Development of an E-Handbook Based on Research on the Medicinal Plant *Premna serratifolia* as The Natural Resources of West Kalimantan for High School Students

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Abstract: This research aims to develop a comprehensive e-handbook, containing research-based information on the medicinal plant Premna serratifolia as the natural resources of West Kalimantan for high school students. This research used a research and development (R&D) method with an ADDIE model and was conducted in three high schools in West Kalimantan. Research instruments include validation instruments and student response questionnaires. The research data were analyzed using quantitative data analysis. Expert validators in content, media, and language assessed the e-Hanbook, resulting in validation percentages of 85.4% for content, 82.6% for media, and 81.5% for language. The practicality of the e-Hanbook was tested through initial and final field trials, achieving percentages of 80.8% and 87.2% respectively. Consequently, the research suggests that the e-Hanbook on *Premna serratifolia* medicinal plants is highly suitable and practical for high school students.

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Introduction

The interest in the utilization of various medicinal plants has experienced a notable surge, particularly within the health research community, driven by the perceived safety and the widespread availability of active natural compounds. This phenomenon is in accordance with Indonesia's remarkable biological diversity, housing an estimated 25,000 to 30,000 plant species that hold potential as herbal medicinal resources (Saragih & Arsita, 2019). Medicinal plants are intricately intertwined with traditional medicine, often relying on empirical knowledge as opposed to laboratory-based clinical trials. Knowledge of these plants is typically transmitted across generations and acquired through experience and expertise (Tima & Wahyuni, 2020).

Extensive research has been conducted on medicinal plants with the support of the Indonesian government through the National Research Master Plan (RIRN) 2017-2045. The focus of this research is on advancing technology for raw material independence in medicine. Key areas of investigation include the validation of traditional herbal medicine and remedies, natural pigment production technology, and the extraction of raw materials from medicinal plants (OHT). In addition, the National Agency of Drug and Food Control (BPOM) has initiated a Pilot Project for a Conducive Export Ecosystem of Traditional Herbal Medicine, under the theme "Jamu Entering Global Market for a Healthier World," commencing on November 22, 2022. The government has also encouraged this initiative in educational institutions by organizing research competitions in the field of medicinal plants (Kartika, 2023). Various research competitions, including the Indonesian Student Research Olympiad

(OPSI), the Madrasah Young Researchers Supercamp (MYRES), and the Youth Scientific Work Competition (LKIR), have been organized by the Ministry of Education, Culture, Research, and Technology (Kemendikbud), the Ministry of Religious Affairs (Kemenag), and the National Research and Innovation Agency (BRIN) to support the government's efforts for raw material independence in medicine.

Handbooks are crucial in conducting experimental activities as they serve as guides to ensure that the activities proceed according to procedure. A module typically includes preparation procedures, implementation steps, data analysis, and reporting guidelines. Experiments are carried out in a laboratory tailored to the specific needs of the experiment (Dinata et al., 2021). Handbook as a learning tool can be categorized as either printed or electronic (Puspitasari, 2019). There is a continuous advancement in learning technology to keep up with evolving learning systems, which includes the use of online learning resources like electronic handbooks (Herawati, Sunarya & Muhtadi, 2020).

Insufficient resources for experiments significantly challenge students in medicinal plant research. A survey of students and educators from SMAN 1 Pontianak, SMAN 3 Pontianak, and MAN 2 Pontianak confirmed this. Findings showed 25% of students had difficulties in the Extraction and Fractionation stages, 17% struggled with Functional Group Identification, and 33% faced challenges in bioactivity testing due to a lack of understanding of research processes. Both students and educators highlighted the need for a comprehensive handbook to guide medicinal plant experiments. This underscores the necessity for educational resources to aid students in understanding experimental stages. *Premna serratifolia*, known as buas-buas, is notably one of the most researched medicinal plants in West Kalimantan.

