

EFFECTIVITY ANALYSIS OF OFFLINE AND ONLINE LEARNING SYSTEMS ON MENDEL'S LAW OF INHERITANCE TOPIC IN HIGH SCHOOL GRADE 11 STUDENTS

Analisis Efektivitas Sistem Pembelajaran Offline dan Online pada Topik Hukum Warisan Mendel pada Siswa Kelas 11 SMA

Sayyidatul Addabiyah

Biology Education, Faculty of Mathematics and Natural Sciences, State University of Surabaya

E-mail: sayyidatuladdabiyah@gmail.com

Lisa Lisdiana

Biology, Faculty of Mathematics and Natural Sciences, State University of Surabaya

E-mail: lisalisdiana@unesa.ac.id

Abstrak

Penelitian ini bertujuan untuk membandingkan efektivitas sistem pembelajaran luring dan daring pada materi pewarisan sifat kelas 11 IPA MAS Kanjeng Sepuh ditinjau dari hasil belajar dan respon siswa, serta pengelolaan pelaksanaan pembelajaran. Pembelajaran daring menggunakan aplikasi *Whatsapp*, *Google Classroom*, dan *Google Meet*, sedangkan pembelajaran luring dilakukan secara tatap muka di dalam kelas. Desain penelitian ini menggunakan *Quasi Experimental Design* dengan jenis *Non-equivalent control group design*. Penelitian ini dilakukan di MAS Kanjeng Sepuh dengan jumlah total responden sebanyak 24 siswa dari kelas 11 IPA 1 dan 11 IPA 2. Teknik pengambilan sampel yang digunakan yaitu *saturation sampling*. Penelitian ini menggunakan tiga teknik pengambilan data yaitu tes, kuesioner, dan observasi. Hasil penelitian menunjukkan bahwa tidak terdapat perbedaan yang signifikan pada hasil belajar sebelum dan sesudah dilakukan pembelajaran daring, sedangkan pada hasil belajar sebelum dan sesudah dilakukan pembelajaran luring terdapat perbedaan yang signifikan. Siswa menunjukkan lebih banyak respon positif pada sistem pembelajaran luring daripada sistem pembelajaran daring. Selain itu, pengelolaan pelaksanaan pembelajaran pada pembelajaran daring dan luring mendapat kategori baik dan sangat baik sehingga sama-sama efektif. Oleh karena itu, dapat disimpulkan bahwa sistem pembelajaran luring lebih efektif daripada sistem pembelajaran daring ditinjau dari hasil belajar dan respon siswa. Sedangkan jika ditinjau dari pengelolaan pelaksanaan pembelajaran, sistem pembelajaran luring dan daring sama-sama efektif. Kedua sistem pembelajaran memiliki kelebihan dan kekurangan masing-masing yang berpengaruh terhadap efektivitas pembelajaran, sehingga diperlukan perhatian lebih untuk meminimalisir kekurangan masing-masing sistem pembelajaran, terutama sistem pembelajaran daring agar proses pembelajaran dapat berjalan lebih optimal.

Kata Kunci: hasil belajar, pembelajaran daring, pembelajaran luring, respon siswa, SMA

Abstract

This research aims to compare the effectiveness of offline and online learning systems on inheritance topic in grade 11 high school students of MAS Kanjeng Sepuh in terms of student learning outcomes, student responses, and management of learning process. Online learning carried out by using the Whatsapp, Google Classroom and Google Meet applications, while offline learning was carried out face-to-face in the classroom. The design of this study used a Quasi Experimental Design with a Non-equivalent control group design type. This research was conducted at MAS Kanjeng Sepuh with a total of 24 students from class 11 IPA 1 and 11 IPA 2. The sampling technique used was saturation sampling. The results of the research showed that there were no significant differences in learning outcomes before and after online learning, but significant differences were found in learning outcomes before and after offline learning. Students showed more positive responses to the offline learning system than the online learning system. In addition, the management of learning process in online and offline learning was in the good and excellent categories so that they were equally effective. Therefore, it can be concluded that the offline learning system was more effective than the online learning system in terms of learning outcomes and student responses. Meanwhile, in term of the management of learning process, offline and online learning systems were equally effective. Both online and offline learning systems have their advantages and disadvantages that affect the effectiveness of learning, so more attention is needed to minimize the disadvantages of each learning system, especially online learning systems so that the learning process can be more optimal.

Keywords: online learning, offline learning, learning outcomes, student responses, high school

INTRODUCTION

The Covid-19 pandemic has brought changes to the learning system in Indonesia. In the beginning, the learning system in Indonesia was always offline-based and very rarely used technology to support learning process. However since Covid-19 pandemic era, which was followed by the influence of society 5.0 era from the Japanese government' discourse in 2019, the learning system in Indonesia has begun to change. Now the learning system in Indonesia use more technology known as the online learning system. The implementation of online learning system is a strategy that must be taken during pandemic in Indonesia. This refers to the principles of education policy during the Covid-19 pandemic era that is prioritizing the health of students, educators, education staff, families, and society in order to fulfill educational services during pandemic era (Abdillah, et al., 2022).

The change of offline to online learning system certainly have some positive and negative effects on students, especially students at the high school. Some of the positive effects to students are increasing students' awareness and digital literacy skills, gaining new experiences regarding online learning, obtaining information more quickly, increasing student' independence in seeking new information about learning, and others (Ifadah & Prastiwi, 2022; Adi, et al., 2021; Firmansyah, 2021). But on the other hand, there are also some negative effects from changes in the implementation of the learning system to students. Harefa's research (2022) found a decrease in student motivation due to an ineffective online learning process, students unable to understand the material, limited students' ability to do many assignments, and limited learning tools during online learning. These things can be categorized as learning obstacles which ultimately have an impact on student learning outcomes. Motivation to study related to learning outcomes. If learning motivation increases, student learning outcomes will also increase (Rahma and Sandika, 2022). Learning outcomes is students' ability to learn a concept shown by the amount of value acquired after given tests (Susanto, 2013). Besides using learning outcomes as indicator, learning effectiveness also can be measured from the student responses and management of learning process. Student responses indicator is used to describe details about the student' experience during the learning process. Meanwhile, management of learning process indicator is used to describe the process of interaction between students, teachers, and learning resources in a learning environment (Yusuf, 2017).

