

The needs analysis of biology handout development on the human circulatory system topic

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Article Information	Abstract
Keyword: Need analysis; Biology handout development; Human circulatory system Kata Kunci: Analisis kebutuhan; Pengembangan handout biologi; Sistem peredaran darah manusia History: Received : 13/05/2023 Accepted : 14/10/2023	The availability of teaching materials greatly supports the quality of learning and helps students understand the subject matter. A teacher needs to convey material based on students' characteristics and the applicable curriculum to achieve an effective and efficient learning process. This study aims to analyze the need to develop biology handouts on human circulatory system material. The data collection instrument is using an online questionnaire. The research data were analyzed descriptively. The subjects of this study consisted of a biology teacher and 123 students of class XII MIA. The results showed the analysis of students' needs for the development of biology teaching materials on the concept of the human circulatory system with a percentage of 69.9%. Teaching materials significantly impact the ease of learning biology, and handouts are essential at these research locations. Similar research also needs to be carried out at various levels of education and on different materials. Abstrak Ketersediaan bahan ajar sangat mendukung kualitas pembelajaran dan membantu peserta didik memahami materi pelajaran. Seorang guru perlu menyampaikan materi yang sesuai dengan karakteristik peserta didik dan kurikulum yang berlaku untuk mencapai proses pembelajaran secara efektif dan efisien. Penelitian ini bertujuan untuk menganalisis perlunya pengembangan <i>handout</i> biologi pada materi sistem peredaran darah manusia. Instrumen pengumpulan data yaitu menggunakan kuisioner secara online. Data penelitian dianalisis secara deskriptif. Subyek penelitian ini terdiri dari seorang guru biologi dan 123 peserta didik kelas XII MIA. Hasil penelitian menunjukkan bahwa analisis kebutuhan peserta didik terhadap pengembangan bahan ajar biologi pada konsep sistem peredaran darah manusia dengan persentase 69,9%. Bahan ajar berdampak signifikan terhadap kemudahan belajar biologi, dan handout penting di lokasi penelitian ini. Penelitian serupa juga perlu dilakukan pada berbagai jenjang pendidikan dan pada materi yang berbeda.

A. Introduction

Teaching materials have various benefits, especially in supporting the learning process and helping students understand the material taught by the teacher (Sabtaningrum et al., 2020). In every teaching and learning activity, teachers need teaching materials that suit the characteristics of students and the applicable curriculum so that learning can be carried out optimally (Yati & Amini, 2020). Teaching materials also have an important function in achieving learning goals and the competencies students must have after studying material, one of which is biology (Saidah & Damariswara, 2019; Zulaeha et al., 2021).

Biology is part of science education and one of the subjects in SMA/MA (Putri et al., 2019; Subudi, 2021). Biology is a science that studies living things and their environment. Understanding concepts is very necessary to master this biological material so that students easily understand it, so the presentation of the material must be accompanied by interesting and relevant picture illustrations (Nasar & Kaleka, 2019; Azizah & Syamsurizal, 2022). Transferring knowledge and interpretation in biology learning will run optimally if it is supported by appropriate learning media, which is used to communicate and interact between teachers and students in the learning process (Syamsurizal et al., 2021).

Biology learning in Indonesia is generally still focused on teachers and students as listeners, so they are less trained to think critically, creatively or in other ways (Syehma, 2019). Therefore, developing critical thinking skills in the 2013 curriculum must be supported by tools or teaching materials used in the learning process (Zahroh, 2021). However, one of the factors that causes educational goals not to be achieved is the use of teaching materials in the learning process (Zahroh, 2021). Therefore, it is necessary to develop teaching materials used in class to support the biology learning process.

