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Evaluation of Blended Learning in Biology Subject at State Senior High School 1 in Jambi City, Indonesia

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Abstract: The aim of this research is to evaluate the implementation of blended learning in the biology subject at State Senior High School 1 in Jambi City, considering various aspects such as context, input, process, and product, as well as analyzing the inhibiting factors of blended learning implementation in the biology subject. This study used a descriptive evaluation research method, utilizing the CIPP evaluation model, and was conducted at State Senior High School 1 in Jambi City. The data was collected through questionnaires and interviews and analyzed both quantitatively and qualitatively. The evaluation results of the context, input, process, and product aspects showed that the implementation of blended learning in the biology subject at State Senior High School 1 in Jambi City has been quite successful and has achieved the objectives of blended learning, which are to accommodate the needs of both students and teachers to achieve all aspects of biology learning competencies. However, inhibiting factors of the blended learning implementation model were identified, including communication technology, such as unstable internet networks, discomfort in interpersonal communication between students and teachers, lack of understanding among students of digital media communication culture, levels of stress and decreased learning motivation, non-conducive learning environment, and low commitment and empathy from teachers.

Keywords: Evaluation, Blended Learning, Biology Subject

INTRODUCTION

The emergence of the COVID-19 pandemic in early 2020 has transformed the orientation of learning from face-to-face to distance or online learning, in line with the issuance of Circular Letter of the Ministry of Education and Culture Director General of Higher Education No. 1 of 2020 regarding the prevention of the spread of Corona Virus Disease (Covid-19) in schools and universities. According to Iswari (2021), distance learning with the support of electronic learning technology (e-learning) has truly been fully implemented due to the pandemic situation. In line with this, the learning activities of biology, especially in high schools, must be able to adapt to the situation that occurs.

Students' understanding of biology learning material cannot be separated from the utilization of learning sources, one of which is the teacher. The emphasis here is that learning sources are not only limited to books and teachers, but a wide range that can include objects, people, places, specific environments, and events. The ideal teaching and learning activities are able to utilize all of these learning sources. With the policy of distance or online learning in schools, students are required to be more active in collecting, managing, interpreting, and concluding various information that they can access from all learning sources.

The change in the learning system caused by the pandemic has apparently caused problems, especially in the implementation of distance or online learning, especially in biology learning activities. Rahmi & Helendra (2021) revealed some difficulties faced by students during online learning activities,

including: (1) technical difficulties, including signal and quota problems, and students' inability to learn online, (2) difficulties in implementing learning activities, including low motivation and interest of students, less active involvement of students in learning activities, and tasks that are too numerous and burdensome for students, (3) external difficulties in the form of an unfavorable home environment. Harefa (2022) found in his research that according to teachers, online learning activities are highly ineffective, causing difficulties for students in the biology learning process, as indicated by students being slow in completing tasks, not doing tasks at all, being indifferent to the learning process, and lacking the enthusiasm to learn.

According to Rahardjo et al. (2020), online learning during the pandemic has the potential to cause social media fatigue, which is a subjective feeling of exhaustion, irritation, anger, disappointment, loss of interest, or decreased motivation related to interactions in various aspects of social media use, due to the abundance of content encountered on social media. The excess or accumulation of information obtained from social media can certainly burden an individual's cognition. As is known, the interaction process in online learning activities is still dominated by social media applications such as Whatsapp, Telegram, Zoom, and others. Based on a survey conducted by the Association for Education and Teachers in Indonesia (2020) as of December 3, 2020, it was found that social media was the favorite application most often used by teachers for online learning. The amount of learning activities and interactions that students have to do on various social media platforms used by teachers, combined with the increasing workload that students have to complete, has the potential to cause a loss of focus, fatigue, and stress on students, which then leads to a loss of interest or decreased motivation to interact in online learning activities via social media.

The phenomenon of social media fatigue is understandable, as before the Covid-19 pandemic, the use of social media for students was one way to relieve stress or fatigue through light and entertaining content on social media. With the use of social media in online learning activities, this certainly creates an accumulation of information and limits students' privacy to do other things they enjoy on social media. This accumulation of information can cause a loss of concentration and focus on what students have to do. This triggers other negative consequences, such as a decrease in interest or motivation to interact in online learning activities via social media, which ultimately results in a decline in student learning performance.

State Senior High School 1 in Jambi City is one of the schools that initially implemented online or distance learning. However, the online learning activities at the school faced various obstacles for the students. Based on the initial survey results, four obstacles were felt most by the students, including: (1) frequent problems with internet network distribution with a frequency distribution of 12 students (80%), (2) high costs incurred during online learning, with a frequency distribution of 11 students (73.3%), (3) difficulty in staying focused during online learning, with a frequency distribution of 10 students (66.67%), and (4) failure to upload assignment files, with a frequency distribution of 10 students (66.67%).

Referring to the difficulties experienced by students in online learning, it indicates that there are still weaknesses in the implementation of online learning in schools. Currently, learning in various educational institutions does not always have to be conducted fully online, as full online learning is considered insufficient to accommodate all learning needs (Zhafira, et al., 2020). There are other learning approaches that teachers can use as a medium for delivering knowledge, such as blended learning, as one solution to overcome the weaknesses of fully online learning.

Onta (2018) states that blended learning is a learning approach that integrates traditional face-to-face learning and distance learning using online-based learning media. Munir (2017) also reveals that blended learning is a learning approach that combines teaching delivery strategies using face-to-face (offline) activities and learning using computers online (internet and mobile learning). This can be utilized as an effort to combine the advantages of the two types of approaches used. Thus, learning that occurs will be even better in mastery of the material as well as in mastery of the technology. Because blended learning is not only an innovative learning approach in combining learning implementation, but also as an innovation to introduce technological advances in the field of education through the learning model. Dwiyanto (2020) also states that blended learning is a

solution to address the challenges in designing learning and developing individual students, making it very appropriate for the current situation.