The plant known as Buas-buas or *Premna serratifolia* (*P. serratifolia*) has been traditionally used by the local community in various ways, such as a cooking spice, vegetable, deworming medicine, remedy for colds, aid in blood clotting, appetite stimulant, breath freshener, food preservative, and lactation aid. (Gusti Ngurah Trisna & Ni Putu Eka Leliqia, 2023; Kristina Lusty Tohomi, Iswahyudi, 2014; Wulandari, 2019). Furthermore, research has shown that *P. serratifolia* exhibits promising properties, including anticancer (Arockia John Paul et al., 2015; Biradi & Hullatti, 2017; Salih, 2017), antidiabetic, (Hadiarti, 2017, 2023; Hadiarti et al., 2021; Simamora et al., 2020; Timotius et al., 2018), antibacterial, (Nursin et al., 2020), antifungal, (Sumi et al., 2020), anthelmintic, (Aisyiah Lestari & Hepi Yanti, 2014), and antioxidant effects (Kurniati, 2013; Oktaviani et al., 2015; Timotius et al., 2018). This plant is considered a notable species in West Kalimantan and can serve as a valuable subject for research-based e-handbooks. After conducting the review, no studies were discovered regarding the creation of an experimental digital module for high school students centered on *Premna serratifolia*.

The concept of a research-based e-handbook entails an educational resource that meets the diverse requirements of learners, incorporates research into the learning process, and encompasses both research methods and findings. This type of e-handbook offers significant value to students by providing valuable insights that aid in their comprehension of research concepts, ideas, and theories (Fitriyati et al., 2015). Its distinguishing feature lies in its capacity to engender learning encounters that encourage the development of advanced thinking skills and establish connections between theoretical knowledge and empirical research findings, thereby rendering learning more tangible and pertinent to real-world applications (Rosyadi et al., 2019).

The e-handbook developed for focusing on the diversity of fish species received high validation scores from both material experts (97.48%) and media experts (93.90%). Students

found the handbook very practical, giving it a score of 95.61% (Parwasih & Warouw, 2020). Similarly, teaching materials for bacterial identification were highly validated by experts, averaging a score of 95.86%. Both students (96%) and teachers (88.33%) provided positive feedback (Wulandari et al., 2017). Additionally, the Research-Based E-Handbook for Antimicrobial Testing in the Microbiology Course underwent validation by material experts (95%), media experts (98%), and readability testing (88%) (Ummah et al., 2020).

Conducting research that aligns with the unique characteristics and needs of students is crucial. This study aims to develop a comprehensive e-handbook, containing research-based information on the medicinal plant *Premna serratifolia*. The study has resulted in the development of an instructional resource aimed at enhancing students' comprehension of the process of scientific investigation. More specifically, this resource takes the form of a research-oriented electronic manual dedicated to the topic of medicinal plants and is anticipated to facilitate students in conducting medicinal plant experiments more effectively.

Research Method

The study utilized research and development (R&D) employing the ADDIE development model, which includes Analysis, Design, Development, Implementation, and Evaluation stages (Parwasih & Warouw, 2020; Rosa, 2015; Ummah et al., 2020; Wiwin Yuliani, 2020; Wulandari et al., 2017). Data collection methods involved direct communication through teacher interviews during the co-curricular analysis stage and indirect communication through the distribution of response questionnaires during the needs analysis and student characteristics analysis stages. The research included 16 students and 4 teachers for analysis, e-handbook development, and instrument design, validation by 9 validators, implementation in an educational setting, and evaluation based on feedback and outcomes. Validation assessments used a Likert scale ranging from 4 (strongly agree) to 1 (strongly disagree), with scores processed using a specific formula to derive percentages (Fatmawati, 2016).

$$P = \frac{\sum R}{\sum N} \times 100\%$$

P : Percentage of validator value

$\sum R$: Total score given

$\sum N$: The maximum score has been set

The validation percentage determined by experts in content, media, and language is based on the criteria specified in Table 1. Following feedback from validators, the next phase involves implementing necessary improvements. This implementation will include distributing the e-handbook link in flipbook format to students engaged in experiments. The final stage includes evaluation, which will involve conducting readability tests in both initial and final field trials. This evaluation will also include distributing response questionnaires to students at SMAN 1 Pontianak, SMAN 3 Pontianak, and MAN 2 Pontianak. The data analysis technique employed was quantitative data analysis, where scores obtained will be processed and adjusted according to the criteria outlined in Table 2.