One of the subjects that requires the effectiveness of the learning system is Biology, especially in inheritance topic. This is shown by the results of research conducted on students at State Senior High Schools in Palopo City which placed the heredity topic, one of the sub-topic of inheritance, as the most difficult material with a percentage of 43.2% (Mardin, et al., 2017). The results of another study conducted on students at State Senior High Schools in Sibolga City showed that students' difficulties in studying genetics lies in the sub-topic of Mendel's law of inheritance principles with a percentage of 58.82% (Hasibuan, 2014). The results of other studies also show that students had difficulties in understanding biology subject topic, especially in writing scientific language, understanding concepts, abstract material, the use of foreign terms, and the topic related to calculations such as inheritance. The research revealed that as many as 26 out of 28 students had difficulties in learning topic related to calculations, such as inheritance (Nafisah, 2011).

To optimizing the effectiveness of the learning system, a learning model is also needed in accordance with the learning objectives. Inheritance topic is a topic that requires calculation skills, reasoning, and cooperation between friends in understanding the material, so that the STAD (Student Team Achievement Divisions) cooperative learning model can be used. In this STAD cooperative learning, students are given the opportunity to collaborate and elaborate in the form of discussions with peers or group work to solve a problem. STAD can also improve student' cooperation skills, critical thinking, and the ability to help friends (Gusniar, 2014). Learning using the STAD strategy can improve student learning outcomes (Esminarto, et al., 2016).

This study uses student learning outcomes, student responses, and management of learning process to measure the effectiveness of the learning system. Many other similar studies only focus on the effectiveness, strength, and weakness of online learning, but the research that directly compares two classes using different learning systems is still rare to find. Therefore, this research is conducted in order to help teachers in determining which learning system out of the two learning systems (offline and online) is more effective for teaching inheritance topic in grade 11 students in terms of student' learning outcomes, student responses, and management of learning process observation.

METHOD

This research used a nonequivalent control group design, which is a type of quasi-experimental design. Both experimental and control groups in this design were given

a pretest to determine the initial state of the each groups. A good pretest result indicated by no significant difference between the experimental group and the control group (Sugiyono, 2017). The subject of this research was grade 11 IPA 1 and grade 11 IPA 2 students of MAS Kanjeng Sepuh Sidayu with a total of 12 students in each class. This research used saturation sampling technique. This technique was chosen because the population is relatively small, each group were less than 30 people, so that the entire population was used as a sample (Sugiyono, 2019). By this technique, the researchers used a sample of the entire population with a total of 24 students.

The researchers applied three instruments to answer research questions. The three instruments were pretest and posttest sheets, student response open-ended questionnaire sheets, and observation. In line with the learning system procedure in each class, online learning classes were given instruments via Google Form, while offline learning classes are given instruments via sheets of paper. Likewise with the observation instrument for the observer. Observers in online learning were given instruments via WhatsApp and observe through Google Classroom and Google Meet, while observers in offline learning were given sheets of instrument paper and observe directly in class.

The first data collection technique was a test using pretest and posttest sheets. The pretest sheet was given to students before the learning process with a different learning system in each class, while the posttest sheet was given to students after the learning process. The results of the test instrument was student learning outcomes.

The second technique was questionnaire technique using an open-ended questionnaire. Questionnaire sheets were given to students after doing the posttest. While the third technique was observation using observation sheets of management of learning process.

After the data was collected using the three instruments, data being analyzed with different methods. Learning outcomes data in the form of pretest and posttest scores in each class were analyzed using the normality test and paired sample t-test by SPSS ver. 26, then data were also analyzed using the N-Gain Score test. The student responses data was reduced, then analyzed by Nvivo ver. 14. Furthermore, observation of learning management data were analyzed using predetermined score interpretations and analyzed descriptively.

RESULT AND DISCUSSION

The data collected in this study were student learning outcomes, student responses, and observation result of management of learning process data.

Learning outcomes

Learning outcomes data were analyzed using the normality test as a prerequisite before the paired sample t-test analysis. Based on the results of the normality test on the learning outcomes data of online learning, it was found that the significance value was $0.200 > 0.05$. Meanwhile, the results of the normality test for offline learning outcomes data significance value was also $0.200 > 0.05$. These results indicate that the distribution of data in both online and offline learning classes was normally distributed. So that, a paired sample t-test can be used to analyzed the data.

Table 1. Paired sample t-test learning outcomes results

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pre Daring - Post Daring	-5.833	25.030	7.226	-21.737	10.070	-0.807	11	0.437
Pre Luring - Post Luring	-10.833	14.434	4.167	-20.004	-1.663	-2.600	11	0.025

Based on the paired sample t-test, it was known that the Sig. (2-tailed) online learning was $0.437 > 0.05$, while the Sig. (2-tailed) offline learning was $0.025 < 0.05$. So it can be concluded that there was no significant difference between the results of the pretest and posttest in online learning, but there was a significant difference between the results of the pretest and posttest in offline learning.

The absence of a significant difference in the learning outcomes of online learning shows that there was no improvement after students treated by using online learning. While significant differences in student learning outcomes after offline learning show that there was an improvement after students treated by using offline learning. Previous research states that online learning can decrease student discipline, understanding and learning outcomes, learning skills, and learning interest (Sumilat, et al., 2022; A'dadiyah, 2021; Kusumaningrum, et al., 2021; Saragih, et al., 2021). The decrease in learning outcomes of online learning can be caused by a decrease in student learning motivation and enthusiasm for learning (Tafdhila, et al., 2021; Cahyani, et al., 2020).

Then to find out how much the value of student learning outcomes increased in each class, the N-Gain score test was carried out. Based on the N-Gain Score test, the N-Gain score of online learning system class was 0.09 and the N-Gain score of offline learning system class was

0.16. Both N-Gain score were categorized as the low category ($g < 0.3$). Based on student responses obtained from both classes it can be analyzed that the low increase in learning outcomes was caused by several things, such as: student difficulty to concentrate, split focus due to signal constraints or less conducive classes, too much material, and limited time. An increase in N-Gain scores which was relatively low in more than one class was also found in Yoannita's research (2016) which revealed that this could be caused by several reasons, such as: less conducive learning condition, tired students, and so on.

