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Analysis of the Learning Needs of Middle School Students in Science Learning Environments in Areas with Different Technological Supports

Pramita Sylvia Dewi[1] & Ari Widodo[2]

[1]Department of Science Education. Universitas Lampung, Indonesia

[2]Department of Science Education. Universitas Pendidikan Indonesia, Indonesia

*Corresponding email: pramita.sylvia@fkip.unila.ac.id

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Abstract: Analysis of the Learning Needs of Middle School Students in Science Learning Environments in Areas with Different Technological Supports. Objective: The supporting technology quality influences online learning the availability of technology in the schools varies depending on the location and the financial situation. This study aims to analyze the learning environments of schools with different technological supports. **Method:** Respondents were 1,543 junior high school students in grades 7, 8, and 9 who lived in six major islands of Indonesia. An online four-scale questionnaire on critical thinking in learning strategies, student involvement in teamwork, management of student learning environment, evaluation of goal setting in the learning community, cognitive problem solving, and student relevance in learning by using a Blended Learning Environment (BLE) questionnaire. Data were collected from those that have a variation in technological support. **Findings:** The results of this study analyze how prepared students, teachers, and schools face the conditions of the learning environment through available technology. This research can help teachers consider strategies to anticipate obstacles during learning. **Conclusion:** Viewed from the aspect of students, they must have good self-regulation in receiving an understanding of learning conditions. Meanwhile, teachers and schools must provide essential services in science without burdening students with tasks. Education in the era will provide an evaluation description for implementing more planned access to education in the future.

Keywords: blended learning environment, technology support, science education.

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INTRODUCTION

Online learning presents various obstacles to the teacher and the students. Availability of devices and internet access are two basic requirements for online learning. The absence of facilities could affect student academic achievement (Bakken, Brown, & Downing, 2017; Finn & Rock, 1997) and decrease learning motivation and self-efficacy (Baird, Dearing, & Hamill, 2009). Therefore, teachers are wary of providing an efficient online learning environment to support student's academic achievement (Galos & Aldridge, 2020). The pleasure of learning is reflected in the learning environment in the classroom between students and teachers to interact with each other during learning (Bell & Aldridge, 2014) and understand students' self-regulation better (Velayutham & Aldridge, 2013). Several studies reveal that students' self-regulation skills related to academic achievement are consciously managed in a good learning environment (Barnard, To, Paton, & Lai, 2009).

Today, blended learning environments have become part of students' learning experiences

worldwide, taking a significant part in the learning process (Han & Ellis, 2020). Learning environment facilities play an important role, especially where the use of technology systems managed by schools could be more practical in its application, making it difficult to obtain effective learning outcomes. In comparison, integrating information communication technology in the learning environment has considerable potential to provide a means that can be managed efficiently as an educational provision to optimize the potential of each student (Aldridge, Dorman, & Fraser, 2004; Aldridge, Fraser, & Fisher, 2003).

This study analyzes findings on integrating communication technology in school learning. Technology development in China is very rapid, but it is different from the enthusiasm of students' learning (Huang, Teo, & Zhou, 2020). Furthermore, supporting factors from schools, teachers, and student interactions affect internet-based technology. This is increasingly convincing that the problem of integrating internet-based technology for students in Indonesia is constrained by uneven signaling. For this reason, it is necessary to collect data for students so that researchers understand the learning environment they experience. Initially, many schools and policymakers debated using digital technology (Aubrey & Dahl, 2008), because it was feared that students were not emotionally and socially ready to take online classes (Edwards, Skouteris, Rutherford, & Cutter-Mackenzie, 2013). However, the challenges of online learning emphasize that digital learning can help students understand abstract concepts and engage them in collaborative learning, reasoning, and problem-solving activities (Dong, Cao, & Li, 2020).