Teaching materials are expected to be easy to use and effective in achieving learning outcomes (Husna et al., 2020). Teaching materials are a means that can communicate information, concepts and knowledge clearly so that teachers and students can easily understand the subject matter (Rahmi et al., 2022). One solution to improve students' critical thinking skills and support the learning process is to develop biology handouts as one of the teaching materials in the classroom learning process. Handouts are written materials prepared by educators sourced from several relevant literature regarding basic competencies and main material that can make it easier for

students to follow the learning process. They can make it easier for students to follow the learning process (Erlinda & Lelfita, 2020).

Using more contextual handouts makes students understand the concept and study better and is supported by relevant images. Handouts are more effective to use in the learning process because they contain material that covers important learning concepts, provides the latest information, and can enrich students' knowledge in achieving their competencies (Nuzalifa & Putri, 2021).

Based on research by Rozalia (2018), the validation consequence of the distribution of expert lecturers, media teachers and biology teachers reached 90.8% through very valid standards. Common benchmarks by each professional are useful for earlier evaluation than conducting a disciplinary hearing. This shows that the handouts produced are suitable for use by educators and students in lessons. Regarding the suitability of content with illustrated handouts, the validator validated it with 95.6%. This shows that the material in the handout is by the competency requirements, core skills and learning effects that can be carried out. Guidance practices are based on KD that students must obtain. As a result, handouts need to be dropped from the curriculum.

According to Priska et al. (2022), in the learning process carried out in real conditions at SMP Negeri 1 Bengkulu City, educators use teaching materials in the form of printed books, worksheets, and paper sheets of the material provided to students. Monotonous teaching materials on one printed medium, books and worksheets result in the material being delivered not being optimal. The process in real conditions does not reflect educators developing the media and teaching materials. Research conducted on 20 students revealed that the development of teaching materials in handouts at SMPN 1 Bengkulu City was 78% in the required category. Likewise, the teacher needs analysis results were 90% in the very needed category. This is also in line with research conducted by Ramadhani et al. (2023), who stated that it is necessary to develop handout teaching materials for every lesson, especially in biology lessons where many important concepts must be understood to avoid misunderstandings. Almost every discussion requires clear images to help students understand.

However, because the learning system is still traditional, students come, sit, listen and take notes, so they do not know the concept of the study taught by the teacher. This causes boredom and

laziness among students. Therefore, guidebooks must be developed and carried out by teachers. Several findings from previous research, namely that handouts can complement textbooks and are of high quality, thus showing the benefits of using handouts for developing teaching materials. Teachers also use handouts as a reference for developing quality and satisfying learning resources for SMA/MA students (Rahmayani, 2015).

Therefore, this research aims to analyze the need for developing teaching materials in the form of handouts because similar research has never been carried out, especially at the SMA/MA level in North Hulu Sungai Regency. It is hoped that the handout can increase the effectiveness of students' learning and serve as teaching material.

B. Material and Method

This research is a descriptive study with qualitative methods carried out at MAN 1, MAN 2, and MAN 3 Hulu Sungai Utara, with the research subjects being 1 biology teacher and 123 students in class XII MIA for the 2022/2023 academic year. This research aims to determine the needs of students and educators for teaching materials in the form of handouts, especially class XI biology material.

Data collection was carried out using observation techniques, student surveys, and structured and unstructured interviews with teachers. Data was obtained using online questionnaire instruments and interview sheets. Interviews were conducted by researchers using a combination of structured and unstructured interviews with teachers with the aim that the conversation could represent the data, and sorting and selecting the data needed for further analysis could be carried out. Meanwhile, unstructured interviews were conducted by researchers without an interview guide to obtain the additional data needed. Then, a survey was conducted via questionnaire to obtain data about biology learning. Data was collected using an online questionnaire via Google Forms.

The data obtained is calculated as a percentage based on grouped similar answers. The data analysis technique used is descriptive. Data obtained through the interview process was analyzed descriptively with an overall data description. The data obtained from the interview is written in its entirety, and the important points are summarized based on the recordings that have been made. The data obtained will be complemented and checked with data from surveys and documentation.