Student learning outcomes from each class that have been tested using the paired sample t-test show that there was a significant difference after treated by using offline learning system, but there was no significant difference in student learning outcomes after treated by using online learning system. Furthermore, the increase in the N-Gain values of the two classes, even though in the low category, but the N-Gain values in the offline learning class were slightly higher than the N-Gain values in the online learning class, so it can be concluded that students gain more achievement when treated by using offline learning. Similar research also concluded that as many as 94% of students who were studied through online learning system received learning achievement in the low category (Maulana, 2021). Other research also states that online learning was less or ineffective because it can reduce student learning outcomes (Pariatno, et al., 2021). This shows that the offline learning system was more effective than the online learning system in terms of student learning outcomes.

Student Responses

Based on the search results using Nvivo ver.14, a set of words that appear most often in online and offline learning classes data are shown in figure 1 and figure 2.

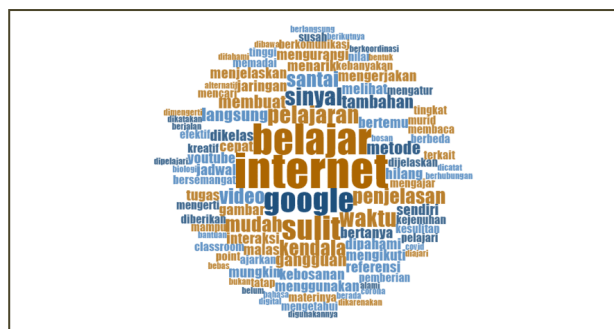


Figure 1. *Word Cloud* of online learning class data

In figure 1 the word "learning" dominates student responses with a frequency of 6.15% of all data, followed by the word "online", "no", "material", "nature", and others. This shows that the internet network makes

students feel more difficult to learn subject matter when online due to constrained signals.



Figure 2. *Word Cloud* of offline learning class data

In figure 2 the word "learning" dominates student responses with a frequency of 5.47% of all data, followed by the word "offline", "topic", "no", "by way", and others. This shows that it is easier for students to learn and understand the material when it is explained directly by the teacher, so that learning can be said to be effective.

Based on the student preferences, 33.33% of students in online learning system class liked online learning, while 66.67% did not like it. Meanwhile, students in offline learning system class who liked offline were 100% or all students. There are differences in preferences for the learning system due to several reasons stated by students.

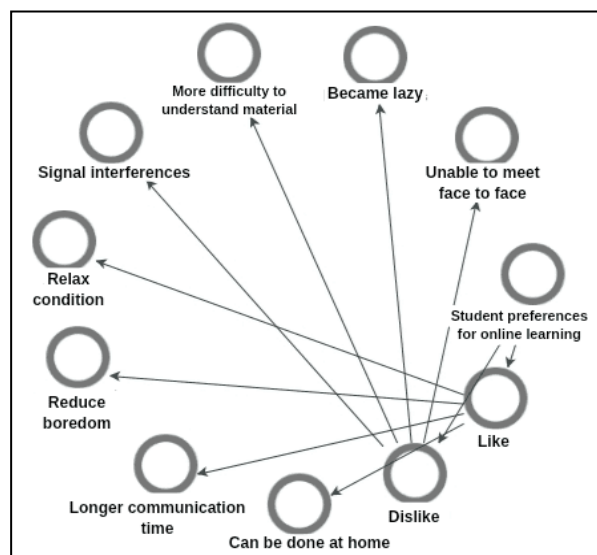


Figure 3. Project map of student preferences for online learning

Figure 3 shows that online learning system class students who like online learning stated that by using online learning, learning can be done in a relaxed condition, reduce boredom, longer time to communicate with teachers and friends, and can be done at home. Other

studies have shown the same results, that is, students like online learning for several reasons, namely: flexibility of time and place, as well as supporting the government's social restrictions during a pandemic (Muntazhimah, et al., 2020). Meanwhile, online learning system class students who did not like online learning stated that by using online learning there were students who experienced signal problems, had more difficulty to understand the topic, became lazy, and could not meet face to face with either the teacher or friends. Most students who dislike online learning were also found in Muntazhimah's, et al. (2020) research. The research revealed that the majority of students from four provinces in Indonesia (Aceh, North Sumatra, Riau, and Jambi) did not like the online learning system. This is caused by material that is difficult to understand, there is no good interaction between students and teachers and students with other students, problematic electricity and the internet, and the difficulty to focus on learning process (Muntazhimah, et al., 2020).

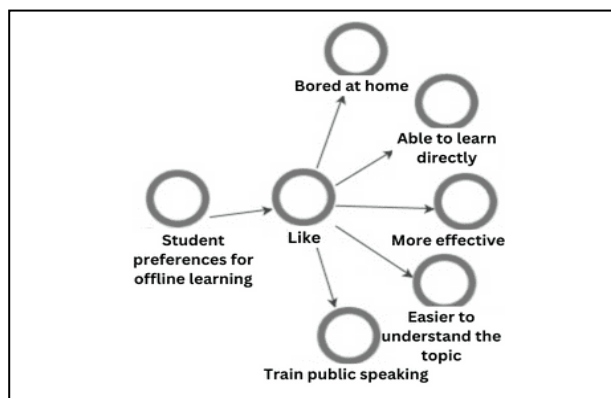


Figure 4. Project map of student preferences for offline learning

Figure 4 shows that all of the offline learning system class students who liked offline learning stated that by using offline learning, students can learn directly, more effective learning process, easier to understand topic, students can practiced public speaking, and reduced boredom at home. This is similar to other research result which states that students prefer offline learning or learn at school because they can meet friends and have direct discussions (Arifin, 2020). In addition, other research implicitly stated that online learning make students less active and bored in learning process, so it can be interpreted that offline learning can make students more active and can reduce boredom in learning process (Tafdhila, et al., 2021).

Based on the obstacles, the obstacles of learning system were divided into 2, namely internal and external

obstacles. Internal obstacles are obstacles come from inside the students themselves, while external obstacles are obstacles come from the outside of student's control (Hidayati, 2020).