Table 1. Validity Criteria (Fatmawati, 2016)

No	Interval	Validity Criteria
1.	80 – 100	Very Valid
2.	61 – 80	Valid
3.	41 – 60	Not Valid
4.	21 – 40	Invalid
5.	< 20	Very invalid

Table 2. Student Response Criteria (Fatmawati, 2016)

No	Interval	Practicality Criteria
1.	80 – 100	Very Practical
2.	61 – 80	Practical
3.	41 – 60	Not practical
4.	21 – 40	Less Practical
5.	< 20	Impractical

Results and Discussion

Analysis Stage

During this stage, an analysis was conducted on extracurricular activities, requirements, and student challenges to explore difficulties faced by educators and students during experiments. Three high school teachers in Pontianak were interviewed to evaluate scientific extracurricular programs. These activities involved students identifying issues from scientific literature, developing frameworks for scientific papers, discussing with mentors, and conducting experiments. Additionally, a needs analysis surveyed 16 students from three Pontianak schools to identify fundamental challenges during experiments. The survey found that 19% of students had prior research experience and had participated in scientific paper competitions, though not at the national level. Students struggled with understanding experimental phases, achieving expected results, and selecting compelling topics for their papers. Notably, many students, being digital natives, preferred using electronic resources like smartphones for accessing journal references. Thus, there is a need for research-based educational resources that provide comprehensive insights into experimental procedures, helping students understand the complexities of conducting experiments with medicinal plants.

Design Stage

In the design phase, the focus was on creating media, content, and tools for a study on medicinal plants by researching learning resources. The media design involved tailoring the selection of media based on study results, resulting in an easily accessible e-handbook for both teachers and students. The e-handbook features A5 paper size, Arial font size 10, and 1.5 line spacing. The content design comprises three main sections: introductory pages, main pages covering the study content, and closing pages. Additionally, this phase included the creation of validation instruments and student response questionnaires.

Development Stage

During the initial phase of development, the team created preliminary designs for the front and back covers, as well as the content within the e-handbook, as shown in Figure 1. The electronic module then underwent a validation phase with input from 9 experts in media, language, and content validation. Based on the assessments from the validators, the e-module was deemed highly valid, achieving a validity rating of 83%. This validity percentage is slightly lower compared to a study by (Ersando, 2022), which attained a 100% validity rating after assessments before and after improvements, involving 7 validators. A detailed breakdown of the percentage values for each field of expertise in this study is presented in Figure 2.
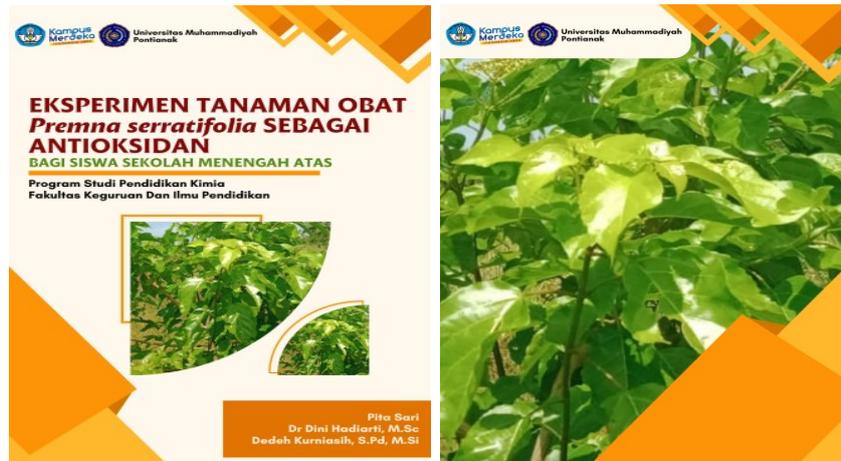
Figure 1. Front and Back Cover of the Research-Based E-Handbook on Medicinal Plants

Feasibility of Material Aspects

The content review was conducted by three experts from universities in West Kalimantan, specializing in medicinal plant experiments with a focus on antioxidants. Four different criteria were used to evaluate the content. The results showed that content accuracy scored the highest at 91.7%, as detailed in Figure 3.
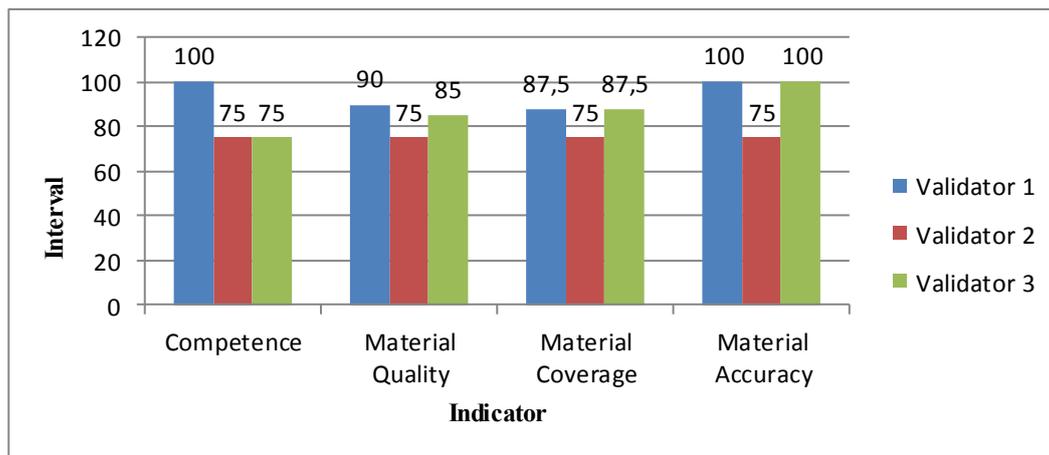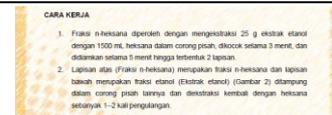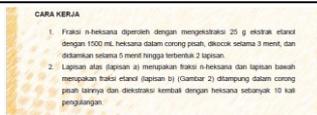

