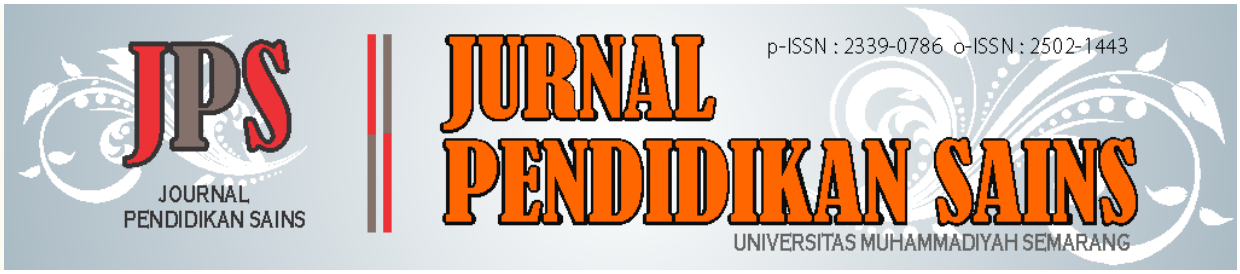
Jurnal Pendidikan Sains (JPS). Vol. 9(1) pp 61-68 ISSN: 2339-0786
DOI: https://doi.org/10.26714/jps.9.1.2021.61-68



Pickles: Experimental Biology Diffusion and Osmosis content On the Concept of substance Transportation During the Pandemic Period

Isra 'Indar Handayani[a, 1] ,, Sukardi [b, 2], Nawawi [b, 3 *]

[a] Public senior high school 1 Sambit, Ponorogo Regency, Indonesia
[b] Public senior high school 1 Ponorogo, Ponorogo Regency, Indonesia
[c] IKIP PGRI Pontianak, Jl. Ampera No.88 Pontianak City, Indonesia
[1] israindarhandayani@gmail.com; [2] sukardireog@gmail.com; [3] nawawi@ikippgriptk.ac.id*
* corresponding author

Article history
Submission : 2021-01-22
Revised : 2021-02-20
Accepted : 2021-03-18

Keyword
Science Process Skills, Independent Biology Practicum during the pandemic

Abstract

This study aims to 1) analyze the Science Process Skills of class XI IPS 1 student at Public senior high school 1 Sambit Ponorogo in Biology learning through pickle making practicum, 2) describe parents' involvement in biology learning during distance learning. The research design used One-Shot Case Study. Where subjects 27 people from class XI IPS 1 Public senior high school 1 Sambit Ponorogo. The research instrument used a science process skills observation sheet, an independent practicum assessment sheet, and an online questionnaire for parents & students. The analysis was carried out by descriptive quantitative. The implementation results show that Science Process Skills were categorized as good in independent practicum activities. Meanwhile, parents are less involved in helping students while learning from home. It affects the success of distance learning. The result has shown that; 1) Student observation ability hypothesize and applicability higher than predictability and deducting abilities in Science Process Skills of class XI IPS 1 student at Public senior high school 1 Sambit Ponorogo in Biology learning through pickle making practicum. 2) Parental involvement in biology learning during distance learning in Class XI IPS 1 Public senior high school 1 Sambit Ponorogo needs to be improved because parents are still shallow during distance learning in class XI IPS 1 Public senior high school 1 Sambit Ponorogo.

1. INTRODUCTION

The Indonesian government formed a task force for handling and preventing the spread of the coronavirus in Indonesia. The large-scale limitation policy was then regulated in the Minister of Health regulation no 9 of 2020. This policy restricts the movement of citizens, public transportation, private vehicles, schools, workplaces, restrictions on religious activities, social restrictions, and cultural activities that lead to mass gatherings (Irawan, Rizki, Joewono, & Belgiawan, 2020). Based on UNESCO data for 2020, the coronavirus has affected more than 900 million students worldwide (Demuyakor, 2020). Meanwhile, (Oyedotun, 2020) The education sector had also been affected by Covid-19 because the Covid-19 pandemic had affected all levels of the global education system from kindergarten to university. In line with this, the Ministry of Education and Culture issued circular number 15 of 2020 concerning Guidelines for Organizing Learning from Home in an Emergency for the Spread of Covid-19.