C. Results and Discussion

The research results show that students have difficulty understanding biology teaching materials. Based on data from distributing questionnaires via Google Forms, the difficulties in the human circulatory system material are 28.5% too much material, 19.5% rote material, 29.3% complicated material, abstract material and they cannot be observed directly 44.7%, lots of confusing terms 48.8%, and lack of good teaching materials 30.1%. This can be seen in Table 1.

Table 1 Difficulty Studying the Human Circulatory System Material

No.	Type of difficulty	Total (%)
1	Many terms are confusing	48,8
2	Material is abstract and cannot be observed directly	44,7
3	There is a lack of good teaching materials available	30,1
4	Complicated material	29,3
5	Too much material	28,5
6	The material is rote	19,5

Based on research by Nisak (2021) regarding students' views on biology material, they stated that the material was too much and complex (51.43%), there was a lot of memorization (48.57%), and difficult terms (40%), and the material was difficult to understand. and imagined (15.71%). Difficulty understanding biological material was also stated by Yudistira et al. (2021), namely too much material 39.6%, rote material 45.3%, complicated material 15.1%, abstract material that cannot be observed directly 15.1%, lots of confusing terms 56%, and lack of availability of good learning resources 35.2%. Likewise Yahdiyani et al. (2022) stated that what causes difficulties in understanding biological material is that there are no clear pictures to support the explanation of the material, 2.9%; material is abstract (cannot be observed directly) 25.7%; too much material 60.0%; many confusing concepts 60.0%; the language used is difficult to understand 42.9%; less attractive (not colored) 8.6%; activity procedures are unstructured and difficult to understand 8.6%; and the questions could not be understood at 22.9%. These three studies describe several difficulties students face in understanding and studying biological material, so it can be concluded that there is a need to develop teaching materials.

Based on the results of observations made by researchers, it is known that the biology teacher in class XI MIA uses teaching materials in the form of textbooks. Based on the analysis, textbooks are

important as the main teaching material in the learning process. The textbooks or package books used have shortcomings, such as too much material and confusing terms. As many as 94.3% of students stated that they needed other teaching materials in handouts to support the learning process and increase their understanding of class XI MIA biology material. This is in line with the opinion of biology teachers, namely that the difficulties experienced by students in studying material about the human circulatory system is that there is a lot of material, and there are processes and mechanisms that are quite difficult to understand. The research results also show that material on the human circulatory system has the highest percentage, namely 69.9%, for material that requires the development of teaching materials, as seen in Table 2.

Table 2 Class XI MIA Material that Requires the Development of Teaching Materials

No.	Material	Total (%)
1	Cell	68,3
2	Plant tissue	46,3
3	Animal Tissue	44,7
4	Motion System	55,3
5	Human Circulatory System	69,9
6	Digestive system	46,3
7	Other Materials	0,8

Based on the research results by Yahdiyani et al. (2022), the circulation system material received the highest percentage in the material difficulty level category, namely 51.4% among other materials. This is in line with research by Aziza (2021), results of a student need analysis questionnaire show that as many as 40.5% of students still have difficulty understanding the concept of the Human Circulatory System through learning resources applied by teachers. The research results by Nisak (2021) also show that the circulatory system material is difficult to study because the material is too much and complex, with a percentage of 42.86%, which is in the high category. So, it is necessary to develop teaching materials for this material.

Difficulties in understanding the circulatory system material based on the results of this research include a lot of material, abstracts, and lots of confusing terms. Therefore, concise and clear teaching materials are needed to support learning. The language used in teaching materials must be simple, straightforward, and communicative (Asmah, 2022). Handouts should fulfill construction requirements related to clarity of sentence structure, use of language, and harmony between learning objectives (Akbar,

2013). It is necessary to pay attention to the use of language so that it is easy for students to understand when studying material and to encourage students to learn using handouts (Novitaningrum et al., 2014).