Arnott and Yelland (2020) argue that digital technology incorporating social and cultural aspects into students' daily lives can provide a pleasant learning atmosphere. The role of parents also greatly affects students' technology skills, which are the closest part of the student's environment. Parent's beliefs and attitudes about the potential of online learning can affect students' learning experience in terms of the quality and quantity of online learning (Isikoglu Erdogan, Johnson, Dong, & Qiu, 2019). The topic gap analysis was followed up on the relationship between the use of technology and the quality of online learning based on field data related to the situation to record the condition of the learning environment. Cohen et al. (2009) also explained that correlations could be analyzed through literature studies, data collection, and historical analysis to provide learning improvement insights. Considering aspects of the success of the learning environment include reflecting on results, planning improvements, and implementing strategies to reassess what is happening in the current situation and conditions in the learning environment (Aldridge, Fraser, & Laugksch, 2011). Data collection focuses on technology support in mixed-learning environments. It is hoped that this research can contribute to providing background information for each student to update their online learning to be more effective and open up teacher awareness of the need for the right learning approach so that students are motivated and actively involved, especially because the number of laziness in learning in the online learning era is usually higher.

A Learning Environment (LE) is a flexible, directed process centered on using the environment for learning (Duchastel, 1994). LE is rooted in the concept of learning that emphasizes information, interest, and regulation between the role of students and their learning environment. The learning environment involves the teacher that students must construct the meaning of their learning, starting with the beliefs, understandings, and cultural practices brought to the classroom (Sinha, Rogat, Adams-Wiggins, & Hmelo-Silver, 2015). Therefore, this study developed six main indicators called the Blended Learning Environment (BLE) instrument to

identify better student learning processes with technology that supports the change and impacts the learning environment.

First, emphasis on critical thinking in learning strategies develops students' critical awareness in planning activities in the learning environment; this supports the development of student self-regulation regularly in the classroom (Velayutham, Aldridge, & Fraser, 2011). The existence of perceived self-efficacy, as in the research of Liaw and Huang (2013) also shows that learning leads to goal-based strategies. When the learning environment is designed as a learning strategy, the results will mark success as a determinant of the validity of the learning environment. In this sense, learning is the critical basis for all learning environment design.

Second, student involvement in teamwork supports the learning environment, so a learning community is needed as an inquiry activity (McKerlich & Anderson, 2008). The involvement is characterized by the level of participation and interaction of students and teachers, including students' experiences in group activities to create an optimal learning environment. To assess the quality of teacher and student involvement, social behavior in the learning environment plays a crucial role in learning success, where student readiness is vital for successful learning in any condition so that it is correlated with learning outcomes (Lee, Song, & Hong, 2019; Wang, Han, & Yang, 2015).

Third, the student learning environment management focuses on managing learning facilities with behavioral involvement, where students participate actively. An essential element that contributes to the success of blended learning is the management and willingness to take responsibility for one's education and plan learning time (Barnard et al., 2009). Han and Ellis (2020) also added that learning management leads to motivation and the implementation of goals. This management creates opportunities to decide what and how they learn; this reflects the characteristics of learning that emphasize active learning activities and support collaborative learning.

Fourth, the evaluation of goal setting in the learning community in Moos (1980) research revealed the involvement of students' roles, clarity of rules, and teacher control in assessing the evaluation of the learning system and the dimensions of change-oriented to class maintenance so that the class functions correctly, orderly, clearly, and coherently for changes in the classroom environment according to learning objectives. The essential factor in Sriwichai (2020) research is that the teacher must prepare students for independent learning through online and face-to-face classroom instruction when conducting an intervention. Therefore, they can apply the knowledge to the planned classroom environment by providing students with the knowledge. An evaluation of the socio-emotional sense in a learning community is essential; in other words, to increase the level of intervention and retention, the teacher tries to develop appropriate communication so that interactions that involve a sense of togetherness in the learning environment are created well.

Fifth, cognitive problem-solving becomes an ability that comes from a source of knowledge facilitated by the teacher, so the teacher must give contextual issues to students (Herrington & Oliver, 2000). Research by Lee et al. (2019) stated that cognitive problem-solving refers to students' internal mental processes, such as knowledge formation, understanding, and application. Learning satisfaction is a psychological condition that includes an interest in learning, expectations about learning, and enjoyment. Therefore, cognitive problem-solving is acquiring, understanding, and utilizing knowledge; this is essential it affects learning achievement (McKerlich & Anderson, 2008).

