

Research Paper

E-Module by Flip PDF Professional Based on Problem Based Learning (PBL) Integrated Local Wisdom to improve students' Problem-Solving Ability

Syarful Annam¹, Muh. Makhrus^{1,2*}, Jamaluddin^{1,3}, Agus Ramdani^{1,3}, Gunawan^{1,2}¹Master of Science Education Program, University of Mataram, Mataram, Indonesia.²Physics Education Study Program, University of Mataram, Mataram, Indonesia.³Biology Education Study Program, University of Mataram, Mataram, IndonesiaDOI: [10.29303/jossed.v4i2.5217](https://doi.org/10.29303/jossed.v4i2.5217)**Article Info**

Received: August 30, 2023

Revised: October 14, 2023

Accepted: October 25, 2023

Published: October 31, 2023

Abstract: This research aims to improve problem solving skills through E-Modules by Flip PDF Professional based on Problem Based Learning (PBL) integrated with local wisdom. The type of research is development research. The development procedure carried out refers to the 4D model development steps, namely define, design, develop, disseminate. The E-module used in the learning was developed with the flip PDF Professional application which integrated local wisdom called *peraq api* from Lombok, NTB. The test subjects in this research were 27 students in 7th grade at SMPN 11 Mataram. Data on students' problem-solving abilities was obtained using a description (essay) test instrument with 5 questions (pre-test and pst-test). The increase in problem solving skills is calculated using the N-gain percentage formula. The research results showed that the N-gain percentage value was 63.85% in the medium category. Based on these results, it can be concluded that learning with E-Modules by Flip PDF Professional Based on Problem Based Learning (PBL) Integrated with Local Wisdom is able to improve the problem-solving abilities of students in this research.

Keywords: E-module; Local Wisdom; Problem Based Learning; Problem solving

Citation: Annam, S., Makhrus, M., Jamaluddin, J., Ramdani, A., & Gunawan, G. (2023). E-Module by Flip PDF Professional Based on Problem Based Learning (PBL) Integrated Local Wisdom to improve students' Problem-Solving Ability. *Journal of Science and Science Education*, 4(2), 138–144. <https://doi.org/10.29303/jossed.v4i2.5217>

INTRODUCTION

The 21st century has given very rapid changes in this era. The education sector has been significantly affected by developments in this century (Doyan et al., 2023). In the field of education, skills and literacy related to information and communication technology, creativity, innovation, critical thinking, problem-solving skills and cooperation need to be emphasized and carried out in various ways (Barta et al., 2022; Kaçar & Balım, 2021; Makhrus et al., 2018). Natural Science is a science that is studied to gain an understanding of nature (Songsil et al., 2019). Concepts and theories in science are obtained based on experimental activities carried out based on scientific procedures (Susilawati et al., 2020). Science material is rich in conceptual knowledge, provoking students to be able to think critically in solving the problems they face in learning (Hidayah et al., 2017).

The fact is that the critical thinking skills of junior high school students in science material average 40.62%, which is relatively low. This can be observed when students think about the problems/questions posed by the teacher (Hidayanti et al., 2021). If someone does not have the ability to think critically then they cannot control various kinds of challenges such as processing, assessing and making decisions and information logically and are unable to solve a problem (Sari et al., 2022).

Problem solving abilities are really needed by students in learning. According to Lismayani (2017) this is because problem solving activities can help students to construct new knowledge and facilitate

* Corresponding Author: makhrus.muh@unram.ac.id

learning. However, the results of the Trends in International Mathematics and Science Study (TIMSS) and the Program for International Student Assessment (PISA) show that students' thinking skills are still low. Students do not yet have the skills to become creative thinkers and problem solvers (Irnita, 2018; Lestari et al., 2019). Apart from focusing on learning in the 21st century, there is another thing that needs to be considered, namely the impact of globalization.

Globalization has resulted in the displacement of original Indonesian local cultural values due to the rapid development of foreign cultural values in Indonesia. The reality is that cultural values are shifting, resulting in local cultural values being forgotten. So more massive efforts need to be made through education so that local wisdom values can be preserved. Local wisdom values can also be used as a learning tool. Integrating local wisdom in learning is able to build the character of students' curiosity, solve problems through critical thinking and make students love the local culture (Hunaepi et al., 2020).