One of the difficulties for students in studying the circulatory system material is the availability of teaching materials in the form of handouts. The existence of teaching materials will certainly be meaningful for students if they match the criteria they desire. Based on the analysis results, it is known that several criteria for teaching materials are of interest to students, as seen in Table 3.

Table 3 Criteria for Teaching Materials Needed by Students

No.	Type of criteria	Total (%)
1	Use language that is easy to understand	83,8
2	Complete, concise, concise and clear material	75,7
3	There are explanations for difficult terms	73,9
4	Reading accompanied by pictures	62,2
5	There is additional information	55,9
6	Color on every page	40,5

The research results above align with the results of Yahdiyani et al. (2022), which has the highest percentage of criteria for teaching materials required by students, which is the use of language that is easy to understand. Furthermore, 75.7% chose teaching materials that contained complete, short, concise, and clear material in line with Yudistira et al. (2021) in their research on the criteria for interesting teaching materials for students who obtained the highest percentage were materials that were complete, short, concise and clear (84.9%). This is also supported by research by Latifa et al. (2022), with the highest percentage of 61%, namely that the material presented in learning sources interesting to students is complete, concise, and clear.

Handouts have functions, among others, as a companion to teacher explanations and as reference material for students. Preparing handouts has several benefits, including when students participate in the learning process, it complements material deficiencies, both material provided in textbooks and material provided orally by teachers, and can motivate students (Prastowo, 2015). Another function of handouts is to help students not need to take notes, remind them of the main points of the material being taught, provide feedback, and assess learning outcomes (Mahrudin & Dharmono, 2018).

Original and colored images can attract someone's attention rather than black-and-white images and provide real experiences to motivate students to continue learning (Prastowo, 2015). This aligns with the research results of students who like colorful and interesting teaching materials, which is 96.8%. A good handout is a handout that can be used as a companion to the teaching materials used by the teacher, written using good language that is easy to understand, presented attractively, and equipped with pictures. The contents of the handout can also help activate students in the learning process (Pristiyanti, 2021).

It is hoped that having handouts as teaching materials can help students understand biology learning material, especially material on the human circulatory system. This is by the analysis results that as many as 69.9% of students chose material on the human circulatory system, which required additional teaching materials in the form of handouts. This percentage is the highest among several biology materials in class XI MIA. According to Nisak (2021), teaching materials are one of the important factors that can improve the quality of learning. Salina et al. (2021) stated that teaching materials in the form of handouts contain a summary of important concepts from the material to make it easier for readers to understand and remember the concepts.

The technical presentation of the handout material is concise and easy to remember, and the development of contextual issues in it makes the teaching material meaningful. This can attract students' attention to follow and explore knowledge in depth because students are generally more interested in knowledge that correlates with real life (Rizqa, 2022). A good handout must have a consistent format and appeal to the reader. The information contained in it must be up-to-date and describe current events by adding facts, concepts, and symptoms found in society because teachers always link these phenomena, symptoms that exist in the surrounding environment, by providing examples in the surrounding environment, so that it is easier for students to understand the material (Novitaningrum et al., 2014).

The overall research findings relate to students' difficulties in studying biology material, the teaching materials that students expect, and the biology material that requires the development of teaching materials. The difficulty and ease of students studying biology are determined using teaching materials that suit their learning needs. At the research location, handouts are a form of teaching material that is needed. These results may differ from other locations because the form of

teaching materials is determined through a similar needs analysis, but each location has different characteristics. Therefore, it is necessary to develop teaching materials that suit the characteristics of the material being taught or the characteristics of the students.

D. Conclusion

Based on the analysis of the need for teaching materials in biology subjects, it is necessary to develop teaching materials in the form of handouts, especially in class XI MIA material, namely the concept of the human circulatory system, with a percentage of 69.9%. Teaching materials significantly impact the ease of learning biology, and handouts are essential at research locations. Variations in instructional materials may arise from specific location characteristics, emphasizing the need for instructional materials that align with the subject matter and student characteristics. This research also needs to be carried out at various levels of education and on different materials.