Sixth, the relevance and innovation of students in learning activities is the contribution

of students to plan and create opportunities for learning activities to the conditions of the learning environment (Fraser, Tobin, & McRobbie, 2012). The role of students in their involvement in interacting affects the absorption of ideas (Sinha et al., 2015). Specifically, the engagement acts as a form of prediction, commentary, or expression. In line with the research results by Liaw and Huang (2013), which states that student involvement in e-learning represents students' thoughts, such as interests, creations, hopes, and motivations, manifested in the form of learning activities and positive attitudes toward the learning environment. In comparison, satisfaction refers to interest and creativity in conceptualizing learning content reflecting expectations. This will later correlate with students' knowledge from learning by involving teachers and technology (Mørk et al., 2020).

METHOD

The subjects of this research consisted of 1,543 students, with details of 612 (39.7%) male students and 931 (60.3%) female students. This research involved 124 junior high schools with 58 different classes, representing 24 provinces in Indonesia, using a random cluster sampling method by grouping six regional clusters. Namely, Sumatra Island, Java-Bali Island, Kalimantan Island, Sulawesi Island, West Nusa Tenggara (NTB) Province, East Nusa Tenggara (NTT) Province, Maluku Province, and Papua Province. This selection is based on geographical location and ease of access to information. This research design is more quantitative research with a descriptive approach, a type of research that explores and understands the meaning of several individuals or groups of people originating from social problems (Creswell, Hanson, Clark Plano, & Morales, 2007). This research explains each step of the findings based on the results of the questionnaire data obtained.

This instrument was obtained from the BLE questionnaire, which was distributed online using a Google Form in non-test form, totaling 51 items for 6 indicators, including critical thinking in learning strategies (9 items) and student involvement in teamwork (9 items). Management of the student learning environment (9 items), evaluation of goal setting in the learning community (5 items), cognitive problem solving (9 items), and student relevance in learning (9 items). Data were collected from instruments with a Likert scale for analysis of descriptive data quality (Isaac & Michael, 1982). This instrument was developed independently through several stages with expert validity and statistical validity tests. The analysis was continued using the Confirmatory Factor Analysis (CFA) method to test the suitability classification of instrument scale items. CFA testing criteria by testing the value of Kaiser Meyer Olkin Measure of Sampling Adequacy (KMO MSA) and the value of Anti-Image Correlation. Results are shown Table 1.

Table 1. KMO and bartlett's test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.972
Bartlett's Test of Sphericity	Approx. Chi-Square	30711.428
	df	1275
	Sig.	.000

The Kaiser Meyer Olkin Measure of Sampling Adequacy (KMO MSA) value shows several 0.972, which means the deal is > 0.50, so it can be concluded that the data uses an adequate sample and has been fulfilled. It also means that all values in the test results are valid. Data analysis was carried out with the help of statistics to check the reliability and validity of

the data, then added to analyze differences in needs between science education students. In addition, the confirmatory factor analysis (CFA) validity was tested by testing the Kaiser Meyer Olkin Measure of Sampling Adequacy (KMO MSA) value and the anti-image correlation value. This test is used to classify the suitability of items and determine whether the sample is adequate. A structured questionnaire was chosen with open-type items, where all items for the evaluation dimension were assessed on a five-point Likert scale, from strongly disagree to strongly agree (Ghazali, 2016). However, in practice, only four scales are used, ranging from suitability to students' circumstances or beliefs to suitability to cases experienced by students. This aims to minimize the evaluation results objectively and avoid choosing neutral answers.