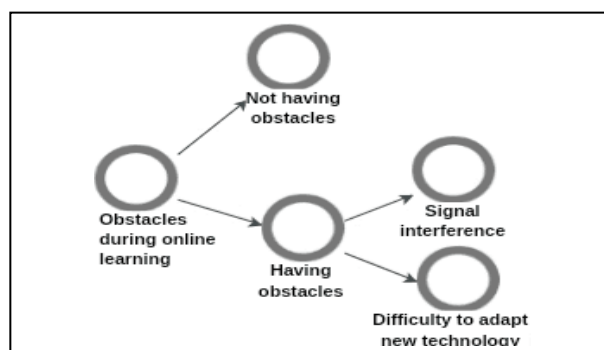


Figure 5. Project map of obstacles during online learning

Figure 5 shows that as many as 75% of students from online learning class stated that they experiencing obstacles during online learning. The internal obstacle experienced by students was the difficulty to adapt the technology. While the external obstacle experienced by students was signal interference. This result was in line with other research which states that the obstacles of online learning were limited internet networks or signals and limited tools (gadgets) owned by students. This will caused an ineffectiveness to the interaction between teachers and students in online learning process (Widad, et al., 2021; Utami & Cahyono, 2020; Purniawan & Sumarni, 2020; Ismayanti & Wahyuddin, 2021).

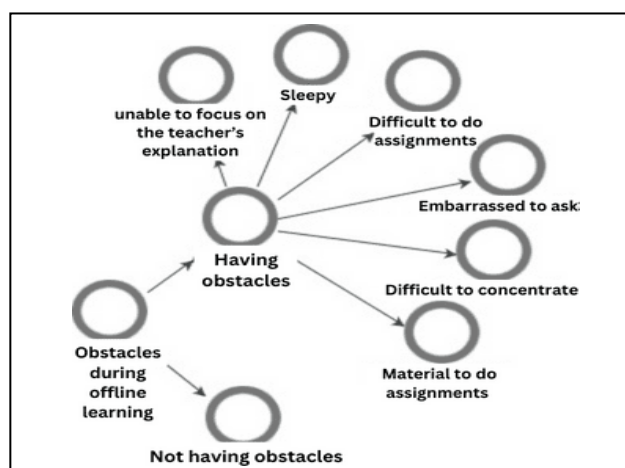


Figure 6. Project map of obstacles during offline learning

Figure 6 shows that as many as 58.33% of students from offline learning class stated that they experiencing some obstacles problems during offline learning. Internal

obstacles experienced by students were unable to focus on the teacher's explanation, got embarrassed to ask, easier to get sleepy, difficult to concentrate, and difficult to do assignments. While the extrinsic obstacle experienced by students was material that is difficult to understand. Most of the obstacles students experience during offline learning were internal constraints, which means they were not obstacles from outside or the learning system, but from within the students themselves. Some of the obstacles experienced by these students are in line with the weaknesses found in each learning system.

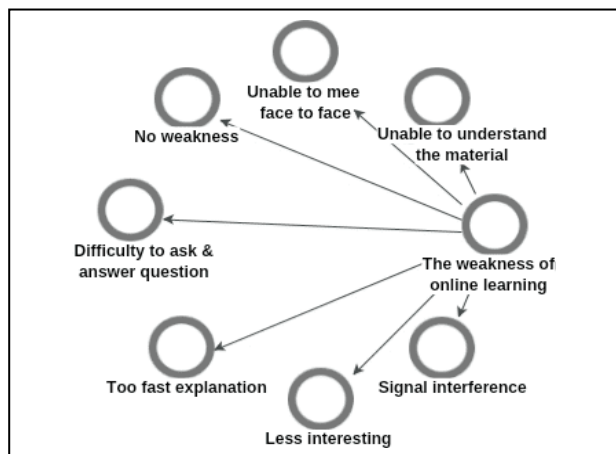


Figure 7. The weakness of online learning system

Based on the weakness of learning system, figure 7 shows that the weakness of the online learning system experienced by students were signal interference, less interesting learning, teacher explanations are too fast, the difficulty in asking and answering questions, unable to meet face-to-face with friends and teachers, and unable to understand the material. The same thing was found in Arifin's research (2020) and Widad, et al. (2021) which states that the weakness of online learning are limited internet access and gadgets, application errors, lack of guidance by teachers, and the difficulty to understand the explained material. Ismayanti and Wahyuddin's (2021) stated in their research that students unable or having more difficulty to understand the material during online learning can be happened because of several reasons, such as: undisciplined students, unconducive learning environment, too much or too little material, no experiment, uncomfortable, lack of feedback, and unclear teacher's presentation or explanation due to small gadget screens and disrupted internet networks/ signal interference.

Figure 8. The weakness of offline learning system

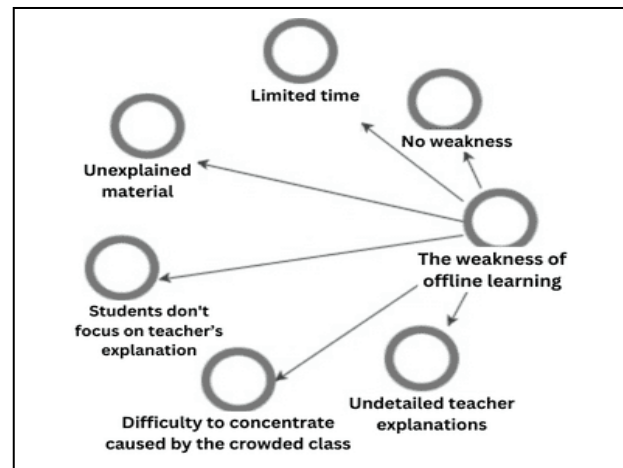


Figure 8 shows that the weaknesses of the offline learning system experienced by students were undetailed teacher explanations, difficulty to concentrate caused by the crowded class, limited time, unexplained material, and students do not focus on teacher's explanation.