Based on the observations that have been made, the reality on the ground shows that learning still rarely integrates local wisdom in it in order to instill local cultural values in students. In addition, according to Ramdani et al. (2020) learning activities are still teacher-centered so that students' reasoning abilities are lacking. The learning resources used only depend on textbooks so that learning seems monotonous. The use of modules or e-modules in learning has never been used. The learning model used has not been able to support students' critical thinking skills and problem solving.

E-Modules are a form of innovation carried out to support learning activities. E-modules are packaged electronically by not removing the elements and components on the module and can be accessed using electronic devices (Yanarti et al., 2022). E-Modules have the advantage of being able to stand alone so they can improve the quality of learning (Marnah et al., 2022). E-Modules should be facilitated by an appropriate learning model. One learning model that can be used is Problem Based Learning (PBL). The PBL model helps improve learning development in a mindset, one of which is critical thinking and problem solving which is one of the 21st century skills (Rusman, 2014; Putra et al., 2021). So that e-modules facilitated by the PBL model can be used as a solution to improve students' abilities.

In developing e-modules, there is a lot of software that can be used, one of which is Flip PDF Professional (Aftiani et al., 2021; Febrianti, 2021). The use of Problem Based Learning-based E-Modules developed using Flip PDF Professional software is expected to improve students' problem-solving skills.

METHOD

This type of research is research and development (R&D) which will produce a product in the form of an E-Module with the Problem Based Learning model assisted by Flip PDF Professional. This research uses a 4D development design which consists of define, design, develop and dissemination stages (Sugiyono, 2014). This research is limited to the development stage.

The define stage is carried out to find out the problems and needs of students in the learning process. This stage consists of a beginning-to-end analysis. The design stage aims to design the product according to what is needed at the define stage.

The develop stage aims to analyze the validity of draft 1 which was created in the previous stage. After validation is carried out and the e-module product is declared suitable for use, then e-module is tested by using it in classroom learning to improve students' problem-solving abilities. The test subjects in this research were 27 students in 7th grade at SMPN 11 Mataram. Data on students' problem-solving abilities was obtained using a description (essay) test instrument with 5 questions (pre-test and pst-test). The increase in problem solving skills is calculated using the N-gain percentage Formula 1.

$$N\text{-gain} = \frac{S_{post} - S_{pre}}{S_{maks} - S_{pre}} \times 100\% \tag{1}$$

The level of the N-gain percentage will be determined based on the criteria in the Table 1:

Table 1. Interpretation of *N-Gain*

N-gain Score (%)	Category
N > 70	High
30 ≤ N ≤ 70	Medium
N < 30	Low

(Hake, 1998)

RESULT AND DISCUSSION

This research is development research using a 4D development model design. The 4D development model consists of 4 stages, namely define, design, develop and disseminate. This research is limited to the development stage, namely validity testing. This research aims to produce a product in the form of an electronic module (e-module) based on Problem Based Learning (PBL).

The define stage aims to identify and define the problems faced by students in learning (Susilawati et al., 2023) so that the basic need for developing E-modules is facilitated by an appropriate learning model. The definition stage carried out several activities to see the needs and problems in learning activities. This stage consists of initial and final analysis which includes analysis of student needs, material and concept analysis, task analysis and curriculum analysis (Doyan et al., 2022).

The results of the analysis of the needs of students show that the use of e-modules in learning is needed as an alternative source of learning. This is because the learning resources used in schools still depend on textbooks. Curriculum analysis produces a basic competency that is suitable for development into an electronic module based on Problem Based Learning. The basic competencies used include basic competencies in aspects of knowledge and skills (Lestari et al., 2023). The basic competencies used are basic competencies 3.7 and 4.7 on Temperature and Heat material in class VII at SMP/MTs level. The determination of the material is seen from the suitability of the material and the problem-based learning process.

The next stage is design. At this stage, researchers designed teaching materials in the form of electronic modules based on Problem Based Learning. The arrangement of e-modules is designed systematically consisting of; (a) cover page, (b) e-module identity, (c) foreword, (d) table of contents, (e) introduction, learning activities, (f) learning tasks, (g) summary, (h) practice questions, (i) reflective sheet, (j) glossary, (k) answer key and (l) bibliography. The e-module is designed using Ms. Word and Canva are then exported into PDF format. Modules in PDF format will be input into the Flip PDF Professional software and then converted into a flipbook.

