Development of *E-Module* Based on Problem Based Learning on Human Reproductive System Material for Class XI SMA

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ABSTRACT

The existence of biology teaching materials on human reproductive system material in the form of PBL-based e-modules makes learning more interesting. The purpose of this study was to determine the validity and practicality of the PBL-based human reproductive system e-module. This type of research is development using the Lee and Owens model. The results of validation of material experts 100% and field practitioners 97.50%, media experts and teaching materials 98.34% with a very valid category. The results of the practicality test from the lecturer were 97%, the one to one trial was 86.58%, the small group trial was 87.42% and the field test practicality value was 87.44% which was included in the very practical category. Based on the results of this study, it can be concluded that the PBL-based human reproductive system e-module is very valid and practical.
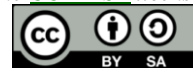
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1. INTRODUCTION

Education is part of a very basic aspect of life for nation building and has a strategic role in producing quality generations (Darmadi, 2019). The purpose of education in this global era is to improve the quality of human resources to face the 21st century (Malik, Oktaviani, Handayani, & Chusni, 2017). The development of 21st century science requires students to be able to compete by developing knowledge and skills. An important skill to be developed by students is higher order thinking skills (Ramadhan, et al. 2018).

Science education has great potential and a strategic role in preparing quality human resources to face the era of industrialization and globalization. This potential will be realized if science education is able to produce students who are proficient in their fields and succeed in fostering the ability to think logically, think creatively, problem solve, be critical, master technology and be adaptive to changes and developments of the times (Ramdani et al., 2020). E-module is an innovation for teaching materials that makes it easy for users to use anytime and anywhere (Franke et al., 2021). E-modules as teaching materials present learning materials, learning steps, and evaluation questions to determine the achievement of the desired competencies and are presented in electronic form (Laili, Genefri, and Usmeldi 2019). E-Modules utilize digital technology to present learning materials in an interactive and interesting way. This can increase students' interest and motivation in learning, especially for generations who are accustomed to the use of technology. In addition, E-Modules can be flexibly accessed by students from anywhere and anytime, as long as they have internet access. This enables independent learning outside formal school hours and supports distance learning or online-based learning.

The existence of teaching materials in the form of PBL-based e-modules can benefit educators to facilitate students with different characteristics and learning speeds. Problem Based Learning (PBL) is one of the learning models that can be used where PBL is a learning model by involving students in solving meaningful problems, so it can be said that PBL is a student-centered learning model (Li et al. 2020). Diana et al., (2015), in their research showed that PBL-based e-modules were able to improve critical thinking skills in students. PBL encourages students to be actively involved in the learning process. By using PBL-based modules, students will be more involved in problem solving, discussion, and analysis, which can improve their understanding of the material. PBL-based e-modules can be designed with attention to clear assessment criteria, making it easier for teachers to evaluate student learning progress and provide constructive feedback.

Based on the needs analysis conducted through questionnaires and interviews with teachers and students at SMA Negeri 1 Gondanglegi, the results show that there are several obstacles when learning Biology,

especially on the material of the human reproductive system. The first obstacle is that the teacher has difficulty completing the reproductive system material because the time is quite short and the subject matter is too much. The second obstacle is from students that they have difficulty understanding and memorizing material in learning the material of the human reproductive system. In addition, an inappropriate learning model can hinder the student learning process. So that the right solution for the use of teaching materials in the digital era like today is the e-module. E-module is a module developed in electronic format so that it can be used through a computer or smartphone. E-module contains written material, images and videos to support learning material (Laili et al. 2019).

Providing problem-based teaching materials can help students increase their knowledge related to reproductive system material. The development of PBL-based e-modules follows the syntax contained in the learning model. The steps or phases in the PBL learning model are orienting students to the problem, organizing students, guiding students both individually and in groups, developing and presenting discussion results and analyzing and evaluating the problem-solving process (Arifah, Kadir, and Nuroso 2021). Through PBL, students will be invited to think critically in dealing with complex problems related to the human reproductive system. This can help them develop analytical and evaluative thinking skills that are important in everyday life and further studies. The development model used in the development of e-modules is Lee and Owens. The nature of the development model is that it has clear steps in development so that it can produce multimedia-based products that are suitable for achieving the desired competencies (Rahmayanti 2020). Based on the description above, it is necessary to conduct research in developing a problem-based learning-based human reproductive system e-module.