Data Collection

The proportional percentage in the distribution of students is also shown in Figure. 1, which explains that based on the data collection results through Google Forms, the capacity of technology support for online learning in each province is uneven. The detailed data are presented in Table 1 based on school data in each region and the number of junior high school students in each class who participated as respondents. In general, Table 2 presents data from 24 provinces of each island in Indonesia based on the distribution of students. There are differences in the characteristics of students in each region in dealing with the learning environment conditions. In the questionnaire, students expressed the situation they felt in learning science. This happens because of differences in technological support, which have benefits and challenges.

The data distribution was analyzed based on the number of students, classes, and schools, as shown in Figure 1. Based on the data distribution in Table 1, Sumatra Island has an almost exact percentage between the number of

Table 2. Distribution of sample data in each province based on number of students, classes, and number of schools

Province	Number of Students	Classes	Number of Schools
Aceh	13	3 Classes	7
Sumatera Utara	8	3 Classes	5
Sumatera Barat	46	3 Classes	4
Riau	68	3 Classes	15
Kepulauan Riau	91	2 Classes	3
Jambi	11	Classes	1
Sumatera Selatan	228	3 Classes	10
Lampung	208	3 Classes	12
Banten	72	2 Classes	1
DKI Jakarta	101	3 Classes	4
Jawa Barat	80	3 Classes	18
Jawa Tengah	27	3 Classes	12
DI Yogyakarta	6	2 Classes	2
Jawa Timur	59	3 Classes	4
Bali	32	2 Classes	2
Nusa Tenggara Barat	4	Classes	3
Nusa Tenggara Timur	30	3 Classes	2

Kalimantan Barat	65	3 Classes	6
Kalimantan Selatan	2	2 Classes	2
Sulawesi Utara	2	2 Classes	2
Sulawesi Tengah	4	2 Classes	2
Sulawesi Tenggara	288	3 Classes	4
Maluku	97	2 Classes	2
Papua	1	Classes	1
24 Province	1.543 Students	58 Classes	124 Schools

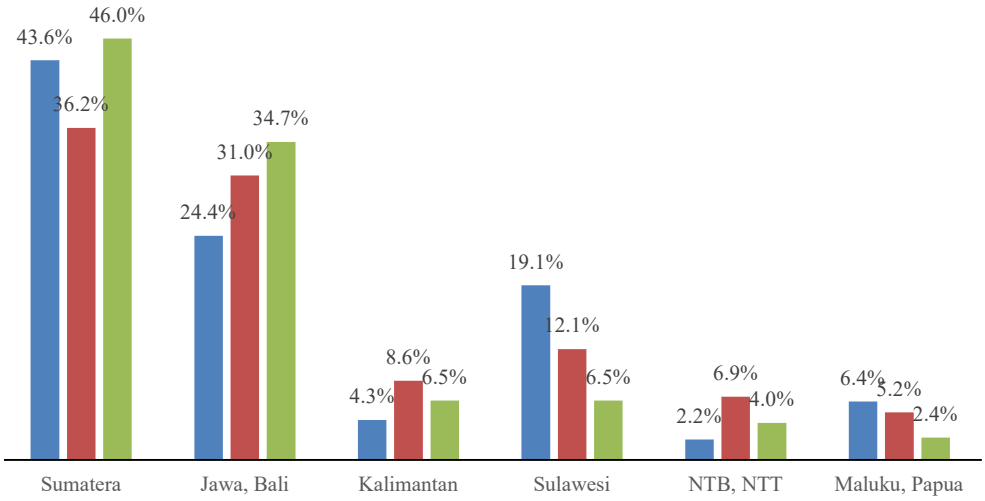

Figure 1. Data distribution on number of students, classes, and number of schools

students and the number of schools, with 46.0% representing 57 schools. However, the grade level is only 36.2%. Then, followed by Java-Bali islands, the highest percentage was found in the variable number of schools, which reached 34.7%, representing 43 schools. As for the island of Kalimantan, the number of students who participated was in a low category, only 4.3% or 67 students. Participating students from Sulawesi Island ranked second under Sumatra Island, with 19.1%. However, the number of classes based on the number of each school is still far from the distribution of the number of students. The bar chart of Sulawesi Island contrasts with Java-Bali, where Java-Bali Island has a higher school-level allocation.

