschede: Netherlands Institute for Curriculum Development (SLO).

Puspitasari, R., Mufit, F., & Asrizal, A. (2022). Kepraktisan E-Book Berbasis Konflik Kognitif Menginterasikan Real Experiment Vidio Analysis Untuk Meningkatkan Pemahaman Konsep Siswa. *Jurnal Penelitian Pembelajaran Fisika*, *8*(1), 27. https://doi.org/10.24036/jppf.v8i1.115724

Rusilowati, A., Kurniawati, L., Nugroho, S. E., & Widiyatmoko, A. (2016). Developing an instrument of scientific literacy asessment on the cycle theme. *International Journal of Environmental and Science Education*, *11*(12), 5718–5727. Retrieved from http://www.ijese.net/makale/736.html

Sari, D. M., Surantoro, & Ekawati, E. Y. (2013). Analisis Kesalahandalam Menyelesaikansoal Materi Termodinamika Pada Siswasma. *Jurnal Materi Dan Pembelajaran Fisika (JMPF)*, *3*(1), 33–39. Retrieved from https://jurnal.fkip.uns.ac.id/index.php/fisika/article/view/5543

Sugiyono. (2019). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D*. Bandung: Alfabeta.

Sukardi. (2012). *Metode Penelitian Pendidikan, Konpetensi dan Praktiknya*. Jakarta: Bumi Aksara.

Suparyanto, & Rosad. (2020). Pengembangan Modul Bebasis ARIAS untuk Meningkatkan Kemampuan Pemahaman Konsep pada Materi Sistem Perdaran Darah Manusia di Kelas V Sekolah Dasar. *Pendas : Jurnal Ilmiah Pendidikan Dasar*, *5*(3), 248–253. https://doi.org/10.23969/jp.v7i2.6649

Wahid, A., Anra, H., & Tursina. (2017). Cross Platform Aplikasi Augmented Reality untuk Mata Pelajaran Kimia Struktur Molekul. *Jurnal Sistem Dan Teknologi Informasi (JUSTIN)*, *5*(3), 201–205. Retrieved from https://core.ac.uk/download/325945753.pdf

Zahro, U. L. (2017). *Pengembangan Lembar Kerja Siswa (Lks) Fisika Dengan Menggunakan Strategi Relating, Experiencing, Applying, Cooperating, Transferring (React) pada Pokok Bahasan Hukum Newton* (Doctoral Dissertation, Universitas Negeri Jakarta). Retrieved from http://repository.unj.ac.id/27118/