E. References

- Akbar, S. (2013). *Instrumen perangkat pembelajaran*. Bandung: PT Remaja Rosdakarya.
- Asmah, D. W. (2022). *Pengembangan handout berbasis socio-scientific issues (SSI) pada materi virus untuk siswa kelas X IPA di MA Ma'rif*. (Undergraduate thesis, Universitas Islam Negeri Kiai Haji Achmad Siddiq, Jember). Retrieved from <http://digilib.uinkhas.ac.id/id/eprint/16809>
- Aziza, A. S. (2021). Pengembangan bahan ajar konsep sistem peredaran darah manusia biologi SMA dalam bentuk booklet digital. *BIOMA: Jurnal Biologi Dan Pembelajarannya*, 3(2), 13-30. DOI: <https://doi.org/10.31605/bioma.v3i2.1246>
- Azizah, P., & Syamsurizal, S. (2022). Kebutuhan pengembangan booklet sebagai suplemen bahan ajar pada materi kingdom fungi kelas X SMA/MA. *Jurnal Penelitian dan Pengembangan Pendidikan*, 6(1), 121-126. DOI: <https://doi.org/10.23887/jppp.v6i1.40393>
- Erlinda, N., & Lelfita, L. (2020). Pengembangan handout model sains teknologi masyarakat (STM) di SMA 1 Negeri Enam Lingkung Padang Pariaman. *Edukasia: Jurnal Pendidikan dan Pembelajaran*, 1(1), 151-160. Retrieved from <https://mail.jurnaledukasia.org/index.php/edukasia/article/view/8>
- Husna, N., Soendjoto, M. A., & Zaini, M. (2020). Keefektifan bahan ajar tumbuhan mangrof untuk melatih keterampilan berpikir kritis siswa. *Quantum: Jurnal Inovasi Pendidikan Sains*,