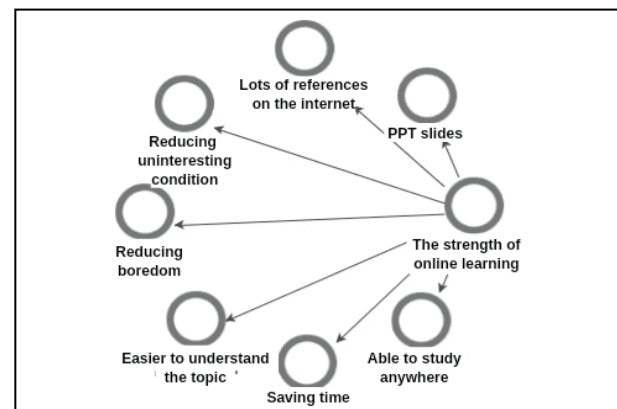


Figure 9. The strength of online learning system

Based on the strength of learning system, figure 9 shows that the strength of online learning systems experienced by students were be able to study anywhere, saving time, easier to understand the topic, reducing boredom, reducing uninteresting condition, lots of references on the internet, and PPT slides that can be recorded. This was similar to other research which states that the strength of online learning are increasing students' technological insights, efficient and flexible, closer with family, material can be accessed anywhere and anytime, and provides new experiences for students (Arifin, 2020; Kusumaningrum, et al., 2021; Kuntarto, 2017).

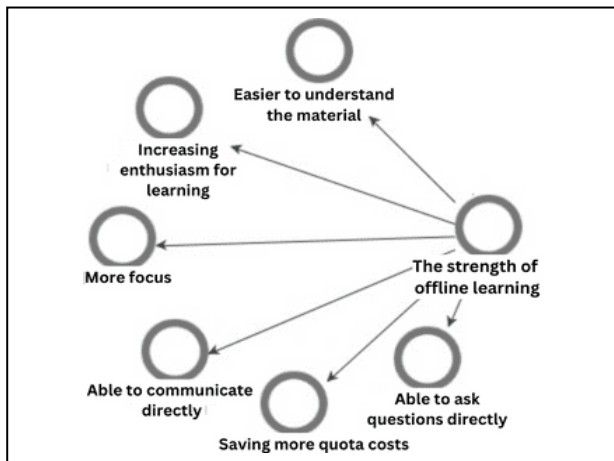


Figure 10. The strength of offline learning system

Figure 10 shows that the strength of the offline learning system experienced by students were be able to ask questions directly, saving more quota costs, be able to communicate directly, more focus, easier to understand the material, and increasing enthusiasm for learning. This was similar to other research which states that the weakness of online learning is the expensive quota prices, so it can be interpreted that the strength of offline learning is able reduce quota costs (Purniawan & Sumarni, 2020; Sumilat, et al., 2022).

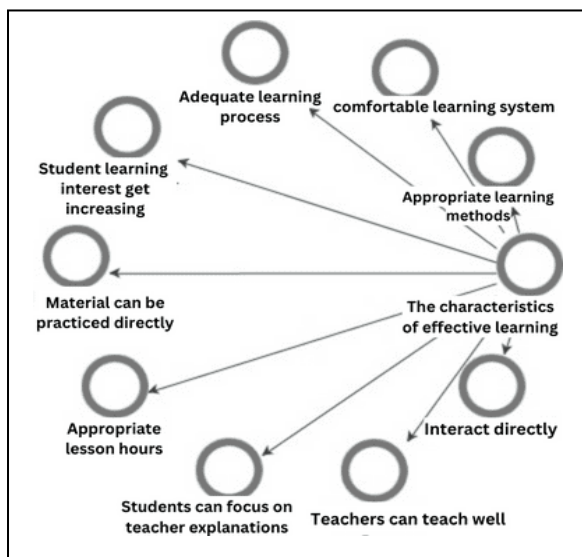


Figure 11. The characteristics of effective learning according to student's opinion

Based on the characteristics of effective learning according to student's opinion, figure 11 shows that students of online and offline learning system stated the same answer results. The characteristics of effective learning stated by students were teachers and students can

interact or communicate directly, teachers can teach well, students can focus on teacher explanations, appropriate lesson hours, material can be practiced directly, student learning interest get increasing, adequate learning process, appropriate learning methods, and comfortable learning system. These characteristics were consistent with the characteristics of effective learning as delivered by Eggen & Kauchak in Makmur & Aspia (2015) that stated students can be active in the learning process, student activity is entirely based on assessment, the teacher provides material as a focus for thinking and interacting in learning, the teacher is actively guiding students to understand the material, teacher use various learning techniques in line with learning objectives, and learning orientation lies in mastering the material and developing thinking skills. Other research suggests that effective learning can improve the quality of learning outcomes. Learning outcomes quality are characterized by a healthy, comfortable, and safe environment; healthy students; relevant material or curriculum; student-centered learning; and integrated learning outcomes which cover 3 aspects (cognitive, affective, and psychomotor) (Setyosari, 2014). Meanwhile, other research also revealed that learning indicated as effective if it can achieve learning objectives and indicators, the teacher uses strategies that make students comfortable, the teacher can guide students to active learning, and good interaction between students and teachers and students with other students (Fakhrurrazi, 2018).

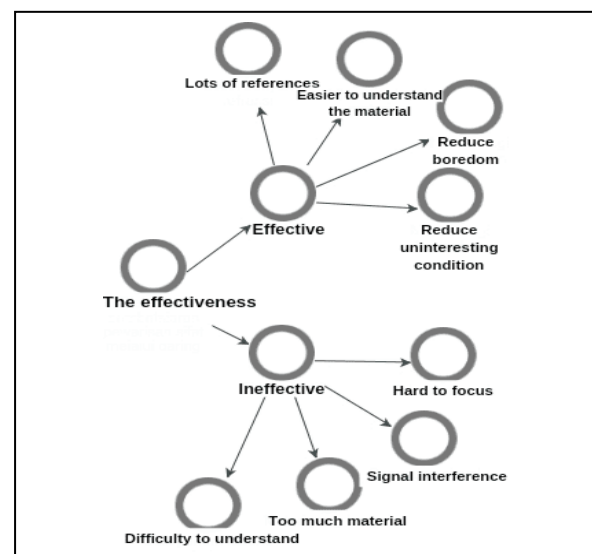


Figure 12. The effectiveness of learning inheritance topic through online learning system

Based on the effectiveness of learning inheritance topic through the learning systems, figure 12 shows that as many as 41.67% of online learning system class students answered that learning inheritance topic through online learning systems was effective. Meanwhile as many as 58.33% of students answered ineffective. Some of the reasons students answered "effective" were more references can be studied, easier to understand the material, less boredom, and less uninteresting condition. Meanwhile, several reasons for students answering "ineffective" were hard to focus, signal interference, too much material, and difficulty to understand the material because it was online.