Figure 2. Graphic of Feasibility Assessment Results for E-Handbook Material

After receiving input from experts and implementing changes as detailed in Table 3, the e-handbook's content validity score improved to an impressive 85.4%, confirming its high level of validity.

Table 3. Improved Material Expert Validation

Suggestions & Comments	Repair	
	Before	**After**
"Add a reference table of wave numbers, functional groups and their common vibration types"		
"The table is converted into columns of secondary metabolite compounds and the results of each solvent"		
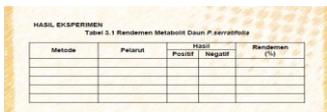
"How fractionation works: adding 10 times too much hexane, pay attention again"		
"The table is converted into columns for functional groups, wave numbers, and vibrational modes"		
"The table is converted into compound, RMSD, free binding energy, and binding interaction columns"		

Feasibility of Media Aspects

The assessment of the media component considered various elements, including cover design, content design, and graphics. The cover design received the highest score at 89.6%, while the content design received the lowest score at 75%. After validation by three assessors and averaging the ratings provided by media experts, the overall score was determined to be 82.6%, placing it in the highly valid category, as illustrated in Figure 4.
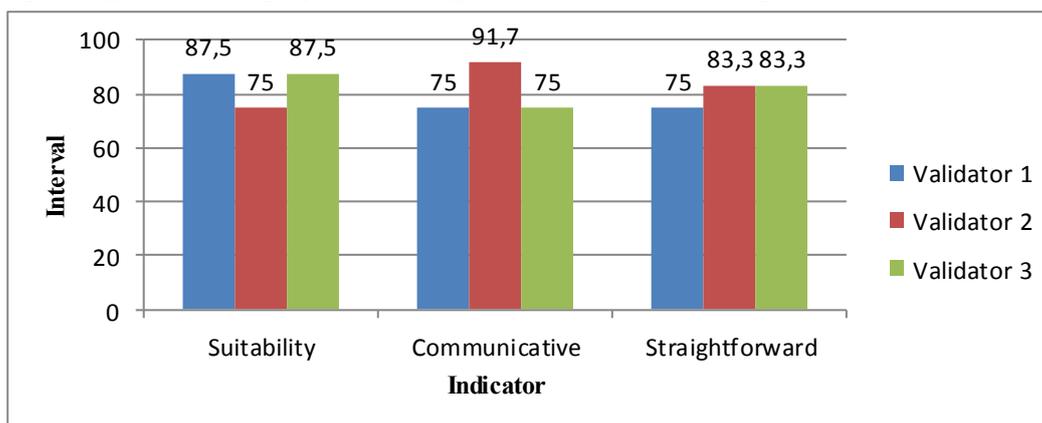

Figure 3. Graph Of The Results Of The E-Handbook Media Feasibility Assessment

Suggestions for improvement included increasing the font size, using Indonesian language for cover titles, and ensuring image background transparency.

