

## Development of Pocket Book of Tissue Culture Based on Case Method

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### ABSTRACT

The use of pocket book as a learning media is still limited. This will make it difficult for students to understand the material. The purpose of this research was to determine the feasibility results of tissue culture pocket book, the level of product feasibility through responses from lecturers, students and to see the effectiveness of tissue culture pocket book products especially in tool sterilization and in vitro propagation topics. The research method uses R&D with 4D models from Thiagrajaan. The results of the needs analysis showed that 66,7% of students had difficulty in understanding the material of tool sterilization and in vitro propagation. In curriculum analysis using the KKNi curriculum. The feasibility level of the assessment product from media experts obtained the criteria "Very worthy" with percentage of 91,67%, assessment of material experts with the criteria "worthy" with percentage of 84,74% and assessment results of learning design experts with the criteria "Very worthy" with percentage of 91,67%. Then the lecturer's response obtained results with the criteria "Worthy" with a percentage of 83,75%. In small group trials with scores of 89,4% and limited field trials of 90%. The disseminate stage obtained an N-Gain score of 0,56 with the "medium" criteria.

#### ***Pengembangan Buku Saku Kultur Jaringan Berbasis Case Method***

**ABSTRAK:** Penggunaan buku saku sebagai media pembelajaran masih terbatas. Hal ini akan menyulitkan mahasiswa dalam memahami materi pembelajaran. Tujuan dari penelitian ini adalah untuk mengetahui hasil kelayakan buku saku kultur jaringan, tingkat kelayakan produk melalui tanggapan dari dosen, mahasiswa dan untuk melihat efektivitas produk buku saku kultur jaringan khususnya pada topik sterilisasi alat dan perbanyakan in vitro. Dalam penelitian ini menggunakan R&D dengan model 4D Thiagrajaan. Hasil analisis kebutuhan menunjukkan bahwa 66,7% mahasiswa mengalami kesulitan dalam memahami materi sterilisasi alat dan propagasi in vitro. Kurikulum yang digunakan adalah KKNi. Tingkat kelayakan produk penilaian dari ahli media diperoleh hasil dengan kriteria "Sangat layak" dengan persentase 91,67%, penilaian ahli materi dengan kriteria "Layak" dengan persentase 84,74% dan hasil penilaian ahli desain pembelajaran dengan kriteria "Sangat layak" dengan persentase 91,67%. Kemudian respon dosen diperoleh hasil dengan kriteria "Layak" dengan persentase 83,75%. Dalam uji coba kelompok kecil diperoleh skor 89,4% dan uji coba lapangan terbatas 90%. Tahap disseminate memperoleh skor N-Gain 0,56 dengan kriteria "sedang".

## **INTRODUCTION**

Learning is a process of change in a person. The changes in question are shown in the form of changes in the quality and quantity of behavior such as changes in skills, knowledge, attitudes, habits, understanding, skills, thinking power and other abilities (Ismail et al., 2022);(Ruth & Ramadas, 2019). In a psychological perspective, learning is a process of change, namely changes in behavior that are the result of interaction with the environment in meeting the needs of life (Syara et al., 2020);(Med, 2023). Haka et al. (2020) and Ingebrand et al. (2020) said it can also be likened to an atmosphere when initially we do not know something and by learning will be able to make us know. The purpose of this learning is to add insight or knowledge, train skills so that in the future they can become independent.

The learning process carried out certainly has a goal that must be achieved, namely to improve the quality and quality of education (Sumadi & Ma'ruf, 2020). To achieve this goal, tools or objects are needed and support in the learning process, one of which is the availability of learning resources Rapanta et al. (2020). Currently, learning that takes place in universities uses textbooks and diktats as a form of learning resources. According to Handoko et al. (2021) textbooks are one type of printed teaching materials. Textbooks that are often used are books that contain a lot of writing, are large and thick, and equipped with pictures in small quantities Restu et al. (2022). A good textbook or textbook according to and has several characteristics, namely: accurate, appropriate, communicative, complete and systematic, student-centered oriented, siding with the ideology of the nation and state, correct language rules, and legible. (Wardani et al., 2020);(Astriani et al., 2020)