The next stage is developed. This development stage aims to develop teaching materials that are valid based on the assessment results of three expert validators. And then e-module is tested by using it in classroom learning to improve students' problem-solving abilities. The learning was carried out in five meetings in the tested class. The first meeting was held to provide an pre-test of problem solving abilities, the second to fourth meetings were held to provide the learning used e- module, and the fifth meeting was held to provide a post-test of problem solving abilities. The results of problem-solving abilities were obtained using a test instrument in the form of 5 descriptions (essay). The results of the pre-test, post-test and n-gain score of students in the tested class can be seen in the table as follows.

Table 2. Pre Test and Post Test Scores in the Tested Class

Data	Pre-test	Post-test
Amount of Students	27	27
The Highest Score	25	77
The Lowest Score	2	66
Score Average	21.8	71.74
N- gain score	63.85 (Medium)	

Based on Table 2, there is an average difference in pre-test and the post-test of students. The average score of students before being given learning with e- modul was 21.8, which was in the very low category. But The average score of the students after being given learning with e- modul was found to be an average score of 71.74 which is in the medium category. The average scores of students' initial and final test results in the class are graphically shown in the Figure 1.

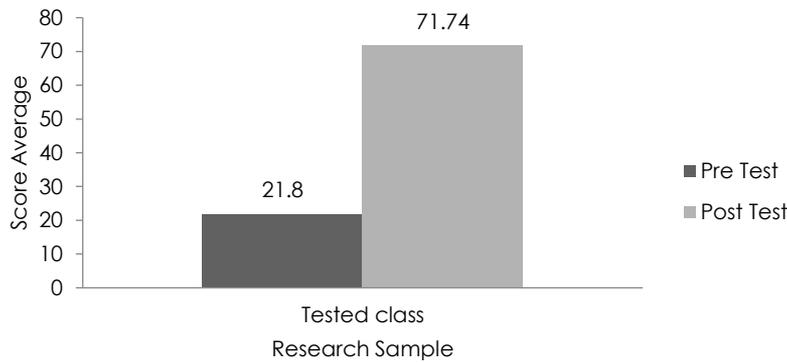


Figure 1. Average score of the pre-test and post-test of students' problem-solving abilities

After that, the average score of pre-test and post-test is entered into the N-gain formula and then we obtained the n-gain percentage score is 63.85 %, which is according to table 1 it's in medium category.

The n-gain percentage scores obtained for each indicator of problem-solving ability can be seen in Table 3.

Table 3. N-gain percentage scores for each indicator of problem solving ability

Indicator	N-gain score
Recognize the problem (IPM-1)	70.43
Strategic planning (IPM-2)	68.77
Strategic planning (IPM-3)	65.66
Evaluate solutions (IPM-4)	60.00

The data in Table 3 can be converted to the graph below.