Table 4. Improved Media Expert Validation

| Suggestions & Comments | Repair | |
	Before	After
" The font in the e-Handbook needs to be enlarged so that the e-Handbook class is too small"		
"The title on the cover should be in Indonesian"		
"Images that have a white background are changed to transparent"		
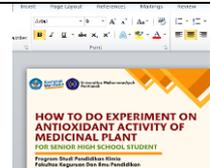
Feasibility of Language Aspects

The evaluation of the language component considered various factors, including appropriateness, communicativeness, and clarity, resulting in an overall rating of 81.5%, which is deemed highly valid. As shown in Figure 4, the appropriateness factor received the highest score at 83.3%, while communicativeness and clarity scored 80.6% and 80.5%, respectively. The use of language should prioritize clarity, effectiveness, and unambiguity to ensure easy understanding (Vebrina et al., 2024).
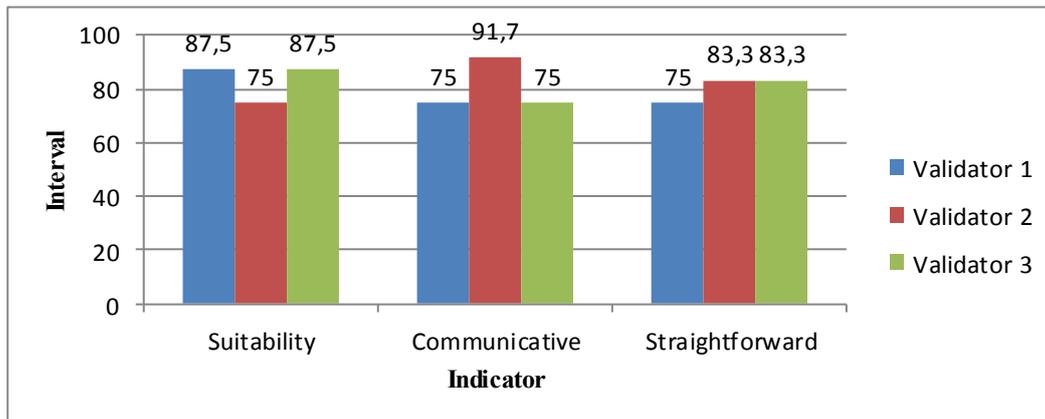

Figure 4. Graphic of E-Handbook Language Feasibility Assessment Results

The validator's improvements include revising the author's profile sentences to avoid sounding like a narrative, integrating the summary section into a subsection, and combining paragraphs 2 and 3 of the foreword to create a three-sentence paragraph. These enhancements were made in response to feedback from experts, as indicated in Table 3, resulting in an overall content validity score of 85.4% in the e-handbook, classifying it as highly valid.

Table 5. Material Expert Validation Improvements

Suggestions & Comments	Repair	
	Before	**After**
" The sentences in the author's section need to be corrected because they seem to be telling a story"		
"The summary is included in the subchapter"		
"The sentences in the foreword of paragraphs 2 and 3 form one paragraph that has more than 3 sentences"		

Implementation Stage

The implementation phase takes place once the e-handbook has been finished during the validation stage and found to be suitable for use. During this phase, the completed e-handbook is initially distributed to students in Word format, then converted to PDF and uploaded to Flipbook. After successful uploading, it will be shared with students via social media platforms, along with an introduction. This process is designed to facilitate readability testing to effectively evaluate the developed e-handbook.

Evaluation Stage

During the evaluation phase, the practicality of the recently developed e-module was assessed through readability tests conducted with students at several reputable schools in West

Kalimantan, including SMAN 1 Pontianak, SMAN 3 Pontianak, and MAN 2 Pontianak. The evaluation involved an initial field test with nine students on June 3-4, 2024, and a final field test with eighteen students on June 13-14, 2024. The combined test results from 27 students yielded a practicality score of 84.15%, categorizing it as "very practical." This score was slightly lower compared to previous studies on research-based e-modules, which obtained practicality scores of 95.61% and 87.2%, based on the research, it is stated that the developed module received a positive response from the students (Rahma Shafira et al., 2023; Ummah et al., 2020). The variance may be attributed to the differing number of respondents in the initial and final field tests, which involved 10 and 20 students, respectively.

Initial Field Trial Results

In the initial field testing, response questionnaires were given to teachers in the three mentioned schools to gather feedback on the students' experience with the e-handbook. The main goal was to assess the suitability and practicality of the e-handbook based on the initial feedback. The results of the testing indicated an overall practicality percentage of 80.8%, indicating high suitability for use. The breakdown of the questionnaire responses is as follows: usefulness at 82.4%, ease of use at 79.4%, and appearance at 80.5%. Based on this assessment, the e-handbook falls within the highly practical usability range of 80%-100%.