Tissue Culture is one branch of biology that studies natural phenomena and their applications (Weckx et al., 2019). Tissue culture can also be interpreted as a technique of propagation or cultivation of plants using tissues that have the same properties as their

parents (Phillips & Garda, 2019). Among college students, tissue culture is generally considered difficult to understand. This is because to understand tissue culture requires a basic understanding first from several branches of biology that are closely related to tissue culture such as plant physiology and morphology, plant anatomy, genetics, laboratory techniques and several other branches of science Harahap et al. (2020). In addition, in learning about tissue culture, adequate learning resources are needed to increase student knowledge and help biology students to learn and understand their learning, especially on tool sterilization material and in vitro propagation so that learning objectives can be achieved (Smither et al., 2020).

Based on the results of initial observations that have been made, 66.7% of students have difficulty in learning tissue culture courses, especially on tool sterilization and in vitro propagation materials. In addition, the difficulty or obstacle that is often experienced by students when attending tissue culture courses is that it is difficult to understand the material, especially tool sterilization material and in vitro propagation due to very limited learning resources or references (Gin et al., 2021). The lack of research on the development of pocket book based on the case method that students can use as handbooks in tissue culture courses is also one of the obstacles that occur. In addition to the problem of inadequate learning resources or supporting references (Kartel et al., 2022), The unavailability of tissue culture laboratories so that students also often find it difficult to understand a material, especially for tool sterilization material and in vitro propagation which should also be done with practicum learning (Alalwan et al., 2020).

In this study, the pocket book is produced. According to Bani & Masruddin (2021) pocket book are small books and easy to put in pockets. Hasairin et al. (2023) also explained that pocket book are printed with a small size to make it more efficient, practical and easy to use. This pocket book is made based on the case method in order to help students develop creativity and also student's ability to

solve problems contained in the material presented in the pocket book. According to Fauzi et al. (2022) stated that the case method is one of the alternative techniques in which problem solving patterns are applied both related to all learning situations and with the application of the case method model in this book students are required to be able to find and solve problems and can also improve students ability to express ideas and opinions.

**METHOD**

The 4D model was used in this study to use R&D technique. The 4D model consist of define, design, develop, and disseminate. In the define stage began with determining the basic problem obtain from the initial research in Biology Department students. In design stage, the pocket book was compiled and design. After the initial design of the pocket book product had been produced, then continue to the develop stage. In this stage the the pocket book product was validated by the experts including the material expert, media expert, and learning design expert. In this stage, the expert were asked to provide suggestion for improvement by filling out some questionnaire with Likert Scale with a score 1-4 (Sugiyono, 2015). The result of the assessment was converted into percentage

$$\text{Score Percentage} = \frac{\text{Total Score Obtained}}{\text{Total Ideal Score}} \times 100\%$$

The effectiveness test is carried out to see whether the book is effective enough to be used in the learning process and see the increase in student learning outcomes after and before using the developed pocket book. The effectiveness of the product is determined by conducting a pretest posttest with 20 multiple choice question to students and using N-Gain formula.

$$N\text{-Gain} = \frac{\text{Posttest score} - \text{Pretest score}}{\text{Ideal score} - \text{Posttest score}}$$

After calculate the effectiveness test by using pretest and posttest, determined the criteria according to the result of the calculation in table 1.

**Table 1.** N-Gain Criteria

Interval	Criteria
N-Gain > 0,7	High
0,3 ≤ N-Gain ≤ 0,7	Medium
N-Gain < 0,3	Low

**RESULTS AND DISCUSSION**

The pocket book design is carried out through several stage. At the define stage, it begins with conducting various analyzes namely front-end analysis, curriculum analysis, need analysis and student analysis. The researchers first gave the questionnaire to know the problem in the field. And after collecting the information based on the questionnaire, the researchers developed a pocket book of tissue culture based on case method (Erdbrügger et al., 2021). The second stage is design. The initial stage carried out in designing this product is to choose the appropriate media to be used in the development of pocket book. The media used in the development of this pocket book are *Canva* and *Microsoft word* applications to design products.