State Senior High School 1 in Jambi City has implemented blended learning based on the evaluation of full online learning that was previously implemented. The reason for the implementation of blended learning, according to the biology teacher, is that not all main topics can be delivered online, given that not all students have the same access and ability. Face-to-face learning is a joint decision made by the school principal and all school members. The implementation of blended learning at State Senior High School 1 in Jambi City is supported by the availability of internet network in the form of Wi-Fi and internet quota for all teachers to conduct online learning. Based on information obtained from the teacher, it is found that the implementation of blended learning in this school uses a composition of 50% for face-to-face meetings and 50% for online learning.

The learning stages designed in blended learning activities at State Senior High School 1 in Jambi City include: (1) seeking information independently or in groups, (2) group discussions either online or during face-to-face learning in the classroom, and (3) demonstration of the results of discussions or learning activities that have been conducted either directly in front of the class during face-to-face meetings or through uploading assignments online. However, according to the program head, the implementation is not yet fully effective. This is because blended learning was still new for all teachers and students at State Senior High School 1 in Jambi City at that time, so it was still in the adjustment process. In addition, the organization of the material still needs to be adjusted, which parts need face-to-face meetings (synchronous) and which parts can be done online (asynchronous). Students lack focus and concentration in following online learning.

Another problem faced by State Senior High School 1 in Jambi City in implementing blended learning is the constraint of not having a learning management system that supports online teaching, so biology teachers still use free applications with limited facilities such as Google Classroom, Zoom, Edmodo, and Whatsapp. Another constraint faced in implementing blended learning is the issue of signal or availability of internet network. Based on the constraints faced in implementing blended learning at State Senior High School 1 in Jambi City, it is necessary to conduct a study on the evaluation of blended learning in learning activities at the school, given that this evaluation has not been comprehensively conducted. This evaluation is carried out with the aim of obtaining a more comprehensive picture related to the implementation of blended learning in biology subjects at State Senior High School 1 in Jambi City, both from the context, input, process, and product aspects, as well as analyzing the inhibiting factors of implementing blended learning in biology subjects at the school.

METHODS

This research employs an evaluation research method, which is a research activity aimed at collecting data and presenting accurate and objective information regarding the implementation of an educational program, in this case the implementation of blended learning in the subject of biology at State Senior High School 1 in Jambi City. The purpose of using this type of research is to generate recommendations for the improvement of a program. The approach used in this research is a quantitative approach supported by a qualitative approach. The quantitative approach is used to obtain evaluation results based on quantitative data (numbers), while the qualitative approach is used to obtain more in-depth evaluation results related to the processes or activities of the stakeholders involved in the learning program.

The evaluation model used in this research is the CIPP model, which is a complex evaluation model that covers Context, Input, Process, and Product (Stufflebeam et al., 2002). The selection of the CIPP model is because it is considered the most appropriate model to see whether a program is running as desired or not and whether it can produce the desired product. In addition, the CIPP evaluation model is classified as an improvement model and one of the most widely used evaluation models.

This research was conducted at State Senior High School 1 in Jambi City, where the informants involved were three biology teachers, one member of the blended learning organizing team, and 40

State Senior High School 1 in Jambi City students. The data collection techniques used were questionnaires and interviews. The questionnaire data were analyzed using descriptive statistical techniques, while the interview data were analyzed using the qualitative data analysis technique of interactive analysis model proposed by Miles et al. (2014), which includes data reduction, data presentation, and conclusion drawing.

RESULTS

Evaluation Results of Blended Learning Implementation

Evaluation Results of Blended Learning Implementation in Terms of Context Aspect

The context evaluation in this study aims to determine the needs underlying the implementation of blended learning at State Senior High School 1 in Jambi City, the objectives of blended learning implementation, and the alignment between the objectives and those needs. The results of student responses on the obstacle indicators in following blended learning (Table 1) obtained the lowest percentage score of 36.5%, categorized as "not good". In this indicator, the majority of students disagreed that online learning activities at State Senior High School 1 in Jambi City never experience any obstacles or disturbances that make it difficult for students. This is also supported by information obtained from student interviews that the most difficult obstacle they faced in participating in blended learning biology activities was the unstable network or internet signal, which disrupted the smoothness of learning activities.

Table 1. Frequency Distribution of Student Responses on Blended Learning Evaluation in Context Aspect

Indicator		w					Total	%	Criteria
		1	2	3	4	5			
Student's ability to operate technology on laptops and smartphones	f	0	1	5	24	10	163	81,5	Very Good
	fw	0	2	15	96	50			
Suitability of student's learning environment	f	0	1	2	19	18	174	87	Very Good
	fw	0	2	6	76	90			
Obstacles in participating in blended learning	f	11	25	4	0	0	73	36,5	Not Good
	fw	11	50	12	0	0			
Average							**114**	**57,10**	**Fair**

1: Strongly disagree; 2: Disagree; 3: Somewhat disagree; 4: Agree; 5. Strongly agree

Table 1 shows the frequency distribution of student responses regarding the evaluation of blended learning in the aspect of context. Based on the information from the interview results and the student responses in Table 1, it shows that the technical obstacle of unstable network or internet signal is the obstacle that students face during blended learning activities. In addition to this network or internet signal problem, students also find it difficult to bear the cost of online learning sessions, especially for the online session. This is also supported by information obtained from student interviews that there are still students who object to the cost of internet quota that must be spent during online learning activities. This is because applications used such as zoom and Google Meet require a significant amount of internet quota, considering the relatively long duration of online learning sessions, and if there are materials presented by the teacher in the form of videos, which require students to download and watch those videos. Regarding the student responses to the efforts made in overcoming obstacles, it was found that there are still teachers who are less responsive to the obstacles experienced by students during online learning sessions. However, students have made good efforts to overcome these obstacles by confirming the problems they faced at that time to the relevant subject teacher.

The findings regarding the problems experienced by students were then used as evaluation material by teachers to redesign the blended learning program to be implemented, and to formulate the objectives of the learning program, which were to minimize difficulties or reduce shortcomings in previous learning. Regarding the availability of blended learning facilities and technology, based

on the researcher's observation, it was found that State Senior High School 1 in Jambi City already has adequate technology such as LCD projectors, speakers, computers, and wifi facilities as an internet connection. All biology teachers and students have laptops and smartphones that are supported or installed with various applications used during blended learning in biology subjects. In addition to the availability of learning facilities and technology, another aspect that needs to be considered is the suitability of the student learning environment. Based on the data in Table 1, the indicator of suitability of the student learning environment obtained the highest score percentage with a category of "very good," which was 87%. In this indicator, the majority of respondents agreed that a supportive home environment with facilities and atmosphere is needed to be able to participate well in online learning activities.