Pandemic conditions caused Public senior high school 1 Sambit Ponorogo to carry out distance learning so that students carry out learning independently at home, without being able to meet face to face with the teacher, but accompanied by their parents. Parents play a significant role in distance learning during a pandemic; parents play a role in accompanying and motivating students in learning (Lilawati, 2020). Meanwhile, (Prabhawani, 2016)The implementation of education would be the responsibility of parents and the surrounding community, not only the responsibility of educational institutions. The involvement of parents in learning success during the pandemic needs attention. Because basically, students have the motivation to do something if students get encouragement from their closest people, such as their parents (Yulianti, 2014). Complex learning will be easy and fun because parents help students solve their problems.

Teachers were required to be more creative, innovative, and active in collaboration with students and parents, to build emotional bonds to remain patient and enthusiastic in guiding students while learning from home. Teachers must be able to apply learning by utilizing learning resources that are readily available around the house. This is to avoid the saturation of online learning. Boredom was caused by monotonous learning, less varied teacher intonation, and students did not interact directly with friends and teachers (Pawicara & Conilie, 2020). Meanwhile, (Ashikkali, Carroll, & Johnson, 2020) proved that the longer the quarantine (lockdown), the higher the chances of mental health problems appearing in adults. To reduce this saturation, teachers during the Covid-19 pandemic must be able to utilize what is around the home environment so that it can be used as a learning resource and practicum activities.

The implementation of distance learning requires teachers to be more creative, innovative, and productive in making online learning interest and fun, including the implementation of practicum that students must carry out at home. The development of information, technology, and science in the era of the Industrial Revolution 4.0 and Society 5.0 causes these 21st-century students to solve various problems by thinking creatively and using technology. 21st-century learning emphasizes the need for a creative thinking approach, and it is a strategy that involves problem-solving (Turiman, Omar, Daud, & Osman, 2012). Generally, teaching science can be done through various learning methods such as inquiry, problem-solving, project-based learning, and even practicum activities.

Science Process Skills play an important role in equipping students to produce scientific knowledge and learning the nature of science very effectively by doing and experiencing it themselves (Erkol & Ugulu, 2014). Science Process Skills could be developed by implementing and connecting Science Process Skills in everyday life (Aydoğdu, Buldur, & Kartal, 2013). Through practicum activities, the information received by students can stick and last a long time in the structure of students' long-term memory. It was in line with (Anisa, Supardi, & Sedyawati, 2014). The practicum implementation played a role in developed student independence, cognitive skills, affective and Science Process Skills. Meanwhile (Apriana & Anwar, 2014) Learning process, students not only act as recipients of the lesson through the teacher's verbal explanation, but they have a role in finding for themselves the essence of the subject matter, all activities carried out are directed to find and find themselves from something questionable.

Diffusion and Osmosis material are materials that students found challenging to understand since the material is used in abstract material (Sudesti, 2013). As a result, the content is easier to understand; learning must be structured to provide students with accurate and precise knowledge to understand it effortlessly. All of the exercises that give students practical practice are to use practicum. Practical learning using Nutrient media Layang Fish Extract (*Decapterus russelli*) effectively teaches bacterial content to students (Taharu, 2017). Meanwhile, depending on the findings of the study carried out (Khaerunnisa, Kusmiyati, & Ilhamdi, 2019) known that the difficulties experienced by students in practicum are skills, readiness, psychological-emotional habits, attitudes, physical conditions, interest in practicum, the accuracy of concentration, knowledge of practicum material and student motivation. The success of a practicum was determined by the practicum worksheets that are developed; this is in line with (Mirawati & Royani, 2019) Practicum-based high school biology LKS on tissue culture material developed valid, realistic, and successful to enhance the scientific process of MAPK students Syeh Zainuddin Anjani.