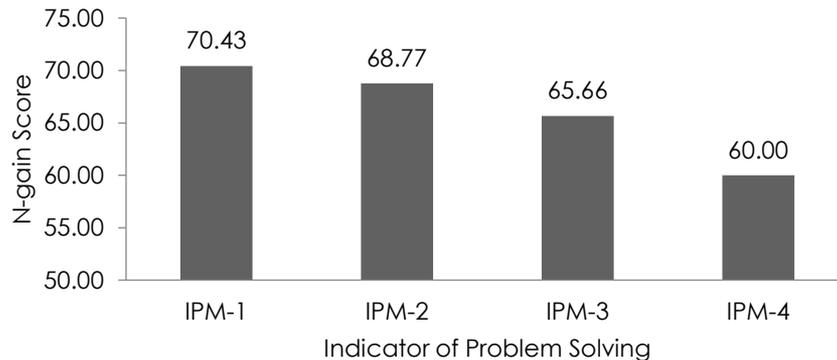


Figure 2. Improvement data per indicator of students' problem-solving abilities

Figure 2 shows the categories of improvement in each indicator of students' problem-solving abilities who use PBL-based e-modules integrated with local wisdom on temperature and heat material. Based on the results of the analysis of the four indicators of students' problem-solving abilities, it can be concluded that the use of PBL-based e-modules integrated with local wisdom in temperature and heat material can influence the improvement of students' problem-solving abilities. Meanwhile, the results of the analysis of the overall N-Gain percentage value were 63.85% in the medium category. So, it can be concluded that the use of PBL-based e-modules integrated with local wisdom in temperature and heat material can increase students' problem-solving abilities by 63.85% in the medium category. This finding is in accordance with the results of research conducted by Serevina et al. (2018) who found that the results of calculating students' pretest and posttest N-Gain scores were 0.6 in the medium category, this shows that students' science process skills increased before and after using PBL-based e-modules on heat and temperature material received the medium category in the study. Likewise, research conducted by Pistanty et al. (2015) who found that the N-Gain test results of students' pretest and posttest were 0.62 in the medium category, this shows that the increase in students' problem-solving abilities before and after using PBL-based modules in science material received a medium category in this research. Zhafirah et al. (2021) in their research also concluded that e-modul increase students' problem-solving abilities with n-gain score 0.575. Another

research result showed that there is an increase in the average problem-solving ability during learning using a Problem Based Learning-based science module to improve problem-solving skills as indicated by the results of the pre-test and post-test (Wahyudiana et al., 2021).

The increase in students' problem-solving abilities is due to the use of PBL-based e-modules integrated with local wisdom which has several advantages, namely the use of e-modules makes learning fun, because e-modules are equipped with multimedia facilities such as images, animation, audio and video and are integrated with local wisdom. fire equipment which is related to the sub-material of heat transfer. This can be seen during the learning process, students are very active in asking questions and enthusiastic in studying the material in the e-module. These observation results are in accordance with the findings of Istuningsih et al. (2018) that e-modules combined with technology are teaching materials that attract students' interest because there are multimedia elements (audio, video and images) in them which can help to understand the material, so this media can make learning more interesting.

In this PBL-based e-module integrated with local wisdom, problems are presented at the beginning of learning to find solutions by conducting investigations, presenting data and analyzing and evaluating the results of investigations. From the results of observations, this activity encourages students to become problem solvers in answering the problems posed in the e-module. Apart from that, the problem orientation presented in the e-module also adds insight and encourages students to seek deeper information. This is proven during learning when students are enthusiastic in asking questions because of the connection between the material being studied and everyday life. This is in accordance with the opinion of Cahyani & Setyawati (2017) that the learning outcomes of problem-based learning are that students have investigation skills and have problem solving skills. Apart from that, problem-based learning also has the advantage of making students better understand the concepts being taught because they themselves discovered the concepts, involving students in actively solving problems and demanding higher students' thinking skills and students can feel the benefits of learning chemistry because the problems solved are related to real life.

CONCLUSION

E-Modules by Flip PDF Professional based on Problem Based Learning (PBL) integrated with local wisdom can improve the students' problem-solving abilities with n-gain percentage score is 63.85 % which is in medium category.

ACKNOWLEDGEMENTS

We would like to thank all parties who have contributed to the research, including the team of expert validators.

REFERENCES

- Aftiani, R. Y., Khairinal, K., & Suratno, S. (2021). Pengembangan Media Pembelajaran E-Book Berbasis Flip PDF Professional Untuk Meningkatkan Kemandirian Belajar Dan Minat Belajar Siswa Pada Mata Pelajaran Ekonomi Siswa Kelas X Iis 1 Sma Negeri 2 Kota Sungai Penuh. *Jurnal Manajemen Pendidikan Dan Ilmu Sosial*, 2(1), 458-470. <https://doi.org/10.38035/jmpis.v2i1.583>
- Barta, A., Fodor, L. A., Tamas, B., & Szamoskozi, I. (2022). The development of students critical thinking abilities and dispositions through the concept mapping learning method – A meta-analysis. In *Educational Research Review* (Vol. 37). Elsevier Ltd. <https://doi.org/10.1016/j.edurev.2022.100481>
- Cahyani, H., & Setyawati, R. W. (2017). Pentingnya peningkatan kemampuan pemecahan masalah melalui PBL untuk mempersiapkan generasi unggul menghadapi MEA. In PRISMA, Prosiding Seminar Nasional Matematika (pp. 151-160). Retrieved from <https://journal.unnes.ac.id/sju/index.php/prisma/article/view/21635>
- Doyan, A., Susilawati, Harjono, A., Muliyadi, L., Hamidi, Fuadi, H., & Handayana, I. G. N. Y. (2023). The effectiveness of modern optical learning devices during the Covid-19 pandemic to improve creativity and generic science skills of students. *AIP Conference Proceedings*, 020005. <https://doi.org/10.1063/5.0122553>
- Doyan, A., Susilawati, S., Hadisaputra, S., & Muliyadi, L. (2022). Analysis Validation of Quantum Physics Learning Devices using Blended Learning Models to Improve Critical Thinking and Generic Science