2. RESEARCH METHOD

The development model used is Lee and Owens. The selection of the Lee and Owens development model is because the model contains clear, systematic procedures, and allows revisions in each stage so that it supports the development of e-modules and makes the product more qualified. The following are the stages of Lee and Owens development.

a. Assessment

This stage aims to identify problems that cause gaps in the field with needs analysis and start-end analysis. At the needs analysis stage, this stage aims to identify and analyze the problems found in the field. So that the product to be developed is appropriate and meets the needs of the target. At this stage, researchers analyzed the problems that exist in the school environment, especially in biology subjects. The initial data collection technique at school was carried out by distributing questionnaires to class XI students and conducting brief interviews with teachers. The initial analysis helped the researcher to understand the needs and characteristics of the students, including their level of prior knowledge, learning style, and interest in the material. This allowed the researcher to design a module that was more in line with the students' needs and preferences. The results of the initial analysis provided direction for the researcher in designing the appropriate structure, content, and learning approach for the module. This ensures that the module is designed by taking into account the students' needs and the learning objectives that have been set.

The final analysis helps in evaluating the extent to which the module succeeds in achieving the set learning objectives. By comparing the final results with the students' initial conditions, it can be evaluated whether the module succeeded in improving students' understanding of the material and their skills in solving problems. In this preliminary-end analysis using the questionnaire approach, the use of questionnaires before and after the use of the module can help in collecting data on students' perceptions of learning, their interest in the topics taught, and their satisfaction with the learning experience. In addition, researchers also conduct interviews with students or teachers to provide a picture of a deeper understanding of their learning experience using the module. This can help in finding the strengths and weaknesses of the module as well as suggestions for further improvement.

b. Design

The initial stage in module design is to set clear and measurable learning objectives. These objectives will guide the design of module content and activities. The next step is to design the module structure, including content arrangement, learning activity arrangement, and logical organization of information. The module structure should make it easy for students to access and understand the learning material systematically. Once the module structure is established, the next step is to design the learning content and activities. Content should be presented in a clear and concise manner, using appropriate media such as text, images, videos, or animations. Learning activities should be designed to encourage student interaction, problem solving, and critical thinking. In addition, this stage also aims to make a schedule, compile a work list of project team members, and specifications of teaching materials to be developed, develop a learning structure. At this stage, the qualifications of validators who will validate the e-module are also prepared.

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c. Development
       The purpose of this stage is to develop and validate the e-module. At the beginning of e-module development, a storyboard is prepared to compile a rough design. In addition, instructions for using the e-module were prepared so that students could use the e-module effectively and efficiently. The material or content that will be contained in the e-module is the material of the human reproductive system based on the PBL model or syntax of the PBL model. The e-module that has been developed is then tested for validity by media and teaching material experts, material experts, and field practitioners. The data from the validation results were then analyzed for the percentage of validity with the following formula (Akbar, 2016).

$$V = \frac{TSe}{TSh} \; X \; 100\%$$

Description:
V   : Percentage of validity
TSe   : Total empirical score (sum of validator assessment scores)
TSh   : Total expected score (maximum score).

       As for the practicality of the e-module, a practicality questionnaire was given to students through one to one trial, small group trial and field test. The data from the test results were then analyzed using the following formula.

$$V = \frac{TSe}{TSh} \; X \; 100\%$$

Description:
V   : Practicality percentage
TSe   : Total empirical score (number of scores obtained)
TSh   : Total expected score (maximum score).

       The results of the percentage of validity and practicality are then analyzed and seen the criteria which can be seen in Table 1.1.

Table 1.1 Criteria for the Validity and Practicality of E-Modules

No	Percentage (%)	Criteria for validity
1	85,01-100,00	Very valid/practical, can be implemented with minor revisions
2	70,01-85,00	Moderately valid/practical, can be implemented with partial revision
3	50,01-70,00	Less valid/practical, recommended not to be used because it needs major revisions
4	01,00-50,00	Not valid/practical, or should not be used

d. Evaluation
       This stage aims to analyze the results of the e-module trials that have been developed. The evaluation stage consists of 2 analyses, namely quantitative data and qualitative data analysis.
1) Quantitative data analysis
     a) Numerical Measurement: Quantitative data produces numbers or numerical data that can be measured, including pretest and posttest results.
     b) Descriptive Statistics: Quantitative data is analyzed using descriptive statistical methods such as mean (average), median, and mode to provide an overview of the performance and effectiveness of the e-module.
     c) Comparative Analysis: used to compare the results between the experimental class using e-module with the control group without e-module or between pretest and postest results to measure the improvement of students' understanding.
2) Qualitative Data Analysis
       Qualitative data analysis aims to understand the underlying context of students' experiences with the e-module. This involves an in-depth understanding of users' responses, perceptions, and experiences. Qualitative data was analyzed by identifying from user responses using student and teacher response questionnaire analysis.