Table 6. Initial Field Trial Results

Aspect	Percentage	Category
Usefulness	82.4%	Very Practical
Convenience	79.4%	Practical
Appearance	80.5%	Very Practical
Average	**80.8%**	**Very Practical**

Final Field Trial Results

The data gathered from the last round of field testing included giving survey forms to teachers in the mentioned schools. The outcomes of the final field testing showed an 87.5% success rate, which is considered highly practical. The survey breakdown is as follows: 92% for usefulness, 82.2% for ease of use, and 87.5% for appearance. This evaluation places the e-handbook in the highly practical usability category, with a score falling between 80% and 100%.

Table 7. Final Field Trial Results

Aspect	Percentage	Category
Usefulness	92%	Very Practical
Convenience	82.2%	Very Practical
Appearance	87.5%	Very Practical
Average	**87.2%**	**Very Practical**

Based on research by Anugra Rahma Shafira, Wiwit, & Nurhamidah (2023) and Nurul Fauziah, Oktariani, & Rahmawati (2023), students often use unvalidated blogs and articles as references, raising doubts about research accuracy. There is also a lack of e-handbooks to aid learning, despite their effectiveness in teaching concrete concepts and research-based content. Rochmatul Ummah, Endang Suarsini, & Sri Rahayu Lestari (2020) support this, noting that e-handbooks make learning more engaging, enhance critical thinking, and improve understanding through visual aids. The final field test results showed that students responded positively with a percentage of 87.2% and understood the material better with the electronic handbook.

Conclusion

Based on the results and discussion of the research, the e-handbook designed for experimenting with medicinal plants has successfully undergone validation by experts in content, media, and language. Three experts in their respective fields conducted the validation, resulting in percentages of 85.4% for content, 82.6% for media, and 81.5% for language. Additionally, the e-handbook underwent readability testing through initial and final field tests, which yielded percentages of 80.8% and 87.2% respectively. Consequently, this study affirms that the e-handbook is valid and practical for use by high school students.

Recommendation

According to the research, it is recommended to enhance the creation of educational materials that students can access easily through electronic devices, which are constantly advancing. Teachers should consider leveraging technological advancements to enhance the learning experience for students, particularly in the context of chemistry lessons, to prevent monotony. Meanwhile, researchers should prioritize the collection of accurate and representative data, employing suitable techniques and adhering to ethical considerations, especially in studies involving human subjects. Thorough data analysis is imperative for researchers to ensure robust and reliable findings.

References

Aisyiah Lestari, M., & Hepi Yanti, A. (2014). Uji Aktivitas Ekstrak Metanol dan n-Heksan Daun Buas-Buas (Premna serratifolia Linn.) pada Larva Nyamuk Demam Berdarah (Aedes aegypti Linn.). *Protobiont*, *3*(2), 247–251. https://doi.org/10.26418/protobiont.v3i2.6831

Arockia John Paul, J., Karunai Selvi, B., & Karmegam, N. (2015). Biosynthesis of silver nanoparticles from Premna serratifolia L. leaf and its anticancer activity in CCl4-induced hepato-cancerous Swiss albino mice. *Applied Nanoscience (Switzerland)*, *5*(8), 937–944. https://doi.org/10.1007/s13204-014-0397-z

Biradi, M., & Hullatti, K. (2017). Bioactivity guided isolation of cytotoxic terpenoids and steroids from Premna serratifolia. *Pharmaceutical Biology*, *55*(1), 1375–1379. https://doi.org/10.1080/13880209.2017.1301491

Dinata, P. A. C., Rasidah, & Wardhana, V. W. (2021). The Validity of Electronic Practicum Module Based on Scientific Argumentation for Practicum Media during COVID-19 Pandemic. *Journal of Physics: Conference Series*, *1805*(1). https://doi.org/10.1088/1742-6596/1805/1/012022

Ersando, E. . M. R. . L. I. . S. R. P. . & R. R. (2022).). Pengembangan E-Modul Pemisahan Senyawa Fenolik dari Fraksi Simpur Air dengan Teknik Kromatografi Lapis Tipis (KLT) Preparatif Sebagai Sumber Belajar Kimia Bahan Alam. *Jurnal Kependidikan Kimia*, *2*(10), 109–121.

Fatmawati, A. (2016). Pengembangan Perangkat Pembelajaran Konsep Pencemaran Lingkungan Menggunakan Model Pembelajaran Berdasarkan Masalah Untuk SMA Kelas X. *Jurnal Penelitian Pendidikan Guru Sekolah Dasar*, *6*(August), 128. https://doi.org/10.23971/eds.v4i2.512

Fauziah, N., Oktariani, O., & Rahmawati, R. (2023). Pengembangan E-Modul Belajar dan Pembelajaran Bernuansa Hasil Riset Kependidikan. *Edukatif : Jurnal Ilmu Pendidikan*, *5*(1), 308–315. https://doi.org/10.31004/edukatif.v5i1.4484

Fitriyati, U., Mufti, N., & Lestari, U. (2015). Pengembangan Modul Berbasis Riset Pada Matakuliah Bioteknologi. *Jurnal Pendidikan Sains*, *3*(3), 118–129.