On the other hand, Sulawesi Island has the highest distribution of the number of students. In contrast, Maluku and Papua Provinces occupy the second-lowest position among the five islands in Indonesia regarding class distribution and the number of schools because these two provinces are difficult to reach. However, for the number of students who took the survey, it turns out that the Provinces of NTB and NTT occupy the lowest position of the six islands in Indonesia. The map in Figure. 1 shows that the area of these two provinces is almost the same as the provinces of Maluku and Papua, so the number of students does not represent the results of the three categories achieved. This explains that geographical conditions in Indonesia also significantly affect the learning environment in each region in Indonesia. Furthermore, the reliability analysis in Table 3 was also carried out by testing the six essential indicators used in the BLE questionnaire. Reliability tests were carried out on each class and each gender difference.

Table 3. BLE indicator reliability index for classes and gender

B L E Competencies	Number of students	Number of items	Cronbach's Alpha
BLE of all indicators	1543	51	0.95
A. Critical thinking in learning strategies	1543	9	0.74
B. Student involvement in teamwork	1543	9	0.85
C. Management of student learning environment	1543	9	0.81
D. Evaluation of goal setting in the learning community	1543	6	0.71
E. Cognitive problem solving	1543	9	0.82
F. Student relevance in learning	1543	9	0.77
Classes Competencies			
Classes 7	604	51	0.94
Classes 8	703	51	0.95
Classes 9	236	51	0.96
Gender Competencies			
Male	612	51	0.96
Female	931	51	0.95

Based on Table 3, the reliability test results using statistics show an excellent reliability index of 0.95 based on Cronbach's Alpha. Likewise, with the six BLE indicators, which have a value range between 0.71-0.85, the reliability index of this BLE questionnaire is categorized as suitable for use in data collection, and each reliability index in each batch and gender meets 0.9 so that it is declared acceptable.

■ RESULT AND DISCUSSION

This explanation begins with the results of obtaining the entire main questionnaire data. The field survey showed that the data obtained from the BLE questionnaire provided information that the evaluation indicator for goal setting in learning communities, which is the fourth indicator, actually had the lowest percentage of student responses among the six main indicators. Based on the number of items in the fourth indicator, with only 5 items compared to 9 items in each of the other indicators, it is possible that students have not been able to reach the learning community with limited technology. Following are the results in Table 4.

Based on the data disclosed in Table 4, this can be controlled if students perceive that their role as individuals who must carry out the

Table 4. BLE competencies based on 6 clusters in Indonesia

B L E Competencies	Sumatera	Jawa, Bali	Kalimantan	Sulawesi	NTB, NTT	Maluku, Papua	$\underline{X}$
A. Critical thinking in learning strategies	78.6%	79.0%	76.3%	77.9%	74.8%	78.5%	77.52%
B. Student involvement in teamwork	83.7%	84.6%	80.7%	81.8%	84.4%	85.1%	83.38%
C. Management of student learning environment	78.6%	79.0%	75.4%	77.2%	76.0%	79.8%	77.67%

D.	Evaluation of goal setting in the learning community	77.1%	76.7%	75.6%	75.4%	78.2%	75.3%	76.38%
E.	Cognitive problem solving	80.1%	79.9%	78.4%	78.6%	75.2%	79.6%	78.63%
F.	Student relevance in learning	78.8%	78.1%	76.6%	76.9%	75.6%	77.2%	77.20%

teacher's duties positively impacts self-potential development. Thus, students have interventions to maintain their retention level in socio-emotional terms and express freer thoughts, but only some students are brave and aware. Furthermore, the crucial problem is the difference in technology support when students carry out science learning. The upper cluster is considered better in accessing technology to support student learning when compared to the central and lower groups. This aligns with the goal of online education, which cannot be done face-to-face, to increase further knowledge about technology pedagogical content (Graham, 2011; Mishra & Koehler, 2006). The condition of the learning environment that does not support technical technology affects the quality of students' exploration space. As for teachers, technology support can make it easier to access the resources provided on the website, including literature on TPD, at least accessing reading materials on teaching strategies, teaching media, and e-books (McMinn, Aldridge, & Henderson, 2021; Widodo & Riandi, 2013).