- 11(2), 171-177. DOI: <http://dx.doi.org/10.20527/quantum.v11i2.9278>
- Latifa, Z., Zulyusri, Z., Rahmi, Y. L., & Rahmatika, H. (2022). Analisis kebutuhan pengembangan modul biologi menggunakan pendekatan saintifik dilengkapi kartu bergambar pada materi hewan invertebrata untuk kelas x sma/ma. *Biodidaktika: Jurnal Biologi dan Pembelajarannya*, 17(2), 120-125. DOI: <http://dx.doi.org/10.30870/biodidaktika.v17i2.16505>
- Mahrudin, M., & Dharmono, D. (2018). Pengembangan *handout* struktur populasi tumbuhan kawasan tepi sungai maluka Kabupaten Tanah laut pada mata kuliah ekologi tumbuhan. In *Prosiding Seminar Nasional Lingkungan Lahan Basah*, (Vol. 3, No. 2, pp. 563-567), LPPM Universitas Lambung Mangkurat, Banjarmasin. Retrieved from <https://repositori.ulm.ac.id/handle/123456789/16682>
- Nasar, A., & Kaleka, M. B. U. (2019). Effectiveness of experimental laboratory methods on understanding the concept of light, science processes skills, and scientific attitudes of students. *Jurnal Pendidikan Fisika Universitas Muhammadiyah Makassar*, 7(3), 262-270. DOI: <https://doi.org/10.26618/jpf.v7i3.2333>
- Nisak, N. Z. (2021). Analisis kebutuhan bahan ajar biologi untuk siswa SMA ditinjau dari tingkat kesulitan materi, keterampilan berpikir tingkat tinggi, dan keaktifan belajar siswa. *EduBiologia: Biological Science and Education Journal*, 1(2), 128-133. DOI: <http://dx.doi.org/10.30998/edubiologia.v1i2.9629>
- Novitaningrum, M., Parmin, P., & Pamelasari, S. D. (2014). Pengembangan *handout* IPA terpadu berbasis inkuiri pada tema mata untuk kelas ix siswa MTs Al-Islam Sumurejo. *Unnes Science Education Journal*, 3(2), 542-548. DOI: <https://doi.org/10.15294/usej.v3i2.3356>
- Nuzalifa, Y. U., & Putri, S. A. (2021). Efektivitas *handout* kingdom protista berbasis siklus belajar 5e pada kemampuan berpikir kritis siswa. *Jurnal Riset Teknologi dan Inovasi Pendidikan (Jartika)*, 4(1), 137-144. Retrieved from <http://journal.rekarta.co.id/index.php/jartika/article/view/144>
- Prastowo, A. (2015). *Panduan kreatif membuat bahan ajar inovatif*. Yogyakarta: Diva Press.
- Priska, H., Wardana, R. W., Sutarno, S., Nursaadah, E., & Nirwana, N. (2022). Analisis kebutuhan pengembangan *handout* materi ajar sistem organisasi kehidupan berbasis pembelajaran koko (kontekstual dan kooperatif). *DIKSAINS: Jurnal Ilmiah Pendidikan Sains*, 3(1), 57-61. DOI: <https://doi.org/10.33369/diksains.3.1.57-61>
- Pristiyanti, M. (2021). *Pengembangan handout digital dengan konteks keanekaragaman bryophyta dan pteridophyta pada materi plantae di dusun Sumbercandik kabupaten jember untuk siswa kelas X IPA di SMAN Rambipuji Jember*. (Undergraduate thesis, Universitas Islam Negeri Kiai Haji Achmad Siddiq, Jember). Retrieved from <http://digilib.uinkhas.ac.id/id/eprint/13758>
- Putri, O. D., Nevrita, N., & Hindrasti, N. E. K. (2019). Pengembangan instrumen penilaian keterampilan berpikir kritis siswa SMA pada materi sistem pencernaan. *BIOEDUKASI (Jurnal Pendidikan Biologi)*, 10(1), 14-27. DOI: <http://dx.doi.org/10.24127/bioedukasi.v10i1.2004>
- Rahmi, B., Riefani, M. K., & Utami, N. H. (2022). Validitas buku ilmiah digital keanekaragaman tumbuhan semak di areal reklamasi pertambangan batubara. *Edukatif: Jurnal Ilmu Pendidikan*, 4(4), 5818-5826. DOI: <https://doi.org/10.31004/edukatif.v4i4>
- Rahmayani, F., Hindun, I., & Hudha, A. M. (2015). Pengembangan *handout* berbasis kontekstual pada pelajaran biologi materi bioteknologi untuk siswa kelas XII SMK Negeri 02 Batu. *JPBI (Jurnal Pendidikan Biologi Indonesia)*, 1(1), 47-59. DOI: <https://doi.org/10.22219/jpbi.v1i1.2302>
- Ramadhani, R., Rahmi, Y. L., Fitri, R., & Selaras, G. H. (2023). Pengembangan *handout* biologi berbasis pendekatan kontekstual pada materi biologi: Studi literatur. In *Proceeding of Biology Education*, (Vol. 5, No. 1, pp. 22-31). DOI: <https://doi.org/10.21009/35904>
- Rizqa, N. K. (2022). *Pengaruh bahan ajar modul berbasis problem solving terhadap hasil belajar IPS peserta didik kelas V di UPT SDN 1 Keputran Sukoharjo Pringsewu Lampung*. (Diploma thesis, Universitas Islam Negeri Raden Intan, Lampung). Retrieved from <http://repository.radenintan.ac.id/id/eprint/21824>
- Rozalia, A., Kasrina, K., & Ansori, I. (2018). Pengembangan *handout* biologi materi keanekaragaman hayati untuk SMA kelas X. *Diklabio: Jurnal Pendidikan dan Pembelajaran Biologi*, 2(2), 44-51. DOI: <https://doi.org/10.33369/diklabio.2.2.44-51>
- Sabtaningrum, F. E., Wiyokusumo, I., & Leksono, I. P. (2020). E-book tematik terpadu berbasis multikultural dalam kegiatan SFH (School from Home). *Jurnal Ilmiah Sekolah Dasar*, 4(2), 153-162. DOI: <https://doi.org/10.23887/jisd.v4i2.24796>
- Saidah, K., & Damariswara, R. (2019). Pengembangan bahan ajar materi dongeng berbasis kearifan lokal Jawa Timur bagi siswa