3. RESULT AND DISCUSSION
       PBL-based e-module teaching materials on valid and practical human reproductive system materials are the result of research and development. The e-module includes three main parts, namely the initial part, the core part, and the final part. The initial part consists of the front cover, preface, table of contents, competencies,

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concept map, and instructions for use. The core part of the e-module includes materials and activities in PBL-based learning. The e-module cover has a glossary, and a bibliography. The e-module consists of three learning activities. Each learning activity has learning objectives, material description, learning activities, summary, and evaluation. The learning activities follow the PBL syntax. PBL syntax consists of five phases which include orienting students to the problem, organizing students, guiding students both individually and in groups, developing and presenting discussion results and analyzing and evaluating the problem solving process. The e-module that has been developed is then tested for validity and practicality. The validity test was conducted by material experts, media and teaching material experts, and field practitioners. The validation results from the three experts were declared very valid and can be seen in Table 1.2.

Table 1.2 Summary of Expert Validation Results

No	Validator	Value (%)	Category
1	Material Expert	100	Very Valid
2	Media and Teaching Material Expert	98,34	Very Valid
3	Field Practitioner	97,50	Very Valid
	Average Validity		**Very Valid**

The practicality test was conducted to teachers and students through response questionnaires. The practicality test for students was carried out with three categories, the first being one to one trial, small group trial, and field test. The following is a summary of the practicality test results

Table 1.3 Summary of Practicality Results

No	Validator	Value (%)	Category
1	one to one trial	86,58	Very Practical
2	small group trial	87,42	Very Practical
3	field test	87.44	Very Practical
	Average Validity		**Very Practical**

The material validity test aims to evaluate the suitability of the material presented in the e-module with the learning outcomes. Based on these results, it can be seen that the e-module is very valid. The material presented in the e-module is in accordance with the learning outcomes and can be used as teaching materials by students. The suitability of the material presented with the learning objectives is a guarantee of achieving the expected learning outcomes (Khusnul Khotimah, Noorhidayati, and Hardiansyah 2022). Assessment by material experts based on several criteria. These criteria are content eligibility, material suitability, material accuracy, material currency, encouraging curiosity, presentation and material language. Based on the validator's assessment, the example images and videos in the e-module are also adjusted to the content that can facilitate students in understanding the material. The existence of videos and images in the e-module can make it easier for students to understand the material (Maulida, Adnyana, and Bestari 2022).

The assessment of media validation and teaching materials for PBL-based human reproductive system e-module consists of three categories, namely the feasibility of e-module design graphics, e-module completeness, and feasibility of e-module presentation. Overall, the results of validation of e-modules by media and teaching material experts get an average validity value of 98.34% and are included in the very valid category. Teaching materials need to be validated and given an assessment so that their quality and feasibility are known. Good form and design in teaching materials can also make it easier for students to learn (Astuti, Kaspul, and Riefani 2022). Based on the validator's assessment, the graphic design of the reproductive system e-module has harmonious colors and illustrations on the cover illustrating the content of the material. The e-module content design also uses unobtrusive colors so as not to disturb the reader's concentration. The writing of the material content uses a variety of letters but is not excessive. The colors used in media and teaching materials should be colors with harmony to make the reader comfortable and not distracted so that they can understand the material easily (Aziza et al. 2022).

Field practitioner validation was carried out by a biology teacher in grade XI. The assessment aspects consist of relevance, completeness of presentation, systematic presentation, and suitability of the presentation to the demands of learner-centered learning. Overall validity by field practitioners received an average validity score of 97.50% and was included in the very valid category. Learning is organized systematically, displaying the competencies that students will master in learning activities (Suryana 2022). The relevance assessment by field practitioners found that the material and tasks in the e-module are relevant to the competencies that students master. In addition, the description of the material presented is relevant to the level of student development and the number of practice questions is sufficient. Relevant materials are tailored to the needs of students that have been obtained through needs analysis. The relevance of the material is the relationship or

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relevance to the basic competencies and competency standards listed in the curriculum (Anggraini and Julaikah 2022).

