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Submission date: 28-Aug-2023 01:31PM (UTC+0700)

Submission ID: 2152596902

File name: Artikel_ProSIDing_Scopus_Maesaroh_-_Maesyarah_UHAMKA.docx (210.4K)

Word count: 4375

Character count: 24547

Study on Factors Influencing Students' Academic Motivation in Biology Online Instruction

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Abstract¹⁴

The goal of this study is to determine how online biology learning methodologies affect the learning¹⁹ motivation of class XI science high school students in Jakarta, Indonesia. A mixed method was adopted for¹ the investigation. The sample for this study consisted of 80 students from class XI science who were chosen using the¹ Quota Sampling technique. A questionnaire and a series of interview questions about student learning motivation in online biology learning have been used¹ with answer options rated on a Likert scale and validated by experts. Based¹ on ten indicators, the results of a study on the learning motivation of class XI science students in online learning on biology material generated an average result of 5.16% of¹ students strongly disagree, 10.17% of students disagree, 22.24% of students express doubt-doubt, 36.92% of students agreed, and 25.52% of students strongly agreed. This study found that students in class XI Science 93 have high levels of motivation for online learning in biology material. Despite the fact that numerous students had problems paying attention when learning biology online. This undoubtedly affects the learning motivation of Jakarta's class XI Science Senior High School.

Keywords: learning motivation, biology learning, online instructions, pandemic period

Introduction⁸

Online instruction is one approach that is becoming increasingly popular. The increasing popularity of online learning methods is due to technological advancements and the desire for broad access to education (Daniel Hermawan, 2021). Online education in biology learning provides diverse, innovative, and creative learning opportunities that make use of multimedia (Cano et al., 2022).

The issue of the online learning environment, nevertheless is student academic motivation. One of the keys to student learning achievement is considered to be motivation (Elshareif & Mohamed, 2021). Other potential barriers to online learning include distraction from the home environment, social isolation, and a lack of traditional class structures, all of which can negatively impact student learning motivation (Wang & Eccles, 2012)

According to (Kadiresan et al., 2021), social support, contact between²³ students and teachers, and the quality of the didactic material being taught are all aspects that influence student motivation in online learning frameworks. The level of complexity of the information and the necessity for an in-depth understanding of concepts are additional elements that influence student learning motivation in the context of biology material (Maesaroh & Akbar, 2020).

Despite research on student motivation in online education, there exist knowledge gaps, particularly in biology courses. As a result, the study "Study on Factors Influencing Students' Academic Motivation in Biology Online Instruction" is particularly pertinent to filling this gap.

The purpose of this research is to identify and investigate the elements that influence students' academic motivation when participating in online biology instruction.

Method

A mixed method approach is used in this study to obtain a full picture of students' learning motivation and the elements that influence it in online biology learning circumstances (Cohen, L., Manion, L., & Morisson, 2018; Creswell, 2009). The research began with a quantitative survey to gain an understanding of students' learning motivation. Following that, interviews were conducted to gain a more in-depth understanding of the outcomes of the previously administered questionnaire to students.

This study's procedure is divided into three stages:

1. Preparation phase
 - a. Develop a questionnaire in the form of questions related to motivation to learn.
 - b. Validating the research questionnaire.
 - c. Testing the questionnaire to get reliable data.
2. Implementation phase
 - a. Distributing questionnaires to students using the Google form.
 - b. Processing and analyzing the results of the questionnaire data
3. Final phase
 - a. Conduct interviews with selected respondents
 - b. Analyze the results of the interviews
 - c. Summarize and write the results of the research

Table 1. An instrument for obtaining learning motivation in online biology training

No	Indicator Learning Motivation	Amount
Internal indicator		
1	Dedicated to learning and completing assignments	4
2	Tenacious within the face of adversity	3
3	Demonstrate a desire for success	3
4	Have interest in self-directed learning	3
5	It takes courage to let go of things in which you have faith	2
6	Have a future-oriented mindset	3
7	Ways of learning	4
External indicator		
8	Award	2
9	Learning environment	3
10	Study resources	3

A total of 30 statements were included in the research form questionnaire, comprising 22 statements for internal aspects and 8 statements for external attributes. A questionnaire with a Likert scale was used for the research, and respondents could only express approval or disapproval. There are various different answer options available.

Table 2. Scale of Data Measurement

No	Scale	Rating
1.	Completely disagree	1
2.	Disagree	2
3.	Doubtful	3
4.	Agree	4
5.	Completely agree	5

The developed research instrument is still being tested and assessed for validity and reliability in order to adequately measure the variable of learning motivation. 62 respondents participated in a trial of the learning motivation questionnaire instrument for class XI science high school students in online learning on Biology material. The following is the outcome of the research instrument's validity and reliability examination.