Another aspect that biology teachers and the blended learning organizing team considered in evaluating the context was the characteristics of students, including students' learning styles and their ability to master computer applications, including (1) word processors (MS Word or similar), (2) presentation software (MS PowerPoint, Open Impress, or similar), and (3) other supporting applications such as Gmail, Zoom, Google Meet, and others. Based on the analysis of learning styles conducted by biology teachers and the blended learning organizing team, it was found that students tended to have an auditory learning style, which was about 50%, 40% visual, and 10% kinesthetic. The proportion between auditory and visual was not significantly different, so biology teachers used media and platforms that contained both visual and auditory elements to accommodate students' learning styles. The results of students' responses to the indicator of their ability to operate technology on laptops and smartphones (Table 1), where the average score percentage was 81.50 with the criteria "very good". In this indicator, the majority of students agreed that online learning activities at State Senior High School 1 in Jambi City ideally should be supported by students' ability to operate technology on laptops and smartphones.

An evaluation of the blended learning instructional design for Biology at State Senior High School 1 in Jambi City revealed that the Biology teachers and the blended learning organizers analyzed the subject matter by identifying the main topics that could be implemented through blended learning. Additionally, the analysis also considered the depth and breadth of the subject matter, and an analysis of the competencies and learning objectives of each main topic was conducted to determine whether those objectives could be achieved using the blended learning model. Based on the results of the interviews, it was found that not all the main topics in Biology utilized the blended learning model. The decision to select either a fully online or blended learning approach depended on the characteristics of the subject matter's depth and breadth and whether there were any practical activities that needed to be conducted in-person for each main topic.

Regarding the selection of strategies and methods used in blended learning instruction, the Biology teachers determined the strategies and methods by considering the characteristics of the subject matter, the learning objectives, and the topics that the students would study, as well as the independence and reinforcement of the material that could not be done solely online. When selecting the method of delivering the instructional material, the teachers also looked at the characteristics of the students' abilities that needed to be mastered in the subject matter being studied. If the objectives/material were conceptual and factual, then learning activities could be carried out fully online. However, if the material required in-depth analysis, discussion, and practice, it was necessary to conduct those activities both online and in-person.

Evaluation Results of Blended Learning Implementation in Terms of Input Aspect

The evaluation of input in this research aims to determine the extent to which resources, facilities, student readiness, student support, and supporting facilities are prepared to achieve the objectives of blended learning implementation. Student readiness, particularly in terms of their ability to operate gadgets and supporting applications for blended learning, as well as student support for the implementation of blended learning, are also important factors to be evaluated as part of the blended learning support system.

Table 2. Frequency Distribution of Students' Responses Regarding Evaluation of Blended Learning on Input Aspects.

Indicator		w					Total	%	Criteria
		1	2	3	4	5			
Student's understanding of blended learning	f	0	0	2	21	17	175	87,5	Very Good
	fw	0	0	6	84	85			
Student's support for the implementation of blended learning	f	0	0	1	21	18	177	88,5	Very Good
	fw	0	0	3	84	90			
Student's ability to operate gadgets and learning support applications for blended learning	f	0	0	1	19	20	179	89,5	Very Good
	fw	0	0	3	76	100			
Average							**177**	**88,5**	**Very Good**

1: Strongly disagree; 2: Disagree; 3: Somewhat disagree; 4: Agree; 5. Strongly agree

The results of the blended learning evaluation questionnaire, specifically on the aspect of input (Table 2), indicate that the indicator of students' ability to operate gadgets and supporting applications for blended learning received the highest average score percentage of 89.50% with a rating of "Very Good". The majority of respondents agreed that there were no difficulties experienced by students in operating the software or supporting applications used during blended learning activities. This was because the biology teacher and the blended learning team had conducted socialization and training for students on various technologies and applications that could be used in blended learning.

The results of student responses on the indicator of students' understanding of blended learning (Table 2) obtained an average score percentage of 87.50%, with a rating of "Very Good". The majority of respondents agreed that students should have a good understanding of the explanation provided by the teacher or e-learning campus administrator regarding the implementation of blended learning. The information obtained from the interviews also proved that the students of State Senior High School 1 in Jambi City had understood the concept of blended learning, as stated by the students that blended learning is a learning process that integrates face-to-face learning with online learning to achieve learning goals, so that the combination can complement the shortcomings of each learning process.

The results of student responses on the indicator of student support for the implementation of blended learning (Table 2) obtained an average score percentage of 88.50%, with a rating of "Very Good". The majority of respondents agreed that support from students, teachers, and all school members is necessary in implementing blended learning in biology learning activities at State Senior High School 1 in Jambi City. This is also supported by the information obtained from interviews with students that blended learning has been helpful to them, as during the limited face-to-face learning period, students were able to receive further explanation from the teacher on the material previously provided during online learning.

Based on the findings, it can be concluded that the success of blended learning implementation also depends on the readiness of teachers. Therefore, teachers' readiness in terms of their understanding of technology or applications that support blended learning, as well as the implementation process of blended learning from planning, implementation to evaluation of learning, is crucial. Regarding teachers' readiness in planning blended learning, the results show that all biology teachers have prepared a plan for implementing blended learning for the topics that use the blended learning model. In addition, teachers also prepare teaching materials systematically and comprehensively, starting from preparing materials according to the scope of learning competencies and characteristics of students, and the current issues of development. The types of teaching materials prepared by teachers in blended learning are diverse, including text-based such as word processing documents (.doc), portable document format (.pdf), and presentation slides (power point).

The findings on teachers' readiness in implementing blended learning activities, based on the scenario design, are quite good and have fulfilled the three basic stages of blended learning according to Safira (2018), namely seeking of information, acquisition of information, and synthesizing of knowledge. In addition, the scenario of blended learning activities is accompanied by diverse strategies for presenting materials, which have been determined by teachers based on the diversity of the knowledge of the material in each topic, as well as learning objectives and student characteristics.