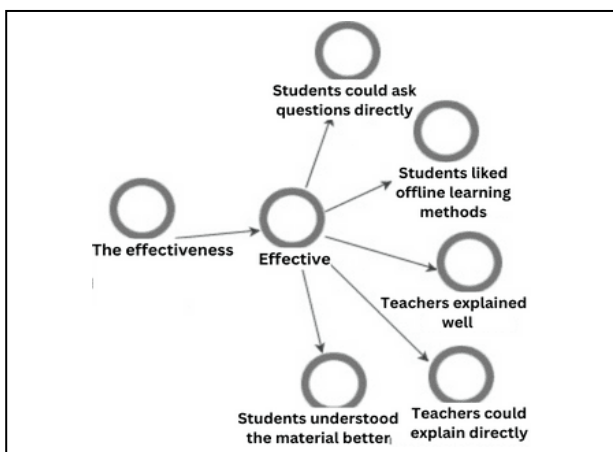


Figure 13. The effectiveness of learning inheritance topic through offline learning system

Figure 13 shows that as much as 100% or overall offline learning system class students answered that learning inheritance topic through offline learning systems was effective. The reasons of students answered "effective" offline learning were students could ask questions directly, teachers could explain directly, teachers explained well, students understood the material better, and students liked offline learning methods. The reasons of students who consider each learning as effective were in line with the strengths of each learning system and the characteristics of effective learning. Meanwhile, the reasons of students consider online learning as ineffective were in line with the weaknesses and obstacles experienced by students in online learning.

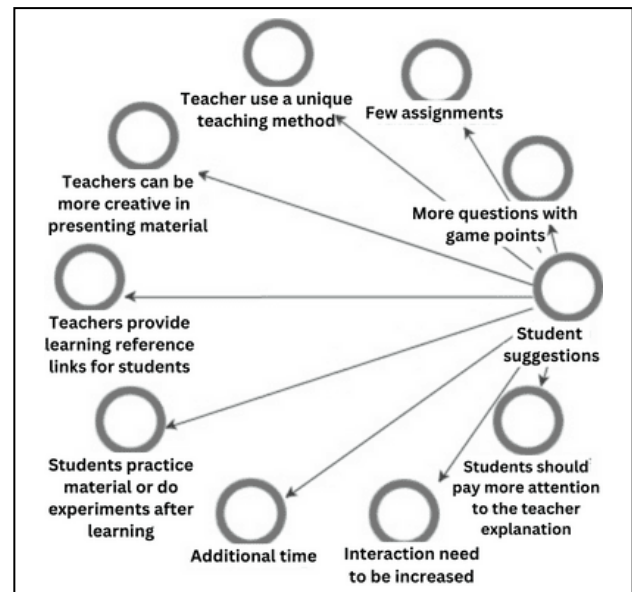


Figure 14. Student suggestions for better and more effective learning system

Based on student suggestions for better and more effective learning system, students of online and offline learning system class stated same suggestions. Student suggestion for better and more effective learning system were interaction between teachers and students need to be increased, students should pay more attention to the teacher explanation, students can practice material or do experiments after learning, there was additional time, the teacher gives more questions with game points, the teacher gives a few assignments, the teacher use a unique teaching method, teachers can be more creative in presenting material, and teachers provide learning reference links for students. This was in line with other research which states that in order to minimize the obstacles during online learning, it is necessary to support good learning facilities and media so as to increase interaction between teachers and students as well as between students (Hasby, et al., 2021). Other research states that teachers are required to be more creative and innovative in presenting learning material, like using video-based media which will make student interest. Presenting material by using video media makes students feel helped in understanding the lesson (Widad, et al., 2021).

Based on some of the criteria above, students show more positive responses to the offline learning system than the online learning system. This shows that the offline learning system was more effective than the online learning system in terms of student responses. The same results were also found in previous research which stated

that students felt offline learning was more effective than online learning for various reasons (Rahmat, 2022).

Management of Learning Process

Based on the observation by 3 observers at the first meeting of online and offline learning systems, the management of learning process in the online learning system for inheritance topic got an average score of 86.7% in the good category, while in the offline learning system got an average score of 92.5% in the very good category. Furthermore, at the second meeting of the online and offline learning systems, the management of learning process in the online learning system of inheritance topic got an average score of 91.2% in the very good category, while in the offline learning system got an average value of 93.7% in the very good category. Based on the observation results, it can be concluded that the management of the learning process by teachers in online and offline learning systems is equally effective. This was consistent with previous research which states that a lesson can be said to be effective if a teacher's ability to manage the learning process is said to be good or excellent (Bungin, 2009). Other research also states that learning can be indicated as effective if all indicators of learning effectiveness reach the minimum good category (Yusuf, 2017).

Even though the management of learning process carried out by the teacher is classified as good and very good, it was possible that student learning outcomes to decrease or a slight increase as the results obtained in this study. This was caused by other factors, such as: the obstacles and weakness of each learning system in this study. Other similar research also stated the same thing. Although the learning implementation has been going well, student learning outcomes are still can be decrease. This was due to several factors, such as: the uneven distribution of learning support facilities, students who were scattered in minimal signal places, students having difficulty to understand the material, lack of awareness of responsibilities to do assignments, and environmental factors that are still not supportive enough (Pariatno, et al., 2021).

CLOSING

Conclusion

This research concluded that student learning outcomes showed more improvement when treated by using offline learning rather than online learning systems based on the results of the paired sample t-test and the N-Gain score test. The implementation of offline learning systems on

inheritance topic are more effective than online leaning systems in terms of student learning outcomes.

Students show more positive responses to offline learning systems than online learning systems based on preference criteria for learning systems, obstacles during learning process, the weakness of learning system, the strength of learning system, characteristics of effective learning according to students, effectiveness of learning inheritance topic through the learning system, and student suggestions for a better and more effective learning system. So that the implementation of offline learning system on inheritance topic is more effective than the online learning system in terms of student responses.

The management of the learning implementation carried out by the teacher during offline and online learning does not have a significant difference with the results of the assessment that were in the good and very good categories. So that the implementation of offline and online learning systems on inheritance topic are equally effective in terms of management of learning process.