The first indicator explains that critical thinking in learning strategies with practical technical support can create interesting learning opportunities. The survey results are still not evenly distributed aspects of critical thinking strategies in the research cluster, such as creating opportunities for students to ask questions through learning activities (actively involved). Science learning must be based on a genuine learning intention. Such a strategy has a great chance of success. However, students who are actively involved in science learning (such as asking questions and answering questions in class) in Indonesia are relatively few (not the majority of students). Even when discussion activities were held between students, many students could not understand the stimulus of the problem well, so the discussion could not run well. Another problem is that teachers are not trained to stimulate the perception of science learning, so information cannot reach students properly (Duit, Treagust, & Widodo, 2008; Widodo, Sumiati, & Setiawati, 2006). This indicates that students have not been categorized as capable if they have not formed a different mindset in solving problems from some other students. Some students understand better when important statements are informed by analogy, and they prefer to find answers to teachers' questions through Google rather than doing their research.

Furthermore, information related to self-regulation needs serious attention. A measure of a student's self-regulation should design appropriate behavior (Van Laer & Elen, 2020). Students must integrate the learning context and show a positive relationship between behavior and self-regulation to be contextualized in blended learning activities as a critical thinking strategy. If examined more deeply, self-regulation is one of the success factors in learning. This can be seen from the results of the research questionnaire, where students claim to master the lesson when they take notes during online learning because notes are much more critical for reference material. In addition, self-regulation is related to student awareness. Good self-regulation brings awareness to students regarding the importance

of honing early skills and preparing before learning. Read online study materials to support prior knowledge and prepare questions before joining chat rooms for discussion. Therefore, self-regulation and learning outcomes should show a positive relationship, as contextualized to blended learning, so that it has the potential to support independent learning.

The second indicator that explains student involvement in teamwork based on the survey has a high cluster characteristic of access to information so that students are more technology literate. However, the support of student involvement in the learning environment tends not to prepare them to hone initial skills. This influence adversely affects students' skill development and psychological outcomes, including self-confidence and self-satisfaction. At the same time, virtual learning environments emphasize the importance of processes that support learning outcomes by using social media to increase students' perceptions of the importance of knowledge processes. However, it becomes unimportant when students do not understand the essence of using a virtual learning environment (Lacka & Wong, 2021). As seen from the results described, the low cluster indicates that the state of the student's learning environment makes them not have full control over learning. Students cannot construct the meaning of their learning, starting with the beliefs, understandings, and cultural practices brought to the classroom. Students are said to be socio-emotionally competent when they can find knowledgeable friends to consult with each other, create study groups, and need mutual assistance. Discussing with classmates makes students more aware of the lesson, and they can share points of view regarding how to solve problems.

The third indicator explains student learning management, in this case, as the dominant benchmark in determining the success and achievement of learning objectives. These findings identify that good student environmental management can be started by contributing to students and teachers. Furthermore, the management of learning planning shows readiness to learn related to learning activities to create an effective learning atmosphere. Reflects the characteristics of blended learning, which emphasizes student-independent learning activities. This finding is assumed as a collaboration factor in sharing knowledge and skills in time management to achieve learning objectives (Narayanan, Balasubramanian, Swaminathan, & Zhang, 2020). Aspects of students' online learning plans are well prepared if students can eliminate all environmental factors that interfere with learning. Regarding success in managing study time, it can be assumed that students have been unable to allocate study time because they still feel stuck in managing time. Students claimed to have tried to schedule the same time every week to study in class, always pay attention to the schedule for interacting with each other, and even steal extra time to study outside of learning hours but still had difficulty doing so.