**Figure 1.** Front and back cover view of Pocket Book

The content of the material in the tissue culture pocket book of the material used is tool sterilization and in vitro propagation, the entire material is equipped with pictures related to the content of the material.

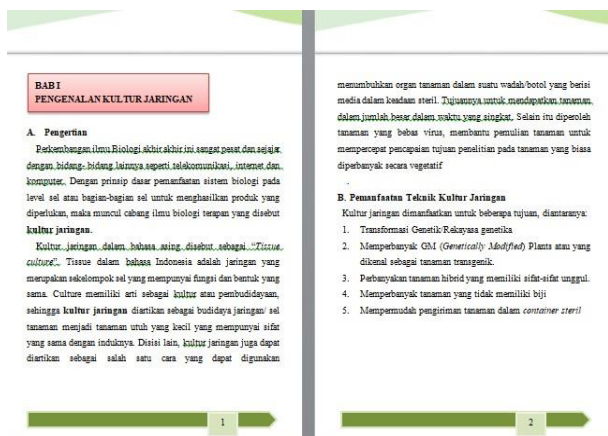


Figure 2. Pocket Book Content Display

Validator Analysis

The development stage involves experts in validating the draft 1 that has been produced before it will be distributed to the target both to students majoring in biology and lecturers of tissue culture courses. The following will be presented the results of the assessment of experts such as media experts, material experts, learning design experts, lecturers of tissue culture courses and the results of field trials. Assessment by media experts. The assessment is carried out by 1 expert lecturer. The assessment results are in the form of scores that are useful as data which is then converted into percent to be adjusted to the criteria. Expert validator assessment criteria are used to improve product quality in the form of assessments from aspects of appearance design, layout, and pocket book content design. The results of media expert eligibility validation are shown in Figure. 3. Based on the results of the assessment by media experts, the tissue culture pocket book based on the case method developed was stated with an average score percentage of 91.6% with the category "Very Feasible" according to Rahmatullah (2019) also stated that the presentation of a product in terms of media is categorized as feasible because the appearance on the product has been designed and presented attractively and not boring.

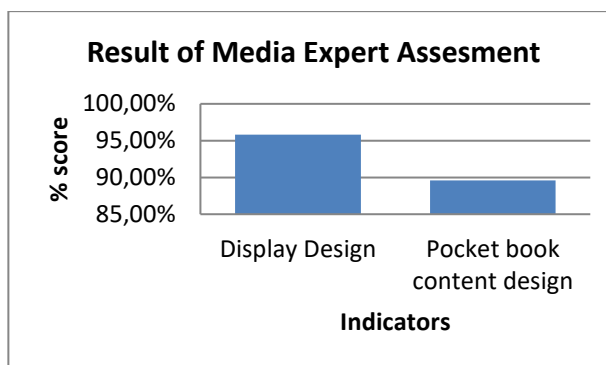


Figure 3. Diagram of media expert assessment results

The assessment by material expert was carried out by 1 expert lecturer. The assessment results are in the form of scores that are useful as data which is then converted into percent to be adjusted to the criteria. Expert lecturer assessment criteria are used to improve product quality. The aspects assessed are aspects of material suitability, pocket book components, and pocket book benefits. The results of the learning design expert feasibility validation are shown in Figure 4. Based on the results of the assessment by material experts, the tissue culture pocket book based on the developed case method was stated with an average score percentage of 84.7% in the "Feasible" category. Aprianti et al. (2022) and Khoiron et al. (2020) also stated that the principle of presenting material must meet several conditions, namely the material must be in accordance with the learning context, the material is within the scope of the main topic and is presented logically and systematically