Table 3. Test Results for Questionnaire Instrument Validity

Aspect	Question	r-count	r-table	Details
Internal	1	0.052976	0,254	Invalid
	2	0.703461	0,254	Valid
	3	0.717724	0,254	Valid
	4	0.115306	0,254	Invalid
	5	0.654514	0,254	Valid
	6	0.480125	0,254	Valid
	7	-0.41008	0,254	Invalid
	8	0.707723	0,254	Valid
	9	0.405788	0,254	Valid
	10	-0.48631	0,254	Invalid
	11	0.534079	0,254	Valid
	12	-0.48527	0,254	Invalid
	13	0.394915	0,254	Valid
	14	0.504972	0,254	Valid
	15	-0.21554	0,254	Invalid
	16	0.699587	0,254	Valid
	17	0.723267	0,254	Valid
	18	0.624506	0,254	Valid
	19	0.69341	0,254	Valid
	20	0.615224	0,254	Valid
	21	0.490468	0,254	Valid
	22	0.627966	0,254	Valid
External	23	0.519867	0,254	Valid
	24	0.386117	0,254	Valid
	25	0.517257	0,254	Valid
	26	0.662509	0,254	Valid
	27	0.240158	0,254	Invalid
	28	0.482433	0,254	Valid
	29	0.736376	0,254	Valid
	30	0.322464	0,254	Valid

Based on Table 3 it can be seen the results of the questionnaire validity test, namely the value of r-count. This value will be compared with the r-table with a significance of 0.05 and with a value of $n = 62$, then an r-table of 0.254 is obtained. So it can be concluded that there are 7 statement items which are declared invalid because they have a calculated r value that is smaller than the r table value so they must be corrected. Whereas the other 23 statements have a calculated r value that is greater than the r table value so that they are declared valid.

When repeated on the same subject, reliability determines whether the measurement can yield results that are relatively indifferent. A measuring instrument is considered reliable if it is trustworthy, consistent, and stable. A reliability test with the Alpha Cronbach formula was used in this investigation. Alpha Cronbach analysis is used to calculate reliability: if the value of Alpha Cronbach > 0.60 , it can be stated that the variable is consistent in measuring.

Table 4. Results of Reliability Testing

Variable	Cronbach's Alpha Finding	Result
Online Learning Motivation in Biology Material	0.802611744	Reliable

Based on Table 4, it can be concluded that this instrument is reliable and can be used as a research instrument.

Findings and Discussion

According to research conducted by researchers on class XII Science students at Public Senior High School in Jakarta, Indonesia, with 80 respondents who completed an online questionnaire using a scale of 1 (strongly disagree), 2 (disagree), 3 (doubt), 4 (agree), and 5 (strongly agree). Here are the outcomes.

1. Internal Motivational Factors

The first indicator is dedicated to learning and completing assignments contained in questions number 1, 2, 3 and 4.

Table 5. Dedicated to learning and completing assignments

No	Statement	Score				
		1	2	3	4	5
1	If I do not take online biology instruction, I will be at a lost	0%	1,25%	5%	28,75%	65%
2	I concentrated on biology online study till it was completed	1,25%	1,25%	3,75%	42,5%	51,25%
3	I take my biology assignments seriously	1,25%	1,25%	2,5%	46,25%	48,75%
4	My biology assignment was completed on schedule	5%	3,75%	13,75%	32,5%	45%
	Average	1.88%	1.88%	6.25%	37.50%	52.50%

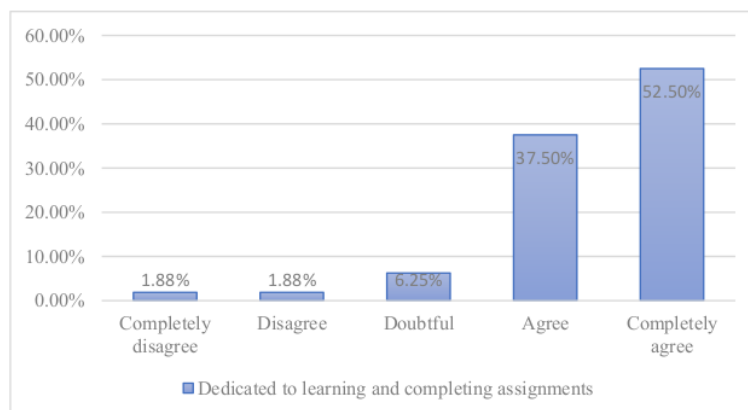


Figure 1. Dedicated to learning and completing assignments

The average signs of attentive learning and tackling assignments revealed that 1.88% of students strongly disagreed, 1.88% of students disagreed, 6.25% of students are unsure, 37.50% of students agreed, and 52.50% of students highly agreed. This proportion

demonstrates that the majority of students are persistent in learning and confronting the teacher's instructions by completing assignments on time and being serious about learning. Student-centered online learning gives students more "power" in expanding their knowledge and trains them to be autonomously (Trinidad, 2020).