The findings on teachers' readiness in evaluating blended learning, based on the headmaster's explanation, are quite good. This can be seen from the variety of assessment techniques used by teachers, as explained in the syllabus, whether in the form of written tests, performance demonstrations, and observations. In addition, all biology teachers have also prepared assessment instruments for the process and learning outcomes of students to measure and assess students' learning outcomes comprehensively, where the instrument includes grids, rubrics, and assessment items for each type of assessment technique used.

Regarding the budget support for the implementation of blended learning, information obtained from an interview with the school principal revealed that the allocated budget for blended learning is limited to the cost of using the Zoom application. This means that if there are similar paid applications, the costs will be passed on to the teachers and students as users of the application. The limitation in budget support is one of the reasons why a Learning Management System (LMS) technology has not yet been made available for managing biology learning materials and as a platform for independent learning activities for students online. Other information also indicates that, apart from budget constraints, the lack of human resources capable of developing an LMS is also a contributing factor to the unavailability of an LMS at State Senior High School 1 in Jambi City.

Evaluation Results of Blended Learning Implementation in Terms of Process Aspect

The process evaluation in this study aims to determine the quality of blended learning implementation and the conformity of the learning process with the blended learning plan prepared by the biology teacher at State Senior High School 1 in Jambi City. One of the indicators of the quality of blended learning implementation is student readiness, which includes their ability to learn independently, ability to use online learning media or platforms, and preparedness to face challenges in implementing blended learning. Based on information obtained from interviews, the biology teacher believes that students' ability to learn independently is still lacking, as there are students who merely fulfill attendance requirements but are not active during online learning. In addition, students still tend to rely on the teacher's explanation of the material, without actively seeking additional information related to the subject matter being taught.

Table 3. Frequency Distribution of Students' Responses on Blended Learning Evaluation in terms of Process Aspect

Indicator		w					Total	%	Criteria
		1	2	3	4	5			
Student interest in blended learning	f	0	1	2	21	16	172	86	Very Good
	fw	0	2	6	84	80			
Teacher's ability to enliven the learning atmosphere	f	0	0	3	19	18	175	87,5	Very Good
	fw	0	0	9	76	90			
The systematic organization of material in blended learning	f	0	0	7	14	19	172	86	Very Good
	fw	0	0	21	56	95			
The suitability of the material provided with the established competencies	f	0	0	2	24	14	172	86	Very Good
	fw	0	0	6	96	70			
Variety of teaching methods	f	0	0	2	26	12	170	85	Very Good
	fw	0	0	6	104	60			
Variety of learning resources	f	0	1	14	18	7	151	75,5	Good
	fw	0	2	42	72	35			
	f	0	1	7	22	10	161	80,5	Very Good

Indicator		w					Total	%	Criteria
		1	2	3	4	5			
Utilization of media and technology for blended learning	fw	0	2	21	88	50			
Clarity in conveying learning objectives, materials, and answering student questions	f	0	0	8	18	14	166	83	Very Good
	fw	0	0	24	72	70			
Special time provided for discussing learning materials	f	0	1	4	22	13	167	83,5	Very Good
	fw	0	2	12	88	65			
Ability to direct discussions to achieve goals	f	0	0	3	23	14	171	85,5	Very Good
	fw	0	0	9	92	70			
Average							**168**	**83,8**	**Very Good**

1: Strongly disagree; 2: Disagree; 3: Somewhat disagree; 4: Agree; 5. Strongly agree

Other findings show that there are still students who do not submit assignments or reports on time. Regarding the ability to use online learning platforms or media, all students are capable of using various platforms such as Zoom, Google Meet, Google Classroom, and Edmodo. And when there are difficulties in online learning, such as signal disruption, students can overcome them by finding a place with a good signal and immediately communicating the problem to the teacher. Another indicator of the quality of blended learning implementation is students' ability to obtain information from various learning sources, where the majority of students already have sufficient ability to search for information related to learning materials from various sources.

The results of student responses to the indicator of the diversity of learning sources (Table 3), obtained an average score percentage of 75.50% with the criteria "good". In this indicator, the majority of respondents agreed that students should try to find as many learning sources as possible during independent learning activities at home. This is also reinforced by information obtained from interviews with students, that the biology teacher directs students to find other learning sources as much as possible, outside of the material sources provided by the teacher. The learning sources obtained by students during blended learning in biology, namely; textbooks, internet articles, and instructional videos on social media such as Facebook and YouTube.

The next indicator of the quality of blended learning implementation is students' activity in asking questions or expressing opinions during the blended learning process, where not all students are actively involved, especially during online learning using various media or platforms. This can be seen from the information obtained from interviews with biology teachers, that there is a significant difference in the activity level of students during online learning compared to offline learning. However, this activity is not visible on all media or applications used, such as during online learning using Edmodo and Google Classroom, many students are actively giving questions, opinions, or objections in writing. But when interacting on Zoom, only a few students actively ask questions. This may be due to some students not feeling confident when asking questions using Zoom.

The quality of blended learning implementation is also assessed by the two-way communication between teachers and students during the blended learning process. The findings on this indicator show that communication has been two-way with good quality communication between teachers and students, both in online and face-to-face learning. The interest of students in participating in blended learning process is also an indicator of the quality of blended learning implementation. The findings on this indicator show that students' interest in blended learning is already quite high. This can be seen from the positive response of students, where all students agree if learning activities are conducted through blended learning. Additionally, this interest is also reflected in the students' attention, such as being on time for online learning, completing every task well according to the teacher's instructions, and asking questions or objections during discussions in the WA or Zoom group.