Suggestion

Research in advanced on the effectiveness of online and offline learning is urgently needed. Future researchers can use other indicators of learning effectiveness, namely communicative processes and learning activities. Researchers need to pay attention to the advantages and disadvantages of each learning system, as well as other supporting things so that learning can be more effective. In addition, researchers must pay more attention to things that can affect student learning outcomes in order to obtain a significant or real increase in learning outcomes after learning process.

ACKNOWLEDGEMENT

The researchers delivers their gratitude to Prof. Dr. Endang Susantini, M. Pd. and Dr. Isnawati, M. Si. as the validators in this research. Researchers also appreciate all of the respondents, biology teachers, and high school students in MAS Kanjeng Sepuh, who have participated in this research.

REFERENCES

- Abdillah, F., Masita, M., & Wahyuni, I. 2022. Penerapan Sistem Pembelajaran di Pelosok Daerah pada Masa Pandemi. *Edumaspul: Jurnal Pendidikan*, 6(1), 268-273. <https://doi.org/10.33487/edumaspul.v6i1.2280>
- A'dadiyah, N. L. 2021. Dampak Pembelajaran Daring terhadap Hasil Belajar Matematika Siswa Kelas V MI NU Wasilatut Taqwa Kudus Tahun 2020/2021.

- LAPLACE: *Jurnal Pendidikan Matematika*, 4(1), 40-49. <https://doi.org/10.31537/laplace.v4i1.462>
- Adi, N. N. S., Oka, D. N., & Wati, N. M. S. 2021. Dampak Positif dan Negatif Pembelajaran Jarak Jauh di Masa Pandemi Covid-19. *Jurnal Ilmiah Pendidikan dan Pembelajaran*, 5(1), 43-48. <https://doi.org/10.23887/jipp.v5i1.32803>
- Arifin, H. N. 2020. Respon Siswa terhadap Pembelajaran dalam Jaringan Masa Pandemi Covid-19 di Madrasah Aliyah Al-Amin Tabanan. *Widya Balina: Jurnal Ilmu Pendidikan dan Ekonomi*, 5(1), 1-12. <https://doi.org/10.53958/wb.v5i1.47>
- Bungin, B. 2009. *Penelitian Kualitatif*. Jakarta: Prenada Media Group.
- Cahyani, A., Listiana, I. D., & Larasati, S. P. D. 2020. Motivasi Belajar Siswa SMA pada Pembelajaran Daring di Masa Pandemi Covid-19. *IQ (Ilmu Al-Qur'an): Jurnal Pendidikan Islam*, 3(1), 123-140. <https://doi.org/10.37542/iq.v3i01.57>
- Esminto, E., Sukowati, S., Suryowati, N., & Anam, K. 2016. Implementasi Model STAD dalam Meningkatkan Hasil Belajar Siswa. *BRILIANT: Jurnal Riset dan Konseptual*, 1(1), 16-23. <http://dx.doi.org/10.28926/briliant.v1i1.2>
- Fakhrurrazi. 2018. Hakikat Pembelajaran yang Efektif. *Jurnal Pendidikan, Hukum dan Sosial Keagamaan*, 11(1), 85-99. <https://doi.org/10.32505/at.v11i1.529>
- Firmansyah. 2021. Motivasi Belajar dan Respon Siswa terhadap Online Learning sebagai Strategi Pembelajaran di Masa Pandemi Covid-19. *Edukatif: Jurnal Ilmu Pendidikan*, 3(2), 589-597. <https://doi.org/10.31004/edukatif.v3i2.355>
- Gusniar. 2014. Penerapan Model Pembelajaran Kooperatif Tipe *Student Teams Achievement Division* (STAD) dalam Meningkatkan Hasil Belajar Siswa pada Mata Pelajaran IPS Kelas IV SDN No. 2 Ogoamas II. *Jurnal Kreatif Tadulako Online*, 2(1), 198-221. <http://jurnal.untad.ac.id/jurnal/index.php/JKTO/article/view/3005/2081>
- Harefa, A. R. 2022. Analisis Kesulitan Belajar Biologi Masa Pandemi Covid-19. *Educativo: Jurnal Pendidikan*, 1(1), 181-189. <https://doi.org/10.56248/educativo.v1i1.27>
- Hasby, E., Noor, T., & Wahyudin, U. R. 2021. Respon Siswa terhadap Pembelajaran Daring PAI pada Masa Pandemi Covid-19 di SMP. *Edukatif: Jurnal Ilmu Pendidikan*, 3(6), 3984-3992. <https://doi.org/10.31004/edukatif.v3i6.1384>
- Hasibuan, M. 2014. Analisis Kesulitan Belajar Siswa pada Materi Genetika di SMA Negeri Se-Kota Sibolga. *Tesis*. Medan: PPs Universitas Negeri Medan.
- Hidayati, S. 2020. Kendala yang Dihadapi Mahasiswa Pendidikan Ekonomi Universitas Pamulang dalam Mengikuti Perkuliahan Daring pada Mata Kuliah Seminar Proposal Penelitian selama Masa Pandemi Covid-19. *JPEK (Jurnal Pendidikan Ekonomi dan Kewirausahaan)*, 4(1), 40-51. <https://dx.doi.org/10.29408>
- Ifadah, E. & Prastiwi, M. S. 2022. Keefektifan Pembelajaran Daring pada Materi Biologi dalam Meningkatkan Literasi Digital Siswa. *Berkala Ilmiah Pendidikan Biologi (BioEdu)*. 11(1), 228-239. <https://ejournal.unesa.ac.id/index.php/bioedu>
- Ismayanti, W. & Wahyuddin. 2021. Preferensi dan Pengalaman Mahasiswa dalam Menggunakan Media Pembelajaran Online di Masa Pandemi. *Jurnal Pendidikan*, 22(2), 77-90. <https://doi.org/10.33830/jp.v22i2.1823.2021>
- Kuntarto, E. 2017. "Keefektifan Model Pembelajaran Daring dalam Perkuliahan Bahasa Indonesia di Perguruan Tinggi". *ILEAL: Journal Indonesian Language Education and Literature*, 3(1), 99-110. <https://www.syekh-nurjati.ac.id/jurnal/index.php/jeill/article/view/1820>
- Kusumaningrum, B., Kuncoro, K. S., Sulistyowati, F., & Arigiyati, T. A. 2021. Meningkatkan Minat Belajar Daring selama Masa Pandemi Covid-19. *Prosiding Seminar Nasional Hasil Pengabdian kepada Masyarakat*, 1(1), 206-211. <https://jurnal.ustjogja.ac.id/index.php/ppm-ust/article/view/11262>
- Makmur, A. & Aspia, A. 2015. Efektivitas Penggunaan Metode *Base Method* dalam Meningkatkan Kreativitas dan Motivasi Belajar Matematika Siswa SMP N 10 Padangsidempuan. *Jurnal EduTech*, 1(1). <https://jurnal.umsu.ac.id/index.php/edutech/article/view/264>
- Mardin, H., B., Nurhayati, & Ramlawati. 2017. Analisis Kesulitan Belajar Biologi Siswa Kelas XII IPA SMA Negeri di Kota Palopo. *Tesis*. Makassar: PPs Universitas Negeri Makassar.
- Maulana, M. A. 2021. Efektivitas Pembelajaran Daring terhadap Hasil Belajar Biologi pada Konsep Biodiversitas di Kelas X IPA MA Muhammadiyah Salaka Kabupaten Takalar". *JRIP: Jurnal Riset dan Inovasi Pembelajaran*, 1(1), 85-95. <https://doi.org/10.51574/jrip.v1i1.22>
- Muntazhimah, Nasution, E. Y. P., & Ningsih, S. Y. 2020. Respon Siswa Sekolah Menengah terhadap Pembelajaran Matematika di Era COVID-19. *Jurnal Pendidikan Matematika*, 8(3), 193-206. <http://dx.doi.org/10.23960/mtk/v8i2.pp193-206>
- Nafisah, D. 2011. Identifikasi Kesulitan Belajar IPA Biologi Siswa Kelas IX SMP Negeri 5 Ungaran. *Skripsi*. Semarang: PPs Universitas Negeri Semarang.