The second indicator is tenacity in the face of adversity found in questions number 5, 6 and 7.

Table 6. Tenacious within the face of adversity

No.	Statement	Score				
		1	2	3	4	5
1	If my biology score is low, I will continue to study in order to improve my grades	1,25%	1,25%	1,25%	42,5%	53,75%
2	If I come across a challenging question, I will work on it until I discover an answer.	1,25%	0%	17,5%	53,75%	27,5%
3	I give up easily when I have difficulty studying	23,75%	38,75%	27,5%	7,5%	2,5%
	Average	8.75%	13.33%	15.42%	34.58%	27.92%

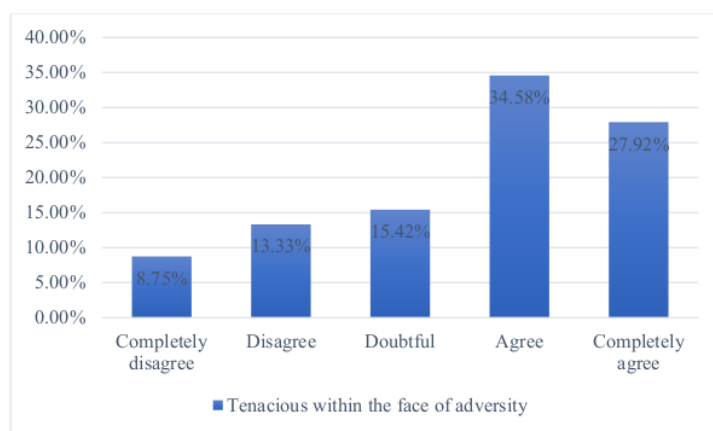


Figure 2. Tenacious within the face of adversity

The average indicator of resilience in the face of adversity provided the following results: 8.75% of students strongly disagree, 13.33% of students disagree, 15.42% of students express doubt, 34.58% of students agree, and 27.92% of students reported that they firmly agreed. This percentage demonstrates that students still have tenacity in completing the tasks assigned by the teacher; students with unsatisfactory biological values and difficulty finding difficult questions will still try to find explanations so that students can receive satisfactory grades. According to other studies, students' actual experiences can cause a decrease in motivation to pursue science (Hellgren & Lindberg, 2017). The third indicator shows an interest in success in questions number 8, 9 and 10.

Table 7. Demonstrate a desire for success

No	Statement	Score				
		1	2	3	4	5
1	I always pay close attention to the teacher's explanation	1,25%	1,25%	7,5%	61,25	28,75%
2	I always respond to the teacher's queries	0%	5%	55%	30%	10%
3	When the teacher explains an object, I do something else	22,5%	50%	22,5%	3,75%	1,25%
	Average	7.92%	18.75%	28.33%	31.67%	13.33%

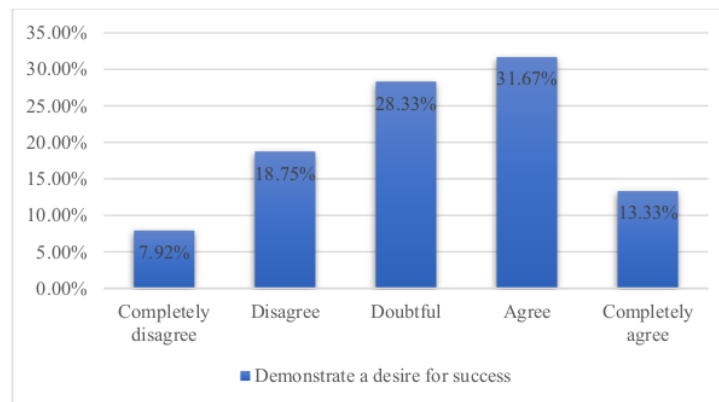


Figure 3. Demonstrate a desire for success

The average signal showing a desire for achievement yielded the following results: 7.92% of students strongly disagree, 18.75% of students disagree, 28.33% of students express doubt, 31.67% of students agree, and 13.33% of students claimed that they strongly agreed. Question number ten has a negative element in that students claim that they do not agree if they engage in other activities while learning online. This demonstrates that students are still interested in online learning. Several elements, including motivation and self-efficacy, independent learning, and social support, can influence student performance in online learning (Chaaban et al., 2021).