The findings on the interest indicator, as seen from the students' responses (Table 3), showed an average score percentage of 86% with a "very good" criteria. On this indicator, the majority of respondents stated that they agreed that blended learning was more enjoyable than full online

learning, and all teachers should strive to stimulate students' interest in blended learning activities. Meanwhile, the results of students' responses on the indicator of teacher's ability to enliven the learning atmosphere (Table 3) obtained the highest average score percentage of 87.50% with the category of "very good". On this indicator, the majority of respondents agreed that all teachers should have good skills in enlivening the learning atmosphere during blended learning activities. This is also supported by the information obtained from interviews with students, which showed that all biology teachers were able to enliven the learning atmosphere so that students did not feel bored, whether in online or face-to-face learning. The methods used varied, with some teachers preferring to tell stories and jokes during teaching, creating a relaxed learning atmosphere, some teachers initiating open discussions, some providing arguments, and some giving criticism, so that learning activities are not boring.

The results of student responses on the indicator of systematic organization of material in blended learning (Table 3) obtained an average score percentage of 86% with the criteria of "very good". On this indicator, the majority of respondents agreed that the learning materials presented by teachers during the implementation of blended learning should be well-organized, so as not to make it difficult for students to understand the learning material. Therefore, the better the teacher's ability to organize learning materials, the easier it is for students to understand the material. Regarding the ease of students in understanding learning materials, it can be seen from the information obtained from interviews with students that the learning materials provided by teachers during blended learning are easy to understand because they are presented in a complete manner and there are also supporting videos to make the material easier to understand.

Regarding the alignment between the learning process and the learning implementation plan, as observed through the utilization of media and technology in blended learning, it was found that the media and technology platforms employed by the biology teacher in blended learning were in line with those specified in the learning implementation plan. According to the students' feedback, the biology teacher used a diverse range of learning media during blended learning, such as instructional videos, presentation slides (PowerPoint), and images. Similarly, various technologies, such as Zoom meetings, WhatsApp, Google Classroom, Google Meet, and Edmodo, were utilized by the biology teacher during blended learning.

The diversity of teaching methods also serves as a benchmark for the alignment of the learning process with the learning implementation plan. Based on the information and analysis of the learning implementation plan developed by the teacher, there were several teaching methods utilized during blended learning, such as assignments, interactive discussions, and portfolios. All these methods were previously specified in the learning implementation plan. These details were consistent with the student's feedback on the diversity of teaching methods (Table 3), where the average score obtained was 86 percent, indicating "very good" criteria. On this indicator, the majority of the respondents agreed that all biology teachers utilized a diverse range of teaching methods during blended learning activities.

Evaluation Results of Blended Learning Implementation in Terms of Product Aspect

Product evaluation aims to determine the results achieved from the implementation of blended learning, as well as how teachers measure the achievement of results from the implementation of blended learning. Regarding the specific achievement of mastery indicators on the remaining material in biology subjects, it shows that overall, students from State Senior High School 1 in Jambi City have mastered the material quite well, although they still need further explanation of the material from teachers during face-to-face learning. This is evidenced by the statement from the biology teacher, that there has been an improvement in student's ability to master the material during biology learning activities based on blended learning, compared to learning activities that do not use blended learning models. This is because in this learning model, students are required to be more active in independently searching for information from various sources related to the topics they are learning, so indirectly, students in their metacognitive activities have built their own knowledge from

the information they have obtained, thus increasing their ability to master the material compared to before.

The achievement of results from the implementation of blended learning can also be seen from students' achievement towards the general and specific objectives of teaching, where according to the biology teacher's statement, overall, students have already achieved and even exceeded the minimum mastery criteria of 75 for biology subjects, while participating in blended learning. In addition, the level of students' learning mastery during blended learning is higher than the level of students who do not use blended learning models. The positive impact of the application of blended learning models on learning mastery is due to the suitability between the exam and/or task material with the learning material provided by the teacher, as shown by the student's response to the indicator of the suitability of exam and/or task material with the learning material provided by the teacher (Table 4), where the highest average percentage of score acquisition was 87.50% with the category of "very good". In this indicator, the majority of respondents agreed that the exam or task material provided by the teacher is aligned with the learning material during blended learning activities.

Regarding the diversity of student learning achievement measurement methods, the findings show that there are variations in assessment techniques used by teachers to measure student learning achievement. For example, for knowledge competency, teachers use written test techniques in the form of multiple-choice questions, short answers, and essays. These three forms of tests are combined by teachers, both during quizzes, daily tests, and semester exams. For attitude competency, teachers use self-assessment techniques with instrument forms such as questionnaires. For skill competency, teachers use performance assessment techniques with instrument forms in the form of observation sheets and portfolio assessment.

The student's response to the indicator of the diversity of student learning achievement measurement methods (Table 4), showed an average percentage score of 85% with the criteria of "very good". In this indicator, the majority of respondents agreed that all teachers should use diverse methods to measure and assess student learning achievement during blended learning activities, in addition to giving assignments. This is also reinforced by the information obtained from interviews with students, that there are various assessments used by teachers during blended learning, such as; student's active participation in giving questions or arguments during discussions, multiple-choice tests, essay tests, matching tests, true/false tests, and portfolio assessment.

Table 4. Frequency Distribution of Students' Responses Regarding Blended Learning Evaluation on Product Aspect

Indicator		w					Total	%	Criteria
		1	2	3	4	5			
Structured assignments (group assignments, individual assignments, problem-solving exercises, etc.)	f	0	1	5	23	11	164	82	Very Good
	fw	0	2	15	92	55			
Provision of feedback on assignments (return of assignments)	f	0	0	4	20	16	172	86	Very Good
	fw	0	0	12	80	80			
Diversity of ways to measure student learning outcomes	f	0	0	5	20	15	170	85	Very Good
	fw	0	0	15	80	75			
Alignment of exam and/or assignment material with learning material	f	0	0	2	21	17	175	87,5	Very Good
	fw	0	0	6	84	85			
Alignment of grades given with student learning outcomes	f	0	1	1	21	17	174	87	Very Good
	fw	0	2	3	84	85			
Average							**171**	**85,5**	**Very Good**

1: Strongly disagree; 2: Disagree; 3: Somewhat disagree; 4: Agree; 5. Strongly agree

The student responses regarding the indicator of the alignment between given grades and student learning outcomes (Table 4) showed an average percentage score of 87% with the criterion of "Very Good". The majority of respondents agreed that the final grades obtained by students in a course were in line with the learning outcomes achieved during blended learning. This is also supported by the information obtained from interviews with students, stating that their final grades corresponded with the values assigned to assignments and test scores, including quizzes and daily tests.