The practicality study was conducte to deerine the ease of use, time efecivenes, and beefts of the e-module. The practicality test was conducted to teachers and students through a response questionnaire. Practicality tests for students were carried out through three categories, namely individual trials, small group trials, and field trials. Based on the results of the three trials, it was stated that the human reproductive system e-module was very practical with a value of more than 87.14%.

Teaching materials have an important position to support the success of the learning process in class, namely as a medium for delivering information to students. In order for the process of delivering information and learning in class to run smoothly, good teaching materials are needed so that learning objectives can be achieved optimally. The use of teaching materials by teachers in the form of e-modules in learning can provide opportunities for students to learn according to their own ways and speeds (Aryawan, et al 2018). This is in accordance with the characteristics of the module contained in Depdiknas (2008), namely self instructional, which means that through e-modules students can learn themselves, not depending on other parties. Therefore, the use of e-modules in the learning process can provide benefits for teachers and students. In addition, the use of PBL-based e-modules encourages students to solve problems and perform critical analysis of complex situations. Thus, PBL-based e-modules help develop students' critical thinking skills in the context of human reproductive system material. PBL e-modules tend to emphasize the practical application of the concepts learned in the context of real life. By applying case studies or real-life scenarios in the e-module, students can more easily understand the relevance and importance of the learning material. E-Module PBL utilizes digital technology to present learning materials interactively and dynamically making it easier for students to access learning materials flexibly and adapt learning to their individual learning styles.

4. CONCLUSION

PBL-based e-module encourages students to be actively involved in learning. With the PBL model, students not only listen to information, but are also active in solving problems, collaborating, and discussing. Through PBL, students are motivated to develop critical thinking skills which are very important in understanding biological concepts. Students are invited to analyze problems, develop problem-solving strategies, and evaluate the resulting solutions. E-module PBL utilizes digital technology to present learning materials in an interactive and interesting manner making it easier for students to access learning materials more flexibly and adapt learning to their individual learning styles. The purpose of this study was to determine the validity and practicality of the PBL-based human reproductive system e-module. This type of research is development using the Lee and Owens model. The results of this study are the results of validation by material experts obtained 100%, validity by field practitioners with an average validity of 97.50%, validation by media experts and teaching materials with an average validity of 98.34% which is included in the very valid category. The practicality test value obtained from the lecturer was 97%. The practicality value obtained from the one to one trial was 86.58%, the small group trial was 87.42% and the field test practicality value was 87.44% which was included in the very practical category. Based on the results of this study, it can be concluded that the PBL-based human reproductive system e-module is very valid and practical.

5. ACKNOWLEDGEMENT

6. REFERENCES

Ahghar, Ghodsy. (2012). "Effect of Problem-Solving Skills Education on Auto-Regulation Learning of High School Students in Tehran." *Procedia - Social and Behavioral Sciences* 69(Iceepsy):688–94. doi: 10.1016/j.sbspro.2012.11.462.

Akbar, S. (2016). Instrumen Perangkat Pembelajaran. Bandung: PT Remaja Rosdakarya Offset.

Anggraini, Merinda Okta, and Dwi Imroatu Julaikah. (2022). "Penggunaan Video Youtube Deutsch Mit Inap – Essen Und Trinken Sebagai Bahan Ajar Tambahan Keterampilan Menyimak Kelas XI SMA Semester 2." *E-Journal Laterne* 11(2).

Arifah, Nur, Fitriani Kadir, and Harto Nuroso. (2021). "Hubungan Antara Model Pembelajaran Problem Based Learning Dengan Kemampuan Berpikir Kritis Pada Pembelajaran Fisika Siswa." *Karst : JURNAL PENDIDIKAN FISIKA DAN TERAPANNYA* 4(1):14–20. doi: 10.46918/karst.v4i1.946.

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Aryawan, R., Sudatha, I. G. W., & Sukmana, A. I. W. I. Y. (2018). Pengembangan e-modul interaktif mata pelajaran ips di smp negeri 1 singaraja. *Jurnal Edutech Undiksha,* 6(2), 180-191.