The practicum activity carried out in this research is making pickles using existing ingredients at home. Pickling was chosen because students could see osmosis and diffusion events that can be used in everyday life, and the ingredients are cheap and easy to obtain. Independent practicum activities were

carried out using ingredients in the kitchen such as; vinegar, salt, sugar, water, and cucumber—the importance of implementing practicum that directs and develops Science Process Skills during a pandemic. Meanwhile, there are very few research papers on implementing both the diffusion and osmosis fluid pickle practice carried out at home during the Covid-19 pandemic. Based on the above definition, the objectives of this study include: 1) analyze the Science Process Skills of class XI IPS 1 student at Public senior high school 1 Sambit Ponorogo in Biology learning through pickle making practicum; 2) describe the involvement of parents in biology learning during distance learning.

METHOD

This study used a quantitative research method with a type of pre-experimental design using a One-Shot Case Study. The research design One-Shot Case Study can be described as follows.

X	**O**

Figure 1. One-Shot Case Study

Description:
X = Treatment given (*Independent*)
O = Observation (*Dependent*)

The research subjects took Biology lessons across fields of interest in class XI IPS 1 Public senior high school 1 Sambit Ponorogo controlled by 27 people. The data instruments used were the Science Process Skills observation sheet, independent practice examination reports, and online questionnaires given to parents and students of class XI IPS 1. Criteria for Science Process Skills can see in table 1. Meanwhile, Science Process Skills are obtained by assessing from the video tables recorded sent to WhatsApp Group about practicum making cucumber pickles independently at home. Students' Science Process Skills can see from the video that has been sent to the WhatsApp Group. Also, Students sent a photo of the observation results to the WhatsApp Group. The data analysis used is quantitative descriptive analysis. The researcher analyzed the learning process, the results of practicum reports, and online questionnaires filled out by parents.

Table 1.Criteria for Science Process Skills

Percentage of Interval	Category
81% -100%	Very Good
71% - 80%	Good
51% -70%	Fairly Good
26% -50%	Less Good
<25 %	Not Good

Modifications of (Zahara, 2018)

2. RESULTS AND DISCUSSION

Biological material in class XI IPS 1 during the pandemic period had been carried out online, using WhatsApp Group and Google Classroom. In line with (Angelo & Enriquez, 2014; Firman & Rahman, 2020; Iftakhar, 2016; Sicat & Ed, 2015), Various media can support online learning, such as; Google Classroom, Edmodo, and Schoology. The pickle-making exercise is carried out by students at home, by using materials at home. It is easier for students to plan their experiments, make findings independently, and record their results online. It same with (Hendriyani & Novi, 2020) states that students can determine the suitability of the tools they have at home independently through practicum carried out at home. The implementation of how it works is not limited to experiments in the laboratory. Reporting is achieved by requiring students to record all practicums and submit a video of making pickles via google classrooms. Using A video presentation of a practicum report is the same as a report. Practical reports can be communicated orally through video presentations that can train students' communication skills and creativity in pandemic periods (Hendriyani & Novi, 2020). The Photo results from the Realistic pickling class XI IPS 1 can be seen in Figure 1. As illustrated in the pickling, osmosis can be seen in Figure 2.

Figure 1. The results of independent lab pickling by class XI IPS 1 in the study of materials Diffusion and Osmosis

Based on the assessment of the results of the practicum report and video of the process of making pickles at home by students on google classroom, it can be seen that the Science Process Skills emerge. Similar research conducted at the tertiary level (Frima, Novita, Nurfaizi, Widodo, & Husen, 2020) showed that 80% of students could practice practicum skills through a remote practicum at home daily using the method chemistry kitchen chemistry experiment. The results of Science Process Skills in independent practicum class XI IPS 1 Public senior high school 1 Sambit Ponorogo can be seen in Figure 3.

Students have developed the ability to observe pickles by analyzing the number of Pickles created by students. Students write down their findings on the state of Pickles before and after treatment. The findings of the hypothesis that they made before giving the treatment were balanced by the observations received. It is reinforced by insights from the results of writing a theory formulation, so the learners infer their observations and announce the result. Via making-pickle, by integrating the principles of diffusion and osmosis in daily life, students were taught to understand the content. So that students easily understand the biology material provided during the distance learning period.