- Pariatno, T., Sadtyadi, H., & Walyono. 2021. Analisis Pembelajaran Daring terhadap Hasil Belajar Siswa pada Mata Pelajaran Pendidikan Agama Buddha (Studi Kasus di SMA Bhakti Karya Kecamatan Kaloran, Kabupaten Temanggung). *Jurnal Pendidikan Sains Sosial dan Agama*, 7(2), 74-88. <https://doi.org/10.53565/pssa.v7i2.317>
- Purniawan & Sumarni, W. 2020. Analisis Respon Siswa pada Pembelajaran Daring di Masa Pandemi Covid 19. *Prosiding Seminar Nasional Pascasarjana UNNES*.
- Rahma, A. & Sandika, B. 2022. Pengaruh Smartphone terhadap Motivasi dan Hasil Belajar Biologi Materi Sistem Eksresi Kelas XI SMA. *JIPB: Jurnal Inovasi Pembelajaran Biologi*, 3(1), 43-52. <https://doi.org/10.26740/jipb.v3n1.p43-52>
- Rahmat, A. 2022. A Comparative Analysis between Online and Offline English Learning in Covid-19 Pandemic Era: Students' View. *J-SHMIC: Journal of English for Academic*, 9(2), 39-54. [https://doi.org/10.25299/jshmic.2022.vol9\(2\).9998](https://doi.org/10.25299/jshmic.2022.vol9(2).9998)
- Saragih, R. M. B., Matondang, K., & Wati, N. 2021. Respon Siswa MTs Swasta Al-Umm terhadap Pembelajaran Daring selama Pandemi Corona. *Jurnal Cendekia: Jurnal Pendidikan Matematika*, 5(2), 1729-1738. <https://doi.org/10.31004/cendekia.v5i2.375>
- Setyosari, P. 2014. Menciptakan Pembelajaran yang Efektif dan Berkualitas. *JINOTEP: Jurnal Inovasi dan Teknologi Pembelajaran*, 1(1), 20-30. <http://dx.doi.org/10.17977/um031v1i12014p020>
- Sugiyono. 2017. *Metode Penelitian Kuantitatif, Kualitatif, dan R&D*. CV. Alfabeta: Bandung.
- Sugiyono. 2019. *Metode Penelitian Kuantitatif, Kualitatif, dan R&D*. CV. Alfabeta: Bandung.
- Sumilat, J. M., Rorimpandey, W. H. F., & Siruru. 2022. Analisis Dampak Pembelajaran Daring terhadap Hasil Belajar Siswa. *Jurnal Basicedu*, 6(5), 8537-8544. <https://doi.org/10.31004/basicedu.v6i5.3739>
- Susanto, A. 2013. *Teori Belajar dan Pembelajaran di Sekolah Dasar*. Jakarta: Prenada Media Group.
- Tafdhila, Marleni, L., & Saputra, A. 2021. Pengaruh Pembelajaran Daring terhadap Motivasi Belajar di Masa Pandemi Covid 19 pada Mahasiswa Keperawatan STIK Siti Khadijah Palembang. *Jurnal Perawat Indonesia*, 5(1), 576-584. <https://doi.org/10.32584/jpi.v5i1.832>
- Utami, Y. P. & Cahyono, D. A. D. 2020. Study at Home: Analisis Kesulitan Belajar Matematika pada Proses Pembelajaran Daring. *Jurnal Ilmiah Matematika Realistik (JI-MR)*, 1(1), 20-26. <https://doi.org/10.33365/ji-mr.v1i1.252>
- Yusuf, B. B. 2017. Konsep dan Indikator Pembelajaran Efektif. *Jurnal Kajian Pembelajaran dan Keilmuan*, 1(2), 13-20. <http://dx.doi.org/10.26418/jurnalkpk.v1i2.25082>
- Yoannita, B. 2016. Pengaruh *Self Efficacy* terhadap Hasil Belajar Fisika melalui Penggunaan Model Problem Based Learning. *Skripsi*. Jakarta: PPs. Universitas Negeri Jakarta. <http://repository.unj.ac.id/id/eprint/25318>
- Widad, F., Ibrahim, M., & Kasiyun, S. 2021. Implementasi Penggunaan Media Pembelajaran Berbasis Video melalui Daring di Sekolah Dasar. *Edukatif: Jurnal Ilmu Pendidikan*, 3 (5), 3263-3268. <https://doi.org/10.31004/edukatif.v3i5.1217>