Astuti, Nadia, Kaspul Kaspul, and Maulana Khalid Riefani. (2022). "Validitas Modul Elektronik 'Pembelahan Sel' Berbasis Keterampilan Berpikir Kritis." *Jurnal Eksakta Pendidikan (Jep)* 6(1):94–102. doi: 10.24036/jep/vol6-iss1/667.

Aziza, Afifah Nurrahmah, Helendra, Syamsurizal, Ardi, and Relsas Yogica. (2022). "Validitas E-Modul Berbantuan Video Pembelajaran Tentang Materi Jaringan Hewan Untuk SMA." *Ruang-Ruang Kelas: Jurnal Pendidikan Biologi* 2(1):42–48.

B, Mochiah M., Ben Banful, Ken Fening, Blankson W. Amoabeng, and Kwasi Offei Bonsu. (2014). "Botanicals for the Management of Insect Pests in Organic Vegetable Production." *Journal of Entomology and Nematology* 3(6):85–97.

Darmadi, D. H. (2019). Pengantar pendidikan era globalisasi: Konsep dasar, teori, strategi dan implementasi dalam pendidikan globalisasi. An1mage.

Diana, Nina, Puguh Karyanto, Suciati, and Indriyati. (2015). "Penerapan E-Module Berbasis Problem-Based Learning Untuk Meningkatkan Kemampuan Berpikir Kritis Dan Mengurangi Miskonsepsi Pada Materi Ekologi Siswa Kelas X MIPA 1 SMA Negeri 5 Surakarta Tahun Pelajaran 2014 / 2015 The Application of E-Module Based on Pro." *Seminar Nasional XII Pendidikan Biologi FKIP UNS* 396–401.

Ditta, Annie S., Carla M. Strickland-hughes, Cecilia Cheung, and Rachel Wu. (2020). "Exposure to Information Increases Motivation to Learn More." *Learning and Motivation* 72(August):101668. doi: 10.1016/j.lmot.2020.101668.

Erdiansyah, Iqbal, and Sekar Utami Putri. (2018). "Implementasi Tanaman Refugia Dan Peran Serangga Pada Tanaman Padi Sawah (Oryza Sativa L.) Di Kabupaten Jember." *Agrin* 22(2):123–31.

Fauzi, Rizqi, and Adieba Warda Hayya. (2022). "Pengembangan E-Modul Interaktif Berbasis STEM Pada Topik Ekologi SMA." *Indonesian Journal of Biology Education* 5(2):80–88.

Franke, Jorg, Lihui Wang, Karlheinz Bock, and Jurgen Wilde. (2021). "CIRP Annals - Manufacturing Technology Electronic Module Assembly." *Elsevier* 70:471–93. doi: 10.1016/j.cirp.2021.05.005.

Heriyati. (2017). "Pengaruh Minat Dan Motivasi Belajar Terhadap Prestasi Belajar Matematika." *Jurnal Formatif* 7(1):22–32.

Khusnul Khotimah, Noorhidayati Noorhidayati, and Hardiansyah Hardiansyah. (2022). "Pengembangan Bahan Ajar Konsep Sistem Pernapasan Pada Manusia Di SMA Berbentuk E-Handout Berbasis Flip HTML5." *JUPENJI : Jurnal Pendidikan Jompa Indonesia* 1(2):106–18. doi: 10.55784/jupenji.vol1.iss2.235.

Laili, Ismi, Genefri, and Usmeldi. (2019). "Efektivitas Pengembangan E-Modul Project Based Learning Pada Mata Pelajaran Instalasi Motor Listrik." *Jurnal Ilmiah Pendidikan Dan Pembelajaran* 3(3):306–15.

Li, Wenwen, Yang Yu, Peng Liu, Ruchun Tang, Yunchuan Dai, and Li Li. (2019). "Identifying Climate Refugia and Its Potential Impact on Small Population of Asian Elephant (Elephas Maximus) in China." *Global Ecology and Conservation* 19. doi: 10.1016/j.gecco.2019.e00664.

Li, Winnie, T. Mrt, Angela Cashell, T. Mrt, David A. Jaffray, and Douglas Moseley. (2016). "Development and Implementation of an Electronic Learning Module for Volumetric Image-Guided Radiation Therapy." *Journal of Medical Imaging and Radiation Sciences* 47(1):43–48. doi: 10.1016/j.jmir.2015.12.001.