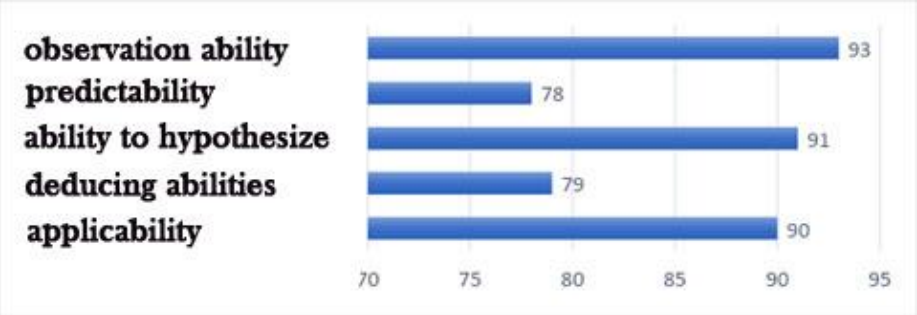


Figure 3. Science Process Skills in Independent Practicum

The science method skills that appear in the independent practice of making pickles at home according to class XI IPS 1. are based on the data in Table 2. Any knowledge was collected where 90 percent of students could apply the Osmosis and Diffusion transport content principle. Students were able to carry out practice separately at home without direct instructor instruction. Students may already bring out the initial theory very well, where they get a 91% value. A solid capacity to observe that is equivalent to 93% encourages the opportunity to bring forward a perfect theory.

Meanwhile, based on the observation results, it found that students were already weak in their predictive abilities since they only received a score of 78%, which affected the weak final ability of the students, which was only around 79% in the positive group. There are essential outcomes because students in the group performing research can propose theories, define factors, plan and execute experiments and collect evidence(Jeenthong, Ruenwongsa, & Sriwattanarothai, 2014). This is in line with

research (Rohman & Lusiyana, 2017) which states that independent practicum modules created by teachers could be used as an assessment of Science Process Skills and Social Skills.

Related to the task of making a Pickle video, that needs to be submitted into google classroom. The percentage of student ability in table 2 is 93% for the observing of Science Process Skills. This role helps students to make constant assessments and to receive documentation. Students were taught through the method of pickle-making to relate the principles of diffusion and osmosis with the application of scientific concepts in real life. The ability to watch students being taught has an impact on the development of hypotheses. Teachers must make students aware of fundamental science method talents, including hands-on activities such as practicum while doing work (Aydinli et al., 2011).

To develop Science Process Skills, teachers must master the material more to guide students well. When students carry out learning, they must learn independently, including carrying out independent practicum activities at home. Through these practicum activities, students can strengthen their understanding of diffusion and osmosis material in the concept of substance transport. This is in line with research (Anisa et al., 2014), which states that the approach to Science Process Skills through practicum activities using student worksheets on the colligative nature of solutions is proven to improve student learning outcomes. At the same time, the role of parents in learning Biology can be seen in table 2 and table 3.

Table 2. The results of the questionnaire parents' assistance during online learning

Information	Often	Rarely	Never
Parents always accompany during distance learning during the pandemic	14.81%	59.26%	25.93%
Parents always try to help do assignments given by the teacher during the pandemic period	7.41%	33.33%	59.26%

Based on table 2, information is obtained that during the distance learning period at Public senior high school 1 Sambit Ponorogo, as many as 59.26% of respondents stated that they rarely provide learning assistance, 25.93% of respondents stated never assisted students, and only 14.81% of parents assisted students in online learning. Based on the online questionnaire filled out by the parents of the students, information was obtained that only 7.41% helped the child in doing the schoolwork given by the teacher. In comparison, 62.59% of the respondents said that they seldom helped and did not even help students do the assignments from school. Parents ask their children to do their assignments.