In addition, the student responses regarding the indicator of feedback provision on assignments (assignment feedback) (Table 4) showed an average percentage score of 86% with the criterion of "Very Good". The majority of respondents agreed that all teachers should provide comments and suggestions for improvement on all assignments completed by students during blended learning activities. This is also supported by the information obtained from interviews with students, stating that teachers had provided feedback on their assignments, whether in the form of comments or suggestions for improvement. This helped the students identify their shortcomings and mistakes in their work.

Barriers to Implementing Blended Learning in Biology Subject at State Senior High School 1 in Jambi City

The implementation of blended learning is not free from various obstacles or barriers, and one of the learning components that often faces barriers is online learning, whether technical or non-technical. One of the barriers that students often face in biology-based blended learning is the aspect of communication technology, namely unstable internet networks. Another obstacle is interpersonal communication barriers. This is because the use of online learning media or platforms such as Zoom applications can make users psychologically uncomfortable, as they become the center of attention and feel like they are trapped in a computer window. This results in users being more anxious psychologically. In addition, not all students have mediated communication skills and are able to grasp online learning material, which can potentially lead to misunderstandings of information or material conveyed by the teacher. The findings regarding students' difficulties in understanding online learning material can be seen from the statements made by students, where they still have difficulty understanding the material given because of minimal explanation from the teacher. Although some teachers use learning videos and voice notes on WhatsApp to explain the material, there are also teachers who only instruct students to understand certain material and answer questions without any explanation.

Another barrier is students' lack of understanding of digital media communication culture. Online learning requires adjustment of communication methods, rules, values, norms, ethics, and communication agreements. Findings show that student informants have a lack of understanding of digital media communication culture. They believe that in online learning, etiquette, rules, and communication methods are different from those in face-to-face classes. For example, they think it is okay to communicate with non-standard language or send messages to friends or teachers until midnight because they believe that communication can be done anytime (asynchronous communication). This condition creates discomfort for teachers or other students and disrupts relationships in online learning.

Another obstacle that students experience in blended learning is increased stress levels and decreased learning motivation. Attending classes in person is considered more enjoyable because there is interaction, humor, and stories when having informal communication with friends and the environment before and after class. In online classes, communication is seen as too formal. The learning process is perceived as serious, rigid, and there is not enough time to build interpersonal communication. Human interaction and social interaction cannot be done freely. As young people who like to socialize, the lack of interaction and feeling trapped becomes a burden for students, leading to higher stress or pressure.

Environmental disturbances are the next obstacle in blended learning, especially during online learning. To ensure that students feel comfortable while attending online classes, a comfortable and

distraction-free learning environment is needed to maintain students' focus during the learning process. The findings show that there are still families in the students' home environment who do not fully understand the context of online learning and consider online classes to be less important than in-person classes. Therefore, during online learning, they interrupt, talk to students, or ask them to do other activities (multi-activity).

The commitment and empathy of teachers are also a hindering factor in the implementation of blended learning. The findings show that there are still teachers who are considered less committed to online learning. For example, unilateral schedule changes by teachers are seen as a barrier to the certainty of learning time information. Teachers are also considered to lack empathy for students' conditions by giving them many assignments in a limited amount of time.

DISCUSSION

Evaluation of Blended Learning in Biology Subject at State Senior High School 1 in Jambi City

The evaluation of blended learning, viewed from a contextual aspect, shows that the implementation of blended learning is in line with the underlying needs. This can be seen from the fulfillment of all elements in the context of blended learning, namely: (1) the availability and suitability of equipment such as laptops and smartphones owned by teachers and students, (2) compatibility with the learning styles of students, (3) the ability of teachers and students to operate technology and online learning platforms, (4) the suitability of the course material with the chosen learning model, and (5) the suitability of strategies and methods with the material and characteristics of the students.

The availability of adequate and supportive equipment such as laptops and smartphones owned by teachers and students is a prerequisite for blended learning to be carried out. This is because the availability of laptops and smartphones is part of the support system needed to implement blended learning, especially for online learning sessions. The ability of teachers and students to operate technology and online learning platforms is also included in the support system for blended learning. The ability to operate technology and online learning platforms falls within the realm of digital competence, which is very important for teachers to master as digital educators in blended learning. This is also in line with Dinata's statement (2021) in his research that the aspects of facilities and infrastructure, as well as the ability of teachers and students to operate technology and learning platforms, are determining factors for the success of online learning (one of the components of blended learning).

Regarding the ability of teachers to operate technology and online learning platforms, according to the research conducted by Supyani & Fikri (2021), it is included in the generic digital competence aspect, where this competence shows the general knowledge and skills that teachers must have in order to function as digital educators. This dimension is identical to the description of digital competence in general, such as the ability to operate computers, archive files, and so on. In more detail, Blyznyuk (2018) divides digital competence of educators into several forms, namely: (1) information, which is the ability of educators to search, choose, sort, evaluate, and manage information that is suitable for learning, or in other words, referred to as data literacy skills, (2) communication, which is the ability of educators to interact, engage, share, and collaborate through digital technology, (3) educational content creation, which is the ability of educators to create digital learning content (learning application programs, interactive presentations, learning animations, and so on), (4) security, which is the ability of educators to ensure protection against the impact of technology products for students in the learning process, and (5) educational problem solving, which is the ability of educators to solve problems and overcome technical problems, identify responses and technological needs required in learning, identify weaknesses in digital technology in learning, and creativity in using technology products in learning positively.

The selection of media and platforms used by teachers in blended learning for the subject of biology is adjusted according to the characteristics of students' learning styles. Learning style refers to the ability of learners to absorb, process, and convey information (Sari, 2014). Each learner has a different learning style, with three main types: visual, auditory, and kinesthetic (Rahman et al., 2016).