Li, Xiandong, Fei Xie, Xiaoqiang Li, Guangwu Li, Xu Chen, Jun Lv, and Chunyan Peng. (2020). "Clinica Chimica Acta Development , Application , and Evaluation of a Problem-Based Learning Method in Clinical Laboratory Education." *Clinica Chimica Acta* 510(July):681–84. doi: 10.1016/j.cca.2020.08.037.

Malik, A., Oktaviani, V., Handayani, W., & Chusni, M. M. (2017). Penerapan model process oriented guided

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inquiry learning (POGIL) untuk meningkatkan keterampilan berpikir kritis peserta didik. *Jurnal Penelitian & Pengembangan Pendidikan Fisika*, 3(2), 127-136.

Maulida, Sabrina Intan, Putu Budi Adnyana, and Ida Ayu Purnama Bestari. (2022). "Pengembangan E-Book Berbasis Problem Based Learning Pada Materi Perubahan Lingkungan Dan Daur Ulang Limbah Untuk Siswa Di MAN Karangasem." *Jurnal Pendidikan Biologi Undiksha* 9(2):116–29.

Pramana, Made Wisnu, I. Nyoman Jampel, and Ketut Pudjawan. (2020). "Meningkatkan Hasil Belajar Peserta Didik Dengan Modul Pembelajaran Berbasis Problem Based Learning (PBL)." *Jurnal EDUTECH Undiksha* 8(2):17–32. doi: 10.23887/jjpe.v12i1.25648.

Putri, Sri Ramadela, and Syafriani. (2022). "Pengembangan E-Modul Fisika Berbasis SETS (Science , Environment , Techonogy , So- Ciety) Untuk Meningkatkan Kemampuan Berpikir Kritis Peserta Didik SMA." *Jurnal Penelitian Dan Pembelajaran Fisika* 8(2):142–51.

Qi, Yue. (2021). "The Role of Mobile Web Platforms in the Development of Critical , Strategic and Lateral Thinking Skills of Students in Distance Physical Education Courses." *Thinking Skills and Creativity* 42(1):100935. doi: 10.1016/j.tsc.2021.100935.

Rahmayanti, Dewi. (2020). "Pengembangan Media Pembelajaran Pengolahan Dan Penyajian Makanan Indonesia Menggunakan Aplikasi Lectora Inspire." *Journal Evaluation in Education (JEE)* 1(2):60–67. doi: 10.37251/jee.v1i2.44.

Ramdani, A., Jufri, A. W., & Jamaluddin, J. (2020). Pengembangan Media Pembelajaran Berbasis Android pada Masa Pandemi Covid-19 untuk Meningkatkan Literasi Sains Peserta Didik. Jurnal Kependidikan: *Jurnal Hasil Penelitian dan Kajian Kepustakaan di Bidang Pendidikan, Pengajaran dan Pembelajaran*, 6(3), 433-440.

Ramadhan, G., Dwijananti, P., & Wahyuni, S. (2018). Analisis kemampuan berpikir tingkat tinggi (high order thinking skills) menggunakan instrumen two tier multiple choice materi konsep dan fenomena kuantum siswa SMA di Kabupaten Cilacap. *UPEJ Unnes Physics Education Journal*, 7(3), 85-90.

Safitri, Ismayani. (2020). "Pengaruh Kemandirian Belajar Dan Motivasi Terhadap Kemampuan Pemecahan Masalah Matematika." *ALFARISI: Jurnal Pendidikan MIPA* 1(13):269–77.

Suryana, Nana. (2022). "Pengembangan Bahan Ajar Aqidah Ahklak Di Madrasah Tsyanawiyah Hidayaturrahman NW Menggala." *Jurnal Pendidikan Profesi Guru Madrasah* 2(1):101. doi: 10.33394/jp.v9i1.4537.

Tyera, Losicha, Merty Megawati, and Mulyadi Rusli. (2022). "Penerapan Keterampilan Proses Dasar Berbasis Lingkungan Untuk Meningkatkan Hasil Belajar Siswa." *Educativo: Jurnal Pendidikan* 1(1):112–23. doi: 10.56248/educativo.v1i1.18.

Widiantie, Rahma, and Handayani. (2018). "Kesadaran Metakognisi Dan Keterampilan Memecahkan Masalah Mahasiswa Melalui Pembelajaran Berbasis Masalah Dengan Penugasan Individu." *Jurnal Pendidikan Dan Biologi* 10(1):58–66. doi: 10.25134/quagga.v10i01.872.Abstrak.

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