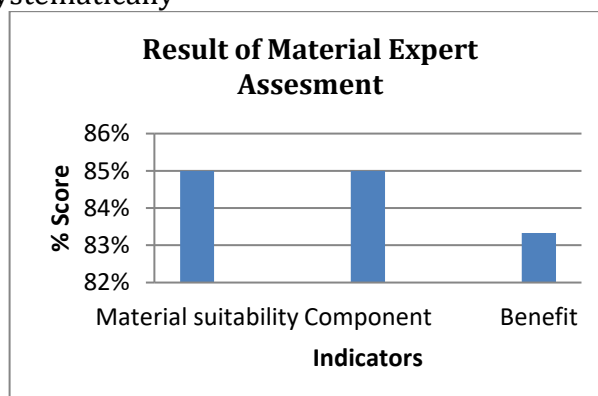


Figure 4. Diagram of material expert assessment results



Based on the results of the assessment by material experts, the tissue culture pocket book based on the developed case method was stated with an average score percentage of 84.7% in the "Feasible" category. Windari et al. (2023) and Wahyuni et al. (2020) also stated that the principle of presenting material must meet several conditions, namely the material must be in accordance with the learning context, the material is within the scope of the main topic and is presented logically and systematically. This is also in accordance with Budiastra et al. (2020) the opinion, that material that is in accordance with the topic of discussion is the main requirement in making media.

The results of validation of the feasibility of learning design expert are shown in Figure 5. Based on the results of the assessment by learning design experts, The pocket book of sterilization material for the tool and in vitro based on the case method with an average score percentage of 84,7% in the category "Worthy". Feasibility in the aspect of learning design is in accordance with Muzakki et al. (2021) which states that learning design is declared feasible when reviewing the achievement of learning, content and learning strategies and methods, which states that learning design is declared feasible when reviewing the achievement of learning, content and learning strategies and methods.

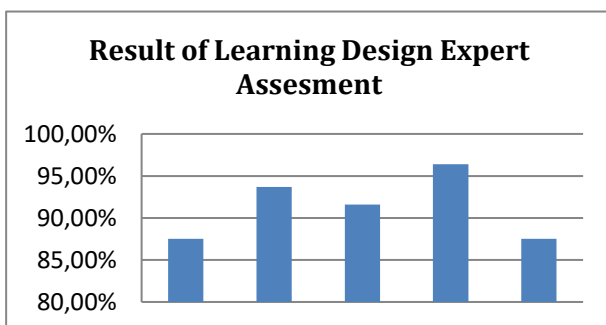


Figure 5. Diagram of learning design expert assessment result

The assessment carried out by learning design experts is in accordance with aspects of the assessment aspects given such as material suitability, material systematics, pocket book efficiency as a learning medium, material systematics, pocket book efficiency as a learning media (Hendriana et al., 2019). After the pocket book is assessed and declared valid

by expert validators, the pocket book of tissue culture based on the case method is declared effective and feasible to be implemented or disseminated to students in the learning process (Abidin et al., 2020).

Table.2 Result of N-Gain

Average	Information
Pretest average	59,5
Posttest average	83,17
N-Gain average	0,58
N-Gain Percentage	58%

After the development stage, an effectiveness test or product evaluation is carried out with students, namely answering pretest and posttest questions. After processing the data and also calculated with the N-Gain formula. This data proves that the results of product distribution that have been carried out to students of the biology department show that learning media in the form of pocket book of tissue culture based on case method have an influence on student learning outcomes (Januar et al., 2021);(Efendi et al., 2022). Judging from the calculation of the average n-gain, it is seen that the learning outcomes of students carried out by doing pretest and posttest increased, namely from the average pretest score obtained by 59,5 increased to 83,17 in the acquisition of the average posttest score. The average results obtained pretest and posttest scores obtained increased by 23,67 from the initial results of pretest scores and cognitively it can be concluded that the N- Gain results fall into the "medium" criteria. The results of this evaluation are in line with the results revealed by Audriansyah et al. (2022) that pocket book based on the case method can increase student learning motivation and make learning more interesting and more focused in the learning process and this pocket book also affects the improvement of student learning outcomes.