- Skills of Students. *Jurnal Penelitian Pendidikan IPA*, 8(3), 1581–1585. <https://doi.org/10.29303/jppipa.v8i3.1920>
- 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. <http://dx.doi.org/10.33603/caruban.v4i2.5354>
- Hidayah, R., Salimi, M., & Susiani, T. S. (2017). Critical Thinking Skill: Konsep dan Indikator Penilaian. *Jurnal Taman Cendikia*, 1(2), 127-133. <https://doi.org/10.30738/tc.v1i2.1945>
- Hidayanti, I., A. Sutisnawati, & D. Uswatun. (2021). Pengembangan Media Pembelajaran Berbasis Articulate Storyline Untuk Meningkatkan Literasi Sains Pada Siswa SD Kelas Tinggi. *Jurnal Ilmu Pendidikan Dasar*, 4(3): 429–37. <https://doi.org/10.31100/dikdas.v4i3.1255>
- Hunaepi, Laras, F., Taufik, S., Endang, S., dan Raharjo. (2020). Efektifitas Perangkat Pembelajaran Inkuiri Terintegrasi Kearifan Lokal Terhadap Keterampilan Berfikir Kritis Mahasiswa. *Jurnal Pendidikan dan Kebudayaan*. 10(3), 271. <https://doi.org/10.24246/j.js.2020.v10i3.p269-281>
- Irmitya, L. U. (2018). Pengembangan Modul Pembelajaran Kimia Menggunakan Pendekatan Science, Technology, Engineering and Mathematic (STEM) pada Materi Kesetimbangan Kimia. *Orbital: Jurnal Pendidikan Kimia*, 2(2) 27-37. <https://doi.org/10.19109/ojpk.v2i2.2665>
- Istuningsih, W., BAEDHOWI, B., & Sangka, K. B. (2018). The effectiveness of scientific approach using e-module based on learning cycle 7e to improve students' learning outcome. *International Journal of Educational Research Review*, 3(3), 75-85. <https://doi.org/10.24331/ijere.449313>
- Kaçar, S., & Balim, A. G. (2021). Investigating the Effects of Argument-Driven Inquiry Method in Science Course on Secondary School Students' Levels of Conceptual Understanding. *Journal of Turkish Science Education*, 18(4), 816–845. <https://doi.org/10.36681/tused.2021.105>
- Lestari, A., Ramdani, A., & Bachtiar, I. (2023). Validitas Modul Elektronik Berbasis Socio-Scientific Issues (SSI) Materi Zat Aditif dan Zat Adiktif Untuk Meningkatkan Kemampuan Argumentasi Ilmiah Dan Pemahaman Konsep IPA. *Journal of Classroom Action Research*, 5(1). <https://doi.org/10.29303/jcar.v5i1.2870>
- Lestari, D., Haris, M., & Hakim, A. (2019). Pengaruh Model Pembelajaran Conceptual Understanding Procedures (CUPs) terhadap Kemampuan Pemecahan Masalah Kimia. *Jurnal Chemistry Education Practice*, 2(1), 31-37. <https://10.29303/cep.v2i1.1184>
- Lismayani, I., Parno, P., & Mahanal, S. (2017). The correlation of critical thinking skill and science problem-solving ability of junior high school students. *Jurnal Pendidikan Sains*, 5(3), 96-101. <http://dx.doi.org/10.17977/jps.v5i3.10338>
- Makhrus, M., Harjono, A., Syukur, A., Bahri, S., & Muntari, M. (2018). Identifikasi kesiapan LKPD guru terhadap keterampilan abad 21 pada pembelajaran IPA SMP. *Jurnal Ilmiah Profesi Pendidikan*, 3(2), 124-128. <https://10.29303/jipp.v3i2.20>
- Marnah, Y., Suharno, & Sukarmin. (2022). Development of physics module based high order thinking skill (HOTS) to improve student's critical thinking. *Journal of Physics: Conference Series*, 2165(1). <https://doi.org/10.1088/1742-6596/2165/1/012018>
- Pistanty, M. A., Sunarno, W., & Maridi, M. (2015). Pengembangan Modul IPA Berbasis Problem Based Learning Untuk Meningkatkan Kemampuan Memecahkan Masalah Pada Materi Polusi Serta Dampaknya Pada Manusia Dan Lingkungan Siswa Kelas XI Smk Pancasila Purwodadi. *Inkuiri*, 4(2), 68-75. Retrived from <https://jurnal.fkip.uns.ac.id/index.php/inkuiri/article/view/7752>.
- Putra, P.D.A., Ahmad, N., Wahyuni, S., & Narulita, E. (2021). An analysis of the Factors Influencing of Pre-service Science Teacher in Conceptualization of STEAM Education: Self-efficacy and Content Knowledge. *Jurnal Penelitian Pendidikan IPA*, 7(specialIssue), 225–230. <https://10.29303/jppipa.v7iSpecialIssue.877>
- Ramdani, A., Jufri, A. W., Jamaluddin, J., & Setiadi, D. (2020). Kemampuan berpikir kritis dan penguasaan konsep dasar IPA peserta didik. *Jurnal Penelitian Pendidikan IPA*, 6(1), 119-124. <https://10.29303/jppipa.v6i1.388>
- Rusman. (2014). *Model-Model Pembelajaran "Mengembangkan Profesionalisme Guru" (Kedua)*. Jakarta: Rajawa Pers.
- Sari, F.N., Indrawati., Wahyuni, D. (2022). Pengaruh Model Pembelajaran Learning Cycle 7e Terhadap Keterampilan Kolaborasi Dan Kemampuan Berpikir Kritis Siswa Ipa SMP. *Lensa (Lentera Sains): Jurnal Pendidikan IPA*, 12(2): 105- 114. <https://doi.org/10.24929/lensa.v12i2.241>