Gusti Ngurah Trisna, & Ni Putu Eka Leliqia. (2023). Review: Studi Kandungan Fitokimia dan Aktivitas Antimikroba Daun Buas Buas (Premna cordifolia). *Prosiding Workshop Dan Seminar Nasional Farmasi*, *1*, 158–166. https://doi.org/10.24843/wsnf.2022.v01.i01.p12

Hadiarti, D. (2017). In Vitro α-Glucosidase Inhibitory Activity of Ethanol Extract of Buas-buas (Premna serratifolia Linn). *Majalah Obat Tradisional*, *22*(2), 80. https://doi.org/10.22146/tradmedj.27917

Hadiarti, D. (2023). *Profiling of α -glucosidase inhibitors from ethyl acetate fraction of Buas-buas (Premna serratifolia) leaves using UHPLC-Q-Orbitrap HRMS and protein – ligand interaction with molecular docking*. *13*(02), 89–98. https://doi.org/10.7324/JAPS.2023.130210

Hadiarti, D., Haryadi, W., Matsjeh, S., & Swasono, R. T. (2021). Understanding Phytochemical Roles On α-Glucosidase Inhibitory Activity Based On Metabolomic Approach Of Premna serratifolia Leaves From West Borneo, Indonesia. *Rasayan Journal of Chemistry*, *14*(02), 1216–1222. https://doi.org/10.31788/rjc.2021.1426320

Herawati, Sunarya, N., & Muhtadi, A. (2020). Pengembangan Modul Elektronik (E-Modul) Interaktif Pada Mata Pelajaran Kimia Kelas Xi Ipa Sma. *Jurnal At-Tadbir STAI Darul Karmal NW Kembang Kerang*, *4*(1), 57–69. https://doi.org/10.3454/at-tadbir.v4i1.3751

Kartika, A. N. (2023). *Upaya Kemandirian Bahan Baku Obat Dalam Pengembangan Industri Farmasi Di Indonesia* (Vol. 10, Issue 1).

Kristina Lusty Tohomi, Iswahyudi, S. W. (2014). *Aktivitas Antioksidan Ekstrak Etanol Daun Buas-Buas (Premna cordifolia Linn.) Terhadap Gambaran Histopatologi Paru Tikus (Rattus norvegicus) Wistar Jantan Pasca Paparan Asap Rokok*. *2*(4), 212–224.

Kurniati, R. I. (2013). Uji Aktivitas Antioksidan Fraksi Etanol Daun Buas-Buas (Premna cordifolia Linn.) dengan Metode DPPH (2,2-difenil-1-pikrilhidrazil). *Jurnal Mahasiswa Farmasi Fakultas Kedokteran UNTAN*, *3*(1), 1–13.

Nursin, N., Nurliana, L., Imran, I., & Musta, R. (2020). Uji Aktivitas Antibakteri Staphylococcus aureus dan Salmonella typhi dari Hasil Mikroenkapsulasi Minyak Atsiri Rogo (Premna Serratifolia Linn). *Hydrogen: Jurnal Kependidikan Kimia*, *7*(2), 73. https://doi.org/10.33394/hjkk.v7i2.1916

Oktaviani, E., Wibowo, M. A., & Idiawati, N. (2015). Penapisan Fraksi Antioksidan Daun Buas-buas (Premna serratifolia Linn.). *Jkk*, *4*(3), 40–47.