Table 3. Online parents' result responses in distance learning

Information	Percentage of
1. People who always accompany students during distance learning	
Both parents	7.41%
One of the parents	29.63%
Brother	18.52%
No one is there	44.44%
Total	100%
2. Action parents in monitoring student activities during distance learning	
Asking about completing tasks that are done	51.85%
Checking tasks that children do	3.70%
Checking children's understanding of the material	7.41%
Communicating with children when there are obstacles	37.04%
Total	100%
3. Children's understanding of the material obtained during distance learning	
Yes, My child understands the material during distance learning	25.93%
I do not know the child has understood or not during distance Learning.	33.33%
My child has difficulty understanding the material during distance Learning.	40.74%
Total	100%

Based on the data in table 3, the parents of class XI IPS 1 Public senior high school 1 Sambit, Ponorogo Regency during the pandemic caused 44.44% of parents to unable to accompany their children. Meanwhile, 29, 63% stated that only one of both parents could accompany them, or 18.52% asked their siblings to accompany them. In contrast, 7.41% could not accompany their children. Parents become substitutes for teachers at home, but parents cannot replace teachers' roles 100%. The data in Table 4 shows that 51.85% of parents have tried to ask about completing a task their child has done, while 3.70% of parents only check whether their child's assignment had been done or not. Schools must continue to collaborate and communicate with parents in providing online learning assistance by utilizing learning resources(Fahmi, 2020).

Based on the interviews with several parents of students in Class XI IPS 1, some information was obtained included; 1) 80% of students' parents have jobs as farmers, 10% are entrepreneurs, and 10% are civil servants or private employees. Because of a lot of parents' activity, they may not follow their children for distance learning. Meanwhile, 29.63% assisted were mothers, where mothers were busy with household matters every morning such as; washing, cleaning, cooking, so it is not optimal in assisting students in studying. Because of that, student independence in learning is very significant for the progress of biology learning in class XI IPS 1 Public senior high school 1 Sambit Ponorogo.

Students' understanding of the material provided during distance learning needs to get parental attention. Based on the data, it is known that 7.41% of parents have checked their children's understanding of the material. Some parents are parents who care about their children's education. Meanwhile, 37.04% always communicate with their children if their children encounter learning problems. Communication between children and parents in distance learning is one of the keys to distance education success. Two-way communication will impact children's material understanding, where 40.74% of parents feel their children have difficulty understanding the material during online learning. So, it is recommended that parents, teachers, and guardians always communicate during the pandemic through the forum WhatsApp Group specifically for parents of students created by a Biology teacher at Public senior high school 1 Sambit to accelerate the course of distance learning.

3. CONCLUSION

Based on the results of the data obtained and the analysis carried out, it can be concluded that; (1) Student observation ability hypothesize and applicability higher than predictability and deducting abilities in Science Process Skills of class XI IPS 1 student at Public senior high school 1 Sambit Ponorogo in Biology learning through pickle making practicum. (2) Parents' involvement in Biology learning during distance learning in Class XI IPS 1 Public senior high school 1 Sambit Ponorogo needs to be improved because parental involvement is still shallow, so it needs assistance and motivation for parents in accompanying their children to learn online during the pandemic period at Public senior high school 1 Sambit Ponorogo.

Acknowledgments

Acknowledgments submitted to the Head of State High School 1 Sambit Ponorogo, Drs. Sukardi, M.Pd of Public senior high school 1 Ponorogo as research partners, the correspondent author Mr. Nawawi, M.Pd from Biology Education Studies Program PGRI Pontianak, and JPS UNIMUS as a place for publishing articles.

REFERENCES

Angelo, M., & Enriquez, S. (2014). Students' Perceptions on the Effectiveness of the Use of Edmodo as a Supplementary Tool for Learning. *In DLSU Research Congress*, 1–6. Retrieved from http://c4lpt.co.uk/top100tools/

Anisa, T. M., Supardi, K. I., & Sedyawati, S. M. R. (2014). KEEFEKTIFAN PENDEKATAN KETERAMPILAN PROSES SAINS BERBANTUAN LEMBAR KERJA SISWA PADA PEMBELAJARAN KIMIA. *Jurnal Inovasi Pendidikan Kimia*, 8(2), 1398–1408.

Apriana, E., & Anwar. (2014). Penerapan Model Pembelajaran Problem Based Learning dan Iinkuiri untuk Meningkatkan Kemampuan Berpikir Kritis Mahasiswa pada Konsep Dampak Pencemaran Lingkungan Terhadap Kesehatan. *Jurnal Biotik*, 2(2), 77–137.