CONCLUSIONS AND SUGGESTIONS

The pocket book of tissue culture based on case method is declared feasible. Based on validation result from material expert who obtained the average score is 91,66% with the

very feasible category. Validation result from media expert obtain an average score 84,72% with feasible category and the validation by the learning design expert obtain a score of 91,67% with very feasible category. The N-Gain, a percentage score 0,59% with category fairly decent. For other researchers interested in this study, it is recommended to complete it up to the stage of testing the effectiveness of the product in classroom learning activities.

## REFERENCES

- Abidin, Z., Utomo, A. C., Pratiwi, V., & Farokhah, L. (2020). Project-Based Learning - Literacy in Improving Students' Mathematical Reasoning Abilities in Elementary Schools. *JMIE (Journal of Madrasah Ibtidaiyah Education)*, 4(1), 1-14. <https://doi.org/10.32934/jmie.v4i1.170>
- Aprianti, N., Agusminarti, A., & Sholihat, N. (2022). Development of Printed Module of Plants Structure Materials and Its Technology-Based Utilization on The Eighth-Grade Cross Puzzles at Smp Negeri 35 Pekanbaru. *Biosfer: Jurnal Tadris Biologi*, 13(2), 231-238.
- Alalwan, N., Cheng, L., Al-samarraie, H., Yousef, R., Ibrahim, A., & Muthana, S. (2020). Studies in Educational Evaluation Challenges and Prospects of Virtual Reality and Augmented Reality Utilization among Primary School Teachers: A Developing Country Perspective. *Studies in Educational Evaluation*, 66(100876), 1-12. <https://doi.org/10.1016/j.stueduc.2020.100876>
- Astriani, N., Bayu, M., & Dhana, A. (2020). Development of Mathematic Teaching Materials Through Think-Pair- Share Learning to Improve Students ' Mathematic Problem Solving Ability. *International Journal of Sciences: Basic and Applied Research (IJSBAR)*, 54(4), 196-205.
- Audriansyah, L. U., Lesmanawati, I. R., & Nada, S. (2022). Developing The Cirebon City Toponymy-Based Digital Encyclopedia as a Plantae Learning Resource for the Tenth-Grade Senior High School Students. *Biosfer: Jurnal Tadris Biologi*, 13(1), 57-66. <https://doi.org/10.24042/biosfer.v13i1.12402>
- Bani, M., & Masruddin, M. (2021). Development of an Android-based Harmonic Oscillation Pocket Book For Senior High School Students. *Journal of Technology and Science Education*, 11(1), 93-103. <https://doi.org/10.3926/jotse.1051>
- Budiastra, A. A. K., Wicaksono, I., & Sanjaya, I. G. M. (2020). The new generation self-directed teaching materials of natural science in elementary schools validity tests. *International Journal of Instruction*, 13(4), 763-780. <https://doi.org/10.29333/iji.2020.13447a>
- Efendi, A., Ariyani, A., & Asma, N. (2022). The Impact of Problem-Based Learning Models to Improve English Achievement at Middle-School 2 Karawang Barat. *ETDC: Indonesian Journal of Research and Development*, 1(4), 530-540.
- Erdbrügger, U., Blijdorp, C. J., Bijnsdorp, I. V., Borràs, F. E., Burger, D., Bussolati, B., ... Martens-Uzunova, E. S. (2021). Urinary extracellular vesicles: A position paper by the Urine Task Force of the International Society for Extracellular Vesicles. *Journal of Extracellular Vesicles*, 10(7). <https://doi.org/10.1002/jev2.12093>
- Fauzi, A., Ermiana, I., Rosyidah, A. N. K., & Sobri, M. (2022). Implementasi Case Method (Pembelajaran Berbasis Pemecahan Kasus) Ditinjau Dari Kemampuan Kolaboratif Mahasiswa. *Jurnal Eduscience*, 9(3), 809-817. <https://doi.org/10.36987/jes.v9i3.3446>
- Gin, L. E., Guerrero, F. A., Brownell, S. E., & Cooper, K. M. (2021). COVID-19 and Undergraduates with Disabilities : Challenges Resulting from the Rapid Transition to Online Course Delivery for Students with Disabilities in Undergraduate STEM at Large-Enrollment Institutions. *Life Sciences Education*, 20(36), 1-17. <https://doi.org/10.1187/cbe.21-02-0028>
- Haka, N. B., Anggoro, B. S., Hamid, A., Novitasari,