Visual learners tend to observe and remember information by visualizing something in their minds (Simanjuntak, 2017), while auditory learners are more likely to understand information conveyed verbally (Andri, 2013). Kinesthetic learners, on the other hand, learn best when they are actively involved, moving, experiencing, and manipulating what they are learning (Gholami & Bagheri, 2013). Although every individual, including students, has tendencies towards all three learning styles, one type of learning style tends to be more dominant than the others (Wahyuni, 2017). Therefore, teachers should understand the differences in their students' learning styles so that the selection of learning media and platforms in blended learning can truly accommodate their students' learning styles.

Based on information from the biology teacher at State Senior High School 1 in Jambi City, it was found that the majority of students at the school have an auditory learning style, accounting for around 50%, followed by 40% for visual learning style and 10% for kinesthetic learning style. The dominance of auditory learners among the students is due to the fact that according to the results of research by Csapo & Hayen (2006) and Anbarasi et al. (2015), the higher the level of education, the more individuals will have an auditory learning style, and the fewer will have visual and kinesthetic learning styles. Hakim et al. (2021) state that the educational process that individuals go through will train their auditory modality more, considering that most of their learning processes rely on hearing as their main modality. The higher the level of education, the longer they are in a condition that requires them to train their auditory modality. This condition makes the majority of individuals more comfortable with the auditory learning style.

Learning style will determine what type of learning media individuals will choose, so that the subject matter they are learning can be more easily understood (Rahman et al., 2017). Ideally, visual learners will choose visual learning media, auditory learners will choose audio media, and kinesthetic learners will choose media that facilitate physical activity. Referring to the two dominant learning styles, auditory and visual, among the students, State Senior High School 1 in Jambi City's teacher decided to use media that contain both visual and auditory elements, or what is also known as audio-video media. The positive response from students towards the diversity of media used by the teacher, namely the presence of visual and audio elements in the media used, indicates that the teacher's selection of learning media was appropriate and could accommodate the two modalities of the students' learning styles at State Senior High School 1 in Jambi City.

The alignment of the subject matter with the selected learning model is another requirement for effective implementation of blended learning in biology education. Findings indicate that not all topics in biology use blended learning models. The choice of whether to use a full online or blended learning model depends on the depth and breadth of the material, as well as whether face-to-face practical activities are required for each topic. The alignment of the subject matter with the selected learning model, whether it be blended learning or distance learning, indicates that the choice of learning model has been considered in accordance with Asyafah's (2019) four criteria: (1) the characteristics of the learning objectives (competencies) established, (2) specific learning objectives in developing potential and competencies, (3) the characteristics and modality of learners, and (4) the learning environment and other learning support facilities.

The evaluation of blended learning from an input perspective indicates that the implementation of blended learning to achieve the goals of blended learning has been supported by (1) the readiness of teachers in planning, implementing, and evaluating blended learning, (2) the understanding of teachers in the technology or applications supporting blended learning, (3) positive student responses to the policy of implementing blended learning, and (4) student experiences in learning using e-learning technology.

The evaluation of blended learning from a process perspective indicates that the quality of implementation of blended learning has been quite good, and the blended learning activities implemented by biology teachers in State Senior High School 1 in Jambi City are in accordance with the plan for learning implementation. One indication of the good quality of implementation of blended learning can be seen from the digital literacy skills of students. Findings on students' digital

literacy skills indicate that the majority of students at State Senior High School 1 in Jambi City have good enough skills in searching for information related to learning materials from various sources.

According to Dinata (2021), digital literacy skills are essential for learning, especially in online settings. Azmi's (2006) research indicates that students consider digital literacy skills, such as the ability to search for information in databases, to be crucial for academic success. Students with strong digital literacy skills can efficiently locate and evaluate important information, communicate effectively, and express ideas in the digital realm. These skills are necessary for utilizing information gathered from the internet for academic purposes and solving scientific problems in various contexts (Nahdi & Jatisunda, 2020).

In terms of the quality of implementing blended learning, a study on the ability of students to overcome obstacles in online learning conducted by Sriwarthini et al. (2020) found that unstable internet connectivity was the most frequently encountered difficulty. However, students could identify the obstacles they faced and sought solutions to solve the problems, enabling optimal implementation of online learning.

Another aspect of the quality of implementing blended learning, evaluated through teacher-student communication during learning activities, showed that communication was interactive and of reasonable quality, both in online and face-to-face learning. Teachers employed three forms of communication in blended learning, which were also found in Iswari's (2021) study: (1) informative communication, where teachers provide information and learning material to students online and in-person; (2) persuasive communication, which aims to change behaviors or habits, such as motivating students to stay active during the learning process; and (3) instructive communication, used for assignment collection and assessment.

The evaluation of blended learning's product aspect showed that the implementation of blended learning had achieved the learning objectives of each course, and students had a good understanding of the material. The study also found that blended learning positively impacted the achievement of the minimum passing criteria for biology.

The positive impact of blended learning on meeting minimum passing criteria was consistent with the findings of Ramadhani (2020), Fadhilatunisa et al. (2020), and Rahayu et al. (2022), who stated that blended learning had a significant and positive effect on students' learning outcomes. According to Aunurrahman (2013), the use of appropriate learning models can enhance students' interest in the subject, improve motivation, and facilitate learning, resulting in better learning outcomes. Hermawanto et al. (2013) also found that the implementation of blended learning had a significant and positive effect on students' concept mastery and reasoning skills. These findings align with Al-Mekhlafi's (2004) assertion that using communication and information technology in blended learning has a positive impact on students' performance and learning achievements. Additionally, Husni et al. (2010) found that using computers in teaching improves students' conceptual understanding and individual ability to acquire information in society.

Obstacles to the Implementation of Blended Learning in Biology Subject at Senior High School 1 in Jambi City

The implementation of blended learning in teaching activities at State Senior High School 1 in Jambi City is not without various obstacles or hindrances. Based on the findings, six factors were identified as hindering the implementation of blended learning: (1) communication technology, specifically the unstable internet network, (2) discomfort in interpersonal communication between students and teachers, leading to difficulties for students in mastering the material, (3) students' lack of understanding of the digital media communication culture, (4) stress and decreased motivation to learn, (5) a non-conducive learning environment, and (6) teachers' low commitment and empathy towards students.