Ashikkali, L., Carroll, W., & Johnson, C. (2020, December 1). The indirect impact of COVID-19 on child health. *Pediatrics and Child Health (United Kingdom)*. Churchill Livingstone. Retrieved from https://doi.org/10.1016/j.paed.2020.09.004

Aydinli, E., Dökme, I., Ünlü, Z. K., Öztürk, N., Demir, R., & Benli, E. (2011). Turkish elementary school student's performance on integrated science process skills. In *Procedia - Social and Behavioral Sciences* (Vol. 15, pp. 3469–3475). Retrieved from https://doi.org/10.1016/j.sbspro.2011.04.320

Aydoğdu, B., Buldur, S., & Kartal, S. (2013). The Effect of Open-ended Science Experiments based on Scenarios on the Science Process Skills of the Pre-Service Teachers. *Procedia - Social and Behavioral Sciences*, 93, 1162–1168. Retrieved from https://doi.org/10.1016/j.sbspro.2013.10.008

Demuyakor, J. (2020). Coronavirus (COVID-19) and Online Learning in Higher Institutions of Education: A Survey of the Perceptions of Ghanaian International Students in China. *Online Journal of Communication and Media Technologies*, 10(3), e202018. Retrieved from https://doi.org/10.29333/ojcmt/8286

Erkol, S., & Ugulu, I. (2014). Examining Biology Teachers Candidates' Scientific Process Skill Levels and Comparing these Levels in Terms of Various Variables. *Procedia - Social and Behavioral Sciences*, 116, 4742–4747. Retrieved from https://doi.org/10.1016/j.sbspro.2014.01.1019

Fahmi, M. H. (2020). KOMUNIKASI SYNCHRONOUS DAN ASYNCHRONOUS DALAM E-LEARNING PADA MASA PANDEMIC COVID-19. *Jurnal Nomosleca*, 6(2), 146–158.

Firman, F., & Rahman, S. R. (2020). Pembelajaran Online di Tengah Pandemi Covid-19. *Indonesian Journal of Educational Science (IJES)*, 2(2), 81–89.

Frima, F. K., Novita, S., Nurfaizi, M. R., Widodo, R., & Husen, M. (2020). PENERAPAN PRAKTIKUM JARAK JAUH PADA TOPIK PERTUMBUHAN MIKROBA DALAM MASA DARURAT COVID-19 DI INSTITUT TEKNOLOGI SUMATERA. *Jurnal Pendidikan Sains (JPS)*, 8(2), 102–109. Retrieved from http://jurnal.unimus.ac.id/index.php/JPKIMIA

Hendriyani, M. E., & Novi, R. (2020). LAPORAN PRAKTIKUM MANDIRI DALAM BENTUK VIDEO PRESENTASI UNTUK MENGEMBANGKAN KREATIVITAS DAN KOMUNIKASI LISAN DI MASA PANDEMI COVID-19. *Prosiding Seminar Nasional Pendidikan FKIP Universitas Sultan Ageng Tirtayasa*, 3(1), 328–339.

Iftakhar, S. (2016). GOOGLE CLASSROOM: WHAT WORKS AND HOW? *Journal of Education and Social Sciences*, 3(1), 12–18. Retrieved from http://www.ucalgary.ca/~dmjacobs/phd/diss/Image74.gif

Irawan, M. Z., Rizki, M., Joewono, T. B., & Belgiawan, P. F. (2020). Exploring the intention of out-of-home activities participation during new normal conditions in Indonesian cities. *Transportation Research Interdisciplinary Perspectives*, 8. Retrieved from https://doi.org/10.1016/j.trip.2020.100237

Jeenthong, T., Ruenwongsa, P., & Sriwattanarothai, N. (2014). Promoting Integrated Science Process Skills through Betta-live Science Laboratory. *Procedia - Social and Behavioral Sciences*, 116, 3292–3296. Retrieved from https://doi.org/10.1016/j.sbspro.2014.01.750

Khaerunnisa, B. S., Kusmiyati, K., & Ilhamdi, Moh. L. (2019). ANALISIS TINGKAT KESULITAN YANG DIALAMI PESERTA DIDIK DALAM PRAKTIKUM BIOLOGI DI SMA STUDENT DIFFICULTIES ANALYSIS IN BIOLOGY LABORATORY PRACTICES IN SENIOR HIGH SCHOOL. *J. Pijar MIPA*, 14(1), 23–28. Retrieved from https://doi.org/10.29303/jpm.v14.i1.1042