The fourth indicator is have interest in self-directed learning in questions number 11, 12 and 13.

Table 8. Have interest in self-directed learning

No.	Statement	Score				
		1	2	3	4	5
1	I always complete the biology assignments assigned to me by the teacher	1,25%	2,5%	26,25%	45%	25%
2	I like doing biology homework with my classmates	7,5%	11,25%	35%	31,25%	15%
3	I've never duplicated a friend's answer since I'm confident in mine	1,25%	12,5%	35%	36,25%	15%
	Average	3.33%	8.75%	32.08%	37.50%	18.33%

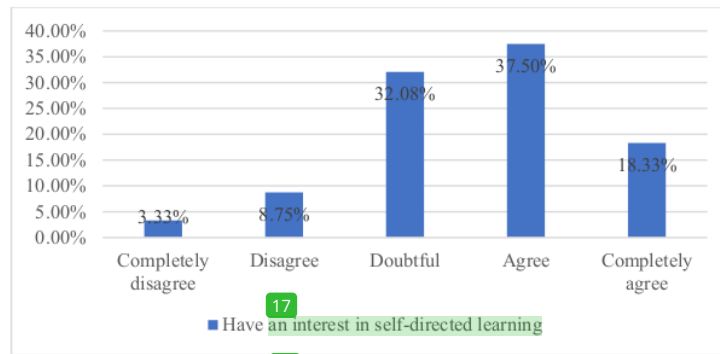


Figure 4. Have an interest in self-directed learning

The average signs of happy independent learning revealed that 3.33% of students severely disagree, 8.75% of students disagree, 32.08% of students express uncertainty, 37.50% of students agree, and 18.33% of students highly agree. In question 13, which is a negative element, as many as 35% of pupils voiced uncertainty and 36.25% agreed. This demonstrates that some students do not understand biology subjects in online learning, resulting in pupils imitating their friends' responses because they are unsure of their own. Knowing: self-efficacy, expectations, competencies, and students' interests can help identify students' motivation in learning, including reading popular scientific publications that help elevate their comprehension (Chatzikiyiakidou & McCartney, 2022).

The fifth indicator is the courage to let go of things in which you have faith in questions number 14 and 15.

3 Table 9. Courage to let go of things in which you have faith

No.	Statement	Score				
		1	2	3	4	5
1	I am not instantly swayed by the responses of my classmates	0%	6,25%	37,5%	40%	16,25%
2	I am convinced that I will receive a high biology grade because I complete my homework properly	5%	8,75%	15%	42,5%	28,75%
Average		2.50%	7.50%	26.25%	41.25%	22.50%

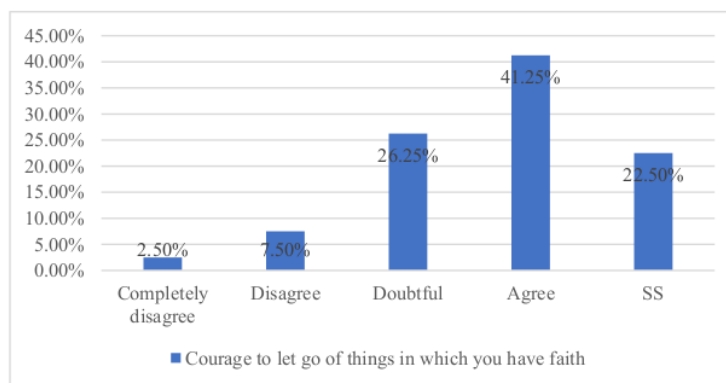


Figure 5. Courage to let go of things in which you have faith

The average indicator of not easily letting go of things believed yielded the following results: 2.50% of students strongly disagreed, 7.50% of students disagreed, 26.25% of students expressed doubt, 41.25% of students said agreed, and 22.50% of students indicated highly agreed. This demonstrates that students are not readily swayed and are unwilling to abandon their beliefs. This belief must be held by every student in order for pupils to be able to complete the teacher's assignments successfully and for students to believe that the tasks they have completed successfully will yield positive results. A dynamic learning environment, as well as the presence of teacher feedback on student work, are two elements that promote student motivation (Bardach & Klassen, 2021).

The sixth indicator is have a future-oriented mindset which is contained in questions number 16, 17, and 18.