The fourth indicator describes the goal-setting evaluation in the learning community and emphasizes each group's characteristics that have an evaluation role for its students. It turns out that student's curiosity about the information they need is very high, even though technology support in their area is almost uneven. However, in this case, the control of students and teachers is quite important to be assessed so that the conditions of the learning environment can be adequately controlled. Based on extracting information, which has a positive direction for class climate change. During the teacher's and students' discussion, the intervention changed the effective learning environment to carry out the actual learning process. This intervention should have feedback information to increase comfort in the learning environment. Controlling social

involvement in building student understanding must apply students' social skills and self-efficacy (Lin, Lin, & Laffey, 2008). The dynamic relationship between these constructs was assessed from learning satisfaction. Social behavior in the learning environment plays an important role in successful learning. When students consider it's okay, they ask the teacher, why should I study this? It's okay for students to complain about confusing learning activities, and it's okay for students to reveal things preventing them from doing their best. Remembering to undergo the actual learning process, the intervention must get feedback from students based on their perceptions to increase students' comfort in the learning environment.

The fifth indicator regarding cognitive problem-solving information related to technology plays a role in students' cognitive aspects. Based on the acquisition of further information, it was found that cognitive presence is important in every learning, especially science. Integrating science provides a foundation for students to understand science material further. These criteria also determine whether assessments and learning tools are more supportive of studying science according to conditions. Furthermore, students learn that modern science differs from ancient science and understand that people's values and opinions influence it. The description provides criteria for determining 'Are assessment and supportive learning tools necessary to demonstrate effective critical thinking?' This is supported because technology encourages critical thinking by dealing with unlimited access to knowledge (Puig & Anaya 2020). The fifth indicator is related to the sixth indicator, which explains the relevance of students in learning and shows that students' self-concept will affect learning motivation. When students have access to adequate technology, student self-control supports the ability to master it. The relevance of this learning activity also shows that students cannot form thoughts in their new knowledge without starting from scientific problems about the world outside the school. Sometimes, what students do has nothing to do with student life outside of school. Although students also learn how science can be a part of their lives.

The emergence of technology provides positive support for students' cognitive development, marked by students' ability to master technology (Pramathevan & Fraser, 2020). Learning objectives in schools are strongly supported by a technological culture that supports all aspects, so it becomes the main factor that helps student learning progress (Grimes & Warschauer, 2008). It turns out that this is in line with the statement of Gulek and Demirtas (2005), which states that when students experience an increase in cognitive development, the more often these students provide opportunities for themselves to access information. The problem finding the cognitive view critically examines reports requiring technical support. Through the opportunity to integrate technology into learning that adjusts to the frequency of its use as it relates to student achievement (Lei & Zhao, 2008; Warschauer, Knobel, & Stone, 2004).

The term 'learning environment' is most often associated with the psychological or emotional state of the classroom and social and cultural influences (Afari, Aldridge, Fraser, & Khine, 2013). The condition of the learning environment is the interaction of individual characteristics in determining human behavior both with the environment and as a significant learning quality (Fraser et al., 2012). Based on the data collection results on student support in every school in Indonesia, there is a diversity of increases in support for the use of technology. This change is the work attitude of students and teachers responsible for promoting students' critical thinking through the learning environment (Soebari & Aldridge, 2015). To that end, we look at various research directions supported by technology. One of the latest steps that have

emerged in education is the concept of an integrated learning environment. The mixed learning environment is intended to investigate the possibility of students engaging in affective learning or coping with general emotional problems (Mikulecky 2019) The blended learning approach can improve effective learning in the learning environment in the current era. Conceptual differences and quality influences are mediated by technology during e-learning activities.