Parwasih, N. W. S., & Warouw, Z. W. M. (2020). SCIENING: Science Learning Journal. *Science Learning Journal*, *1*(2), 6–10. https://doi.org/10.53682/slj.v4i1.6629

Puspitasari, A. D. (2019). Penerapan Media Pembelajaran Fisika Menggunakan Modul Cetak dan Modul Elektronik Pada Siswa SMA. *Jurnal Pendidikan Fisika*, *7*(1), 17–25. https://doi.org/10.24252/jpf.v7i1.7155

Rahma Shafira, A., Alwi, W., & Nurhamidah, N. (2023). Pengembangan E-Modul Sifat Fisika Dan Kimia Perairan Berbasis Riset Untuk Menstimulus Kemampuan Berpikir Tingkat Tinggi Mahasiswa. *Alotrop*, *7*(2), 34–46. https://doi.org/10.33369/alo.v7i2.30640

Rosa, F. O. (2015). *Pengembangan Modul Pembelajaran IPA SMP Pada Materi Tekanan Berbasis Keterampilan Proses Sains*. https://doi.org/10.24127/jpf.v3i1.21

Rosyadi, A. A. P., Dintarini, M., & Khusna, A. H. (2019). Pengembangan Modul Berbasis Riset Dengan Strategi React Pada Matakuliah Kalkulus. *EDU-MAT: Jurnal Pendidikan Matematika*, *7*(2), 102. https://doi.org/10.20527/edumat.v7i2.7006

Salih, G. A. et al. (2017). *Extraction and purification of cytotoxic compounds from Premna*

serratifolia L . (bebuas) for human breast cancer treatment. 24(December), 281–286.

Saragih, D. E., & Arsita, E. V. (2019). Kandungan fitokimia Zanthoxylum acanthopodium dan potensinya sebagai tanaman obat di wilayah Toba Samosir dan Tapanuli Utara, Sumatera Utara. *Prosiding Seminar Nasional Masyarakat Biodiversitas Indonesia*, *5*(1), 71–76. https://doi.org/10.13057/psnmbi/m050114

Simamora, A., Santoso, A. W., Timotius, K. H., & Rahayu, I. (2020). Antioxidant Activity, Enzyme Inhibition Potentials, and Phytochemical Profiling of Premna serratifolia L. Leaf Extracts. *International Journal of Food Science*, *2020*. https://doi.org/10.1155/2020/3436940

Sumi, Rusmiyanto, E., & Rahmawati. (2020). Aktivitas Antifungi Ekstrak Metanol Daun Salam (Syzygium polyanthum [Wight] Walp.)Terhadap Pertumbuhan Hortaea werneckii(T1) Secara In Vitro. *Protobiont*, *9*(3), 194–199. https://doi.org/10.26418/protobiont.v9i3.46271

Tima, M. T., & Wahyuni, S. (2020). Ethnobotanical Study of Medicinal Plants Used in Nangapanda , Ende , Nusa Tenggara Timur. *Jurnal Penelitian Kehutanan*. https://doi.org/10.20886/jpkf.2020.4.1.23-38

Timotius, K. H., Simamora, A., & Santoso, A. W. (2018). Chemical characteristics and in vitro antidiabetic and antioxidant activities of premna serratifolia L. leaf infusion and decoction. *Pharmacognosy Journal*, *10*(6), 1114–1118. https://doi.org/10.5530/pj.2018.6.189

Ummah, R., Suarsini, E., & Lestari, S. R. (2020). Pengembangan E-modul Berbasis Penelitian Uji Antimikroba pada Matakuliah Mikrobiologi. *Jurnal Pendidikan: Teori, Penelitian, Dan Pengembangan*, *5*(5), 572. https://doi.org/10.17977/jptpp.v5i5.13432

Vebrina, K. Y., Kinasih, L., Muddalifa, K., Wulandari, L. P. R., Rosid, M. H. Al, & Arum, D. P. (2024). Strategi Komunikasi Efektif Dalam Bisnis Penerapan Kalimat Yang Tidak Ambigu Untuk Menghindari Gagal Paham. *Journal of Management and Innovation Entrepreneurship (JMIE)*, *1*(3), 492–497. https://doi.org/10.59407/jmie.v1i3.609

Wiwin Yuliani, N. B. (2020). Perencanaan Dan Keputusan Karier: Konsep Krusial Dalam Layanan BK Karier. *Quanta*, *4*(1), 44–51. https://doi.org/10.22460/q.v1i1p1-10.497

Wulandari, R. (2019). Skrinning Fitokimia dan Aktivitas Antioksidan Teh Herbal Daun Buas–Buas (Premna cordifolia ROXB.). *Jurnal Dinamika Penelitian Industri*, *30*(2), 117–122. https://doi.org/10.28959/jdpi.v30i2.5525

Wulandari, Widiyaningrum, P., & Setiati, N. (2017). Pengembangan Suplemen Bahan Ajar Biologi Berbasis Riset Identifikasi Bakteri untuk Siswa SMA Info Artikel. *Jise*, *6*(2), 155–161. https://doi.org/10.15294/JISE.V6I2.19713