The problem of poor internet signal and insufficient internet quota to access and carry out online learning is a common issue experienced by students. To address this issue, the Ministry of Education and Culture of the Republic of Indonesia has collaborated with the Ministry of Communication and Information and several internet providers to facilitate the availability of

affordable internet packages with wide coverage (Cahyawati & Gunarto, 2020). Sriwarthini et al. (2020) also found that the most common problem encountered in online learning is the unstable internet network. Resubun et al. (2021) similarly found that an unstable internet network is a hindrance faced by university students. To overcome this obstacle, students at State Senior High School 1 in Jambi City seek places with good signals and directly communicate their problems to their teachers. Nurchayati et al. (2021) discovered various ways that students deal with unstable internet networks, including buying additional internet quota, seeking public places that offer free Wi-Fi, using their parents' or friends' Wi-Fi, and even switching their mobile SIM cards to a provider with a stronger signal. The most common way used by students is to add to their personal internet network's data package.

Another hindrance in online learning is interpersonal communication barriers. This is because online media use makes users psychologically uncomfortable since they are the center of attention and feel as though they are in a computer window, causing psychological stress. Additionally, not all students have mediated communication skills and the ability to capture online learning material, potentially leading to misunderstandings of information or material conveyed by the teacher. To overcome this obstacle, efforts from teachers are needed to create a comfortable communication atmosphere so that students do not feel anxious, stressed, or lack confidence. Teachers can use strategies such as ice breaking, which involves giving a little game, showing something interesting, focusing attention and preparing to learn again, and providing short and funny stories about good and bad things that can be discussed further (Munir, 2017; Muawanah, 2017).

One of the obstacles experienced by students in blended learning is the level of stress and decreased learning motivation. Anggrini (2021) revealed that stress can affect students' learning outcomes, as it can easily cause confusion and perceptual distortion. This distortion can disrupt learning by reducing the ability to concentrate, remember, and connect one thing with another. Jatira & Neviyarni (2021) stated in their research that the stressors experienced by students during online learning are boredom from being at home or not being able to meet face-to-face, the online learning process becoming tedious, not being able to follow online learning due to limited signal and learning tasks.

Stress experienced by an individual can be overcome by managing stress, known in psychology as coping stress strategies. According to Coon & Mitterer (2012), coping stress strategies are a form of application to reduce stress and improve coping skills through cognitive and behavioral processes. Coping stress is an action that can be taken by individuals to tolerate, control, minimize, or reduce the effects of stress, and individuals can incorporate behavioral and psychological strategies (Cicarelli, 2015). Meanwhile, according to Lazarus (Safaria & Saputra, 2009), coping is a strategy for solving the simplest and most realistic problems by managing behavior, useful for freeing oneself from various real or unreal problems.

Decreased learning motivation is another hindering factor that has the potential to have a negative impact on students' success during blended learning. One element in blended learning, online learning, has the potential to create boredom for students. This boredom can lower the students' learning motivation, as demonstrated by the research findings of Dianti & Findyartini (2019) showing a significant relationship between boredom and students' learning motivation.

Wangge et al. (2021) conducted a study revealing the forms of student boredom in online learning, namely: (1) decreased attendance in online learning with various reasons or arguments, (2) minimal response to given materials, (3) brief answers to direct questions, (4) minimal interaction and classroom discussion, (5) hasty completion of assignments, (6) submission of assignments beyond the designated deadline, and (7) non-comprehensive and hasty exam answers. Strategies that teachers can implement to overcome the decrease in learning motivation caused by boredom include (Wangge et al., 2021): (1) scheduling flexible learning times between online and face-to-face learning, (2) enriching learning materials by accommodating contextual issues, which according to Kadir (2013) and Afriani (2018) can increase student motivation in following learning, and (3) expanding learning media by utilizing social networks.

Another way that teachers at State Senior High School 1 in Jambi City can enhance learning motivation and reduce student boredom during online learning is through the use of planned humor in their presentation media. As a pedagogical tool, humor can alleviate students' anxiety and awkwardness in class. Effective humor application can help educators engage students in learning and even alleviate pressure or stress during exams (McGrath, 2013). Planned humor is humor that can be done by all educators in learning, as it does not require teachers to be creators or designers of humor and to master good humor techniques. Planned humor only requires a little ability to select and mix humor obtained from various sources and is considered beneficial for creating fun and enjoyment in learning (Darmansyah, 2010). If an educator is uncomfortable being the source of humor, teachers can use other humor-related content in teaching. Educators can use visual media such as cartoons, funny videos, and also direct students to humorous websites. Various types of humor combined in learning are considered by students as tools that facilitate them to feel pleasure, comfort, and motivation when learning (Wanzer, 2002).

Low learning motivation issues can also occur in students during face-to-face learning. To overcome such barriers, there are several alternative strategies that can be used to enhance student learning motivation in face-to-face learning (Susanto, 2006), namely: (1) allowing students to make decisions and take control, (2) providing clear instructions, (3) creating a classroom environment that is free of threats, (4) changing the learning atmosphere, (5) offering diverse learning models and methods, (6) creating positive competition, (7) offering rewards, (8) giving responsibility to students, (9) providing opportunities for students to learn in groups, (10) encouraging students to reflect on themselves, and (11) helping students find motivation from within themselves.

CONCLUSION

Based on the evaluation results of blended learning in biology classes at State Senior High School 1 in Jambi City, it can be concluded that the implementation of blended learning is in accordance with its underlying needs. The execution of blended learning has been supported by various required factors, such as teachers' professional and pedagogical competencies, teachers' digital literacy skills, student support, and student experience with e-learning technology. Thus, the implementation of blended learning can proceed well, in line with the lesson plans developed by teachers. Regarding the achievement of learning goals, the implementation of blended learning has reached the intended learning goals, as seen from the attainment of the minimum mastery criteria of each biology topic and students' sufficient mastery of the material.

However, there are some inhibiting factors to the implementation of blended learning, including: (1) communication technology, such as unstable internet networks; (2) discomfort in interpersonal communication between students and teachers, leading to difficulties for students in mastering the material; (3) students' lack of understanding of digital media communication culture; (4) stress and decreased motivation to learn; (5) a non-conducive learning environment; and (6) teachers' low commitment and empathy towards students.

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