- kelas 3 SD. *Premiere Educandum*, 9(1), 73-81. DOI: <http://doi.org/10.25273/pe.v9i1.4320>
- Salina, N., Daningsih, E., & Marlina, R. (2021). Kelayakan *handout* struktur dan fungsi jaringan tumbuhan dengan tambahan distribusi stomata dan laju transpirasi. *EduNaturalia: Jurnal Biologi dan Kependidikan Biologi*, 2(1), 20-28. DOI: <https://dx.doi.org/10.26418/edunaturalia.v2i1.45987>
- Subudi, I. K. (2021). Peningkatan aktivitas dan hasil belajar biologi sebagai dampak penerapan model pembelajaran kooperatif tipe group investigation. *Journal of Education Action Research*, 5(1), 17-25. DOI: <https://doi.org/10.23887/jear.v5i1.32131>
- Syamsurizal, S., Syarif, E. A., Darussyamsu, R., & Farma, S. A. (2021). Developing human movement system booklet as a biology teaching material supplement for XI grade students. *Journal of Biological Education Indonesia (Jurnal Pendidikan Biologi Indonesia)*, 7(1), 95-103. Retrieved from <https://eric.ed.gov/?id=EJ1298066>
- Syehma, B. R. (2019). Pengaruh desain pembelajaran assure terhadap hasil belajar siswa sekolah dasar. *Jurnal Inovasi*, 18(1), 44-49. Retrieved from <https://journal.uwks.ac.id/index.php/inovasi/article/view/587>
- Yahdiyani, Y., Helendra, H., & Yumna, H. (2022). Kebutuhan e-modul biologi berbasis pendekatan saintifik untuk peserta didik kelas XI. *Jurnal Penelitian dan Pengembangan Pendidikan*, 6(1), 111-120. DOI: <https://doi.org/10.23887/jpppp.v6i1.39166>
- Yati, W., & Amini, R. (2020). Pengembangan bahan ajar dengan pendekatan cooperative learning tipe turnamen pada siswa kelas IV SD. *Jurnal Basicedu*, 4(1), 158-167. DOI: <https://dx.doi.org/10.31004/basicedu.v4i1.335>
- Yudistira, O. K., Syamsurizal, S., Helendra, H., & Attifah, Y. (2021). Analisis kebutuhan pengembangan booklet sistem imun manusia sebagai suplemen bahan ajar biologi kelas XI SMA. *Journal for Lesson and Learning Studies*, 4(1), 39-44. DOI: <https://doi.org/10.23887/jlls.v4i1.34289>
- Zahroh, D. A., & Yuliani, Y. (2021). Pengembangan e-LKPD berbasis literasi sains untuk melatih keterampilan berpikir kritis peserta didik pada materi pertumbuhan dan perkembangan. *Berkala Ilmiah Pendidikan Biologi (BioEdu)*, 10(3), 605-616. DOI: <https://doi.org/10.26740/bioedu.v10n3.p605-616>
- Zulaeha, I., Sulisyaningrum, S., Suratno, S., Pristiwati, R., & Arsanti, M. (2021). Bimtek pengembangan bahan ajar digital Bahasa Indonesia bermuatan multikultural bagi guru MTs/SMP di Kota Semarang. *Journal of Community Empowerment*, 1(2), 41-46. DOI: <https://doi.org/10.15294/jce.v1i2.48993>