Lilawati, A. (2020). Peran Orang Tua dalam Mendukung Kegiatan Pembelajaran di Rumah pada Masa Pandemi. *Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini*, 5(1), 549–558. Retrieved from https://doi.org/10.31004/obsesi.v5i1.630

Mirawati, B., & Royani, I. (2019). Pengembangan LKS Biologi SMA Berbasis Praktikum dengan Model Pembelajaran Langsung untuk Meningkatkan Keterampilan Proses Sains Siswa. *Jurnal Penelitian Dan Pengkajian Ilmu Pendidikan: E-Saintika*, 3(2), 88. Retrieved from https://doi.org/10.36312/e-saintika.v3i2.152

Oyedotun, T. D. (2020). Sudden change of pedagogy in education driven by COVID-19: Perspectives and evaluation from a developing country. *Research in Globalization*, 2, 1–5. Retrieved from https://doi.org/10.1016/j.resglo.2020.100029

Pawicara, R., & Conilie, M. (2020). ANALISIS PEMBELAJARAN DARING TERHADAP KEJENUHAN BELAJAR MAHASISWA TADRIS BIOLOGI IAIN JEMBER DI TENGAH PANDEMI COVID-19. *ALVEOLI: Jurnal Pendidikan Biologi*, 1(1), 29–38.

Prabhawani, S. W. (2016). PELIBATAN ORANG TUA DALAM PROGRAM SEKOLAH DI TK KHALIFAH WIROBRAJAN YOGYAKARTA. *Jurnal Pendidikan Guru Pendidikan Anak Usia Dini*, 5(2), 205–218.

Rohman, F., & Lusiyana, A. (2017). PENGEMBANGAN MODUL PRAKTIKUM MANDIRI SEBAGAI ASESMEN KETERAMPILAN PROSES SAINS DAN KETERAMPILAN SOSIAL MAHASISWA. *JIPFRI: Jurnal Inovasi Pendidikan Fisika Dan Riset Ilmiah*, 1(2), 47–56.

Sicat, A. S., & Ed, M. (2015). Enhancing College Students' Proficiency in Business Writing Via Schoology. *International Journal of Education and Research*, 3(1), 159–178. Retrieved from www.learnnc.org,

Sudesti, R. (2013). *Penerapan pembelajaran berbasis praktikum untuk meningkatkan penguasaan konsep dan keterampilan proses sains siswa SMP pada subkonsep difusi osmosis*.

Taharu, F. I. (2017). Pemanfaatan media "Narik Layang" Nutrient Agar Ekstrak Daging Ikan Layang (Decapterus sp PEMANFAATAN MEDIA "NARIK LAYANG" NUTRIENT AGAR EKSTRAK DAGING IKAN LAYANG (Decapterus russelli) PADA PEMBELAJARAN BIOLOGI BERBASIS PRAKTIKUM MATERI BAKTERI. *Jurnal Bioeducation*, 2(1), 1–6.

Turiman, P., Omar, J., Daud, A. M., & Osman, K. (2012). Fostering the 21st Century Skills through Scientific Literacy and Science Process Skills. *Procedia - Social and Behavioral Sciences*, 59, 110–116. Retrieved from https://doi.org/10.1016/j.sbspro.2012.09.253

Yulianti, T. R. (2014). PERANAN ORANG TUA DALAM MENGEMBANGKAN KREATIVITAS ANAK USIA DINI (Studi Kasus Pada Pos PAUD Melati 13 Kelurahan Padasuka Kecamatan Cimahi Tengah). *Jurnal EMPOWERMENT*, 4(1), 11-undefined.

Zahara, S. R. (2018). PENGARUH MODEL PEMBELAJARAN PBL (PROBLEM BASED LEARNING) TERHADAP KETERAMPILAN PROSES DAN HASIL BELAJAR SISWA DALAM PEMBELAJARAN FISIKA DI SMA. *Relativitas*, 1(1), 29–34.