- A., Handoko, A., & Puspita, L. (2020). The Development of Biology Module Based on Local Wisdom of West Lampung: Study of Ecosystem Material. *Journal of Physics: Conference Series*, 1467(1). <https://doi.org/10.1088/1742-6596/1467/1/012013>
- Handoko, A., Sartika, S., & Anggoro, B. S. (2021). Subject-specific pedagogy: Development of biology teaching materials based on van hiele thinking theory. *JPBIO (Jurnal Pendidikan Biologi)*, 6(1), 125–132. <https://doi.org/10.31932/jpbio.v6i1.933>
- Harahap, F., Nurliza, N., & Nasution, N. E. A. (2020). Pengembangan Ensiklopedia Perbanyak Tanaman Melalui Kultur Jaringan Sebagai Sumber Belajar Tambahan Untuk Siswa Sma. *Jurnal Pelita Pendidikan*, 8(1), 52–61. <https://doi.org/10.24114/jpp.v8i1.17301>
- Hasairin, A., Hartono, A., & Hasim, H. (2023). Development of a Lichens Pocketbook in Low-Level Organism Taxonomy Course. *Biosfer: Jurnal Tadris Biologi*, 14(1), 01–09. <https://doi.org/10.24042/biosfer.v14i1.16604>
- Hendriana, H., Putra, H. D., & Hidayat, W. (2019). How to design teaching materials to improve the ability of mathematical reflective thinking of senior high school students in Indonesia? *Eurasia Journal of Mathematics, Science and Technology Education*, 15(12), 1–20. <https://doi.org/10.29333/ejmste/112033>
- Ingebrand, E., Samuelsson, C., & Hydén, L. (2020). A person living with dementia learning to navigate an iPad : a case study. *Disability and Rehabilitation: Assistive Technology*, 1–10. <https://doi.org/10.1080/17483107.2020.1800117>
- Ismail, I., Ali, H., & Us, K. A. (2022). Factors Affecting Critical And Holistic Thinking In Islamic Education In Indonesia: Self-Concept, System, Tradition, Culture. (Literature Review Of Islamic Education Management). *DIJMS : Dinasti Internasional Journal Of Management Science*, 3(3), 407–437.
- Januar, Rahmi, A., Andryadi, Hadini, & Yudelnilastia. (2021). Utilization of Information Technology Media and Communication in Distance Learning during the Covid 19 Pandemic. *Journal of Physics: Conference Series*, 1779(1). <https://doi.org/10.1088/1742-6596/1779/1/012043>
- Kartel, A., Charles, M., Xiao, H., & Sundi, D. (2022). Strategies for Parent Involvement During Distance Learning in Arabic Lessons in Elementary Schools. *Journal International of Lingua and Technology*, 1(2), 99–113.
- Khoiron, M., Wahyuningtyas, N., & Miftakhuddin. (2020). Revitalization of Social Studies Education: A Developmental Study Based on Dick and Carey Instructional Design. *Atlantis Press: International Conference on Social Studies and Environmental Issues*, 404(Icossei 2019), 38–43. <https://doi.org/10.2991/assehr.k.200214.007>
- Med, J. S. (2023). ‘ Not always so ’ : Embracing process in the development of curricula for contemporary person - centred healthcare professional education. *Journal of Evaluation Clinical Practice*, 29(2), 785–792. <https://doi.org/10.1111/jep.13833>
- Muzakki, A., Zainiyati, H. S., Rahayu, D. C., & Khotimah, H. (2021). Desain Pembelajaran Model ASSURE Berbasis Multimedia pada Mata Pelajaran Al-Qur’an Hadits. *Edukasi Islami: Jurnal Pendidikan Islam*, 10(01), 149. <https://doi.org/10.30868/ei.v10i01.1169>
- Phillips, G. C., & Garda, M. (2019). Plant tissue culture media and practices : an overview. *Springer*, 1–16.
- Rahmatullah, M. I. (2019). Pengembangan Konsep Pembelajaran Literasi Digital Berbasis Media E-Learning Pada Mata Pelajaran PJOK di SMA Kota Yogyakarta. *Journal Of Sport Education (JOPE)*, 1(2), 56. <https://doi.org/10.31258/jope.1.2.56-65>
- Rapanta, C., Botturi, L., Goodyear, P., Guàrdia, L.,