- Serevina, V., Sunaryo, Raihanati, Astra, I. M., & Sari, I. J. (2018). Development of EModule Based on Problem Based Learning (PBL) on Heat and Temperature to Improve Student's Science Process Skill. *TOJET: The Turkish Online Journal of Educational Technology*, 26-36.
- Songsil, W., Pongsophon, P., Boonsoong, B., & Clarke, A. (2019). Developing scientific argumentation strategies using revised argument-driven inquiry (rADI) in science classrooms in Thailand. *Asia-Pacific Science Education*, 5(1), 1–22. <https://doi.org/10.1186/s41029-019-0035-x>
- Sugiyono. (2014). *Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif dan R&D*. Alfabeta.
- Susilawati, S., Doyan, A., Artayasa, P., Soeprianto, H., & Harjono, A. (2020). Analysis of Validation Development Science Learning Tools using Guided Inquiry Model Assisted by Real Media to Improve the Understanding Concepts and Science Process Skills of Students. *Jurnal Penelitian Pendidikan IPA*, 7(1), 41. <https://doi.org/10.29303/jppipa.v7i1.473>
- Susilawati, S., Doyan, A., Rokhmat, J., Gunawan, G., Gunada, I. W., & Hikmawati, H. (2023). Validation of PhET-Based Core Physics Teaching Materials to Improve Activities and Learning Outcomes of Physics Education Students. *Jurnal Penelitian Pendidikan IPA*, 9(5), 2715–2719. <https://doi.org/10.29303/jppipa.v9i5.3929>
- Wahyudiana, E., Sagita, J., Isha, V., Setiantini, A., & Setiarini, A. (2021). Problem-Based Learning-Based Ipa Practicum Module To Improve Problem-Solving Ability. *Buana Pendidikan: Jurnal Fakultas Keguruan Dan Ilmu Pendidikan Unipa Surabaya*, 17(2), 161–167. <https://doi.org/10.36456/bp.vol17.no2.a4341>
- Yanarti, Y., Jumadi, J., Lelita, I., & Rosiningtias, W. (2022). Development of Archimedes Law Material E-Module on Motion Systems to Improve Student's Concept Understanding. *Jurnal Penelitian Pendidikan IPA*, 8(4), 2439–2447. <https://doi.org/10.29303/jppipa.v8i4.1905>
- Zhafirah, T., Erna, M., & Rery, R. U. (2021). Efektivitas penggunaan e-modul hidrokarbon berbasis problem based learning untuk meningkatkan kemampuan pemecahan masalah peserta didik. *Prosiding Penelitian Pendidikan dan Pengabdian 2021*, 1(1), 206-216. Retrieved from <http://prosiding.rcipublisher.org/index.php/prosiding/article/view/135>.