So far, science is a learning dependent on the laboratory. Virtual laboratories are an alternative that students and teachers must master to support an ideal learning environment. Virtual laboratories are very powerful in enhancing critical voice and personal relevance. However, real laboratories are activities that virtual laboratories cannot replace as they promote student relevance, uncertainty, and negotiation aspects. However, each type of laboratory contributes differently to each part of the constructivist learning environment (Widodo, Maria, & Fitriani, 2017). This relates to the constructivist aspect of the lesson observed when receiving stimuli from two directions in learning. This aspect becomes an impetus for students to rethink ideas created by students, such as student awareness of learning status, exploration of student thinking, exploration of student interests, encouragement to self-regulate, reflect, and critical, and aspects of the knowledge generation process (Widodo, 2003). There is a paradigm shift in maintaining the quality of education—through various online platforms; this solution is judged to be the most suitable for today, regardless of the challenges teachers and students face. The transition from traditional to online learning can be a completely different experience for students and teachers as they adapt to the available alternatives (Pokhrel & Chhetri, 2021). Combining offline learning with technology to create mixed learning is expected to provide a learning environment that can increase students' learning potential so that students can learn anytime and anywhere (Dhawan, 2020).

The technology available for blended learning creates many difficulties. These difficulties and problems are related to modern technology, ranging from the difficulties experienced by humans as input users and technical constraints such as inadequate networks in each region. Sometimes, blended learning is uninteresting, whereas online content is theoretical and doesn't allow students to practice and learn effectively. Online learning makes students less utilized and less involved with the community, technical problems often occur, and difficulties in understanding instructional objectives are the main obstacles to online learning (Song, Singleton, Hill, & Koh, 2004). In conceptual change research, a multidimensional theoretical perspective justifies the possibility that support for instructional environment design is usually superior to instructional design. In principle, there is great potential for improving the practice of ongoing learning. However, research evidence on the impact of teaching informed by conceptual change through standard classrooms is still limited (Duit et al., 2008). Students tend to be less prepared for several competencies when learning is directed at blended learning. The low level of student readiness for management is reflected in students' lack of training in learning management (Parkes, Stein, & Reading, 2015).

Technology is one of the solutions to the world's problems in moving toward new teaching approaches (Kumar, Gupta, & Srivastava, 2020). Several obstacles have limited student learning: Google Meet and other teaching-based digital technologies. One of the fears caused by online learning is the emergence of fatigue and boredom in students. However, it is considered the dominant factor in every new model adopted by the learning system to minimize the learning gap (Al-Maroof, Salloum, Hassanien, & Shaalan,

2020). This factor is oriented to the different social needs that each student must build to reduce the harmful risks of online learning and develop socio-emotional abilities (Zhang, Wang, Rauch, & Wei, 2020). Thus, technology-based learning should provide convenience as variations in the use of technology in education can reduce the boredom factor in students. For this reason, teachers worldwide must create a real functioning learning environment that ensures good pedagogy implementation and reduces the fear factor. Therefore, it is necessary to have support from teachers and schools to make this happen.

■ CONCLUSION

This study provides four conclusions: (1) there are differences in the distribution of samples regarding the number of students, classes, and schools. This condition affects students' motivation to learn. (2) The BLE questionnaire succeeded in gathering information that students experienced many obstacles in accessing information, thus affecting the independent learning process. More preparations must be made to deal with learning so active student participation can be properly facilitated. With more mature practice, students will feel happier to learn and raise their enthusiasm to study independently. (3) The factors influencing students' independence to survive conditions are self-regulation and learning concentration planned for learning management. Students control themselves so they don't get bored with learning. Constraints from the lack of motivation to learn to cause fear and uncertainty in students, making students still depend only on the teacher. (4) The student's weakness can be overcome if schools and teachers anticipate learning barriers. The strategy that can be done is to modify learning methods to be more varied, where teachers use various techniques tailored to learning needs.

Although one solution to overcome the problems of online learning and blended learning is the selection of learning strategies by the teacher, the teacher's constraint factor cannot be ruled out. Teachers also experience difficulties in several aspects, including curriculum constraints. Teachers should only provide essential concepts to access the competencies needed because they are important for the evaluation process. In particular, science learning includes process, product, and attitude aspects, but online learning assessments are too focused on product aspects; in the end, they don't emphasize process and attitude aspects. An obstacle for teachers in giving assignments because they have to think about the ability of each student to adapt to the conditions of the learning environment.

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