- & Koole, M. (2020). Online University Teaching During and After the Covid-19 Crisis: Refocusing Teacher Presence and Learning Activity. *Postdigital Science and Education*, 2, 923–945. <https://doi.org/10.1007/s42438-020-00155-y>
- Restu, R., Sriadhi, S., Gultom, S., & Ampera, D. (2022). Implementation Of The Merdeka Belajar-Kampus Merdeka Curriculum Based On The RI 4 . 0 Platform At Universitas Negeri Medan. *Journal of Positive School Psychology*, 6(6), 10161–10176.
- Ruth, C., & Ramadas, R. (2019). The “Africanized” Competency-Based Curriculum: The Twenty-First Century Strides. *International Journal of Education*, 7(4), 46–51.
- Smither, S. J., Eastaugh, L. S., Findlay, J. S., & Lever, M. S. (2020). Experimental Aerosol Survival of SARS-CoV-2 in Artificial Saliva and Tissue Culture Media at Medium and High Humidity. *Taylor & Francis*, 2(2), 1–9. <https://doi.org/10.1080/22221751.2020.1777906>
- Sugiyono. (2015). *Metode Penelitian Kombinasi*. Jawa Barat : Alfabeta.
- Sumadi, S., & Ma’ruf, M. H. (2020). Implementation of the Concept and Theory of Management Functions in Efforts To Improve Quality. *International Journal of Economics, Business and Accounting Research (IJEBAR)*, 4(02), 353–360. <https://doi.org/10.29040/ijebar.v4i02.1114>
- Syara, Y., Anggoro, B. S., Handoko, A., Haka, N. B., Kesumawardani, A. D., & Hidayah, N. (2020). The Use of Moodle-based Learning Management System (LMS) on MATE (Media Ajar Teori Evolusi). *Journal of Physics: Conference Series*, 1467(1). <https://doi.org/10.1088/1742-6596/1467/1/012016>
- Wahyuni, S., Erman, Sudikan, S. Y., & Jatmiko, B. (2020). Edmodo-based interactive teaching materials as an alternative media for science learning to improve critical thinking skills of junior high school students. *International Journal of Interactive Mobile Technologies*, 14(9), 166–181. <https://doi.org/10.3991/ijim.v14i09.13041>
- Wardani, R. S., Nawawi, I., & Hanifah, N. (2020). Content Analysis Of Character Values In Student Textbook 2017 Revised Edition For Class Five 6 Th Theme Heat And Displacement. *Proceeding International Webinar Series – Educational Revolution in Post Covid Era*, 153–161.
- Weckx, S., Inzé, D., & Maene, L. (2019). Tissue Culture of Oil Palm: Finding the Balance Between Mass Propagation and Somaclonal Variation. *Frontiers in Plant Science*, 10(5), 1–17. <https://doi.org/10.3389/fpls.2019.00722>
- Windari, M. R., Prihatin, J., & Fikri, K. (2023). The Effectiveness of Digital Textbooks on Brain-based Learning assisted by Animated Videos and Maze Chase-Wordwall on Science Literacy Skills and Student Learning Outcomes. *Biosfer: Jurnal Tadris Biologi*, 14(1), 79–88. <https://doi.org/10.24042/biosfer.v14i1.16891>