Table 10. Have a future-oriented mindset

No	Statement	Score				
		1	2	3	4	5
1	I studied biology diligently in order to make it easier for me to reach my goals in the future	1,25%	0%	8,75%	50%	40%
2	When I obtain high or low grades, I will maintain and study harder	1,25%	1,25%	5%	51,25%	41,25%
3	Even though there was no exam, I studied biology diligently	2,5%	8,75%	42,5%	41,25%	5%
	Average	1.67%	3.33%	18.75%	47.50%	28.75%

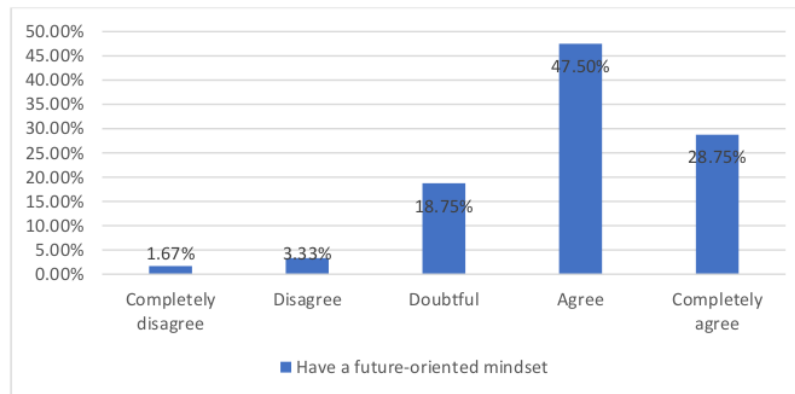


Figure 6. Have a future-oriented mindset

The average indicator with a future orientation yielded the following results: 1.67% of student strongly disagree, 3.33% of students disagree, 18.75% of students express doubt, 47.50% of students agreed, and 28.75% of students expressed they agreed. This demonstrates that students have a future orientation that will date. Balance is required in the learning process to produce classroom settings that are in line with the planning and to attain future goals (G. G. Lee et al., 2021). The right balance can be achieved through the use of learning methods, learning media, and learning resources.

The seventh indicator is ways of learning, which is found in questions 19, 20, 21, and 22.

Table 11. Ways of learning

No.	Statement	Score				
		1	2	3	4	5
1	When studying biology online, I always pay close attention.	1,25%	1,25%	23,75%	50%	23,75%
2	Before beginning online biology sessions, I always study up on biology material	3,75%	13,75%	50%	25%	7,5%
3	To help in learning, I created a mind-map of biological material.	10%	37,5%	33,75%	16,25%	2,5%
4	I always make notes after the teacher explains biology material	1,25%	5%	28,75%	46,25%	18,75%
Average		4.06%	14.38%	34.06%	34.38%	13.13%

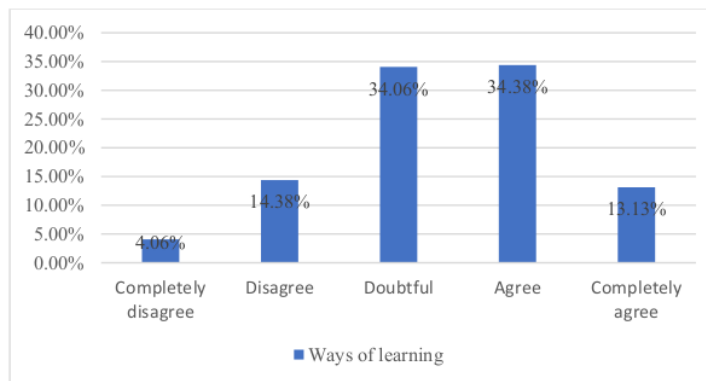


Figure 7. Ways of learning

The average indicators of learning styles revealed that 4.06% of students severely disagreed, 14.38% of students disagreed, 34.06% of students expressed uncertainty, 34.38% of students agreed, and 13.13% of students strongly agreed. This demonstrates that many students have learning techniques, particularly when participating in distance learning or active learning. A learning strategy is a method for students to process academic assignments within the context of their current learning environment (S. W. Y. Lee et al., 2016). To succeed in an online learning environment, students require different learning strategies than in a face-to-face learning setting.

2. External Motivational Factors

The first indicator is the award, contained in questions number 23 and 24.

Table 12. The Award

No.	Statement	Score				
		1	2	3	4	5
1	When I earn a high biology grade, the teacher will compliment me	13,75%	17,5%	37,5%	28,75%	2,5%

2	My parents would lavish me with praise and presents if I received a high biology grade	15%	25%	27,5%	22,5%	10%
Average		14.38%	21.25%	32.50%	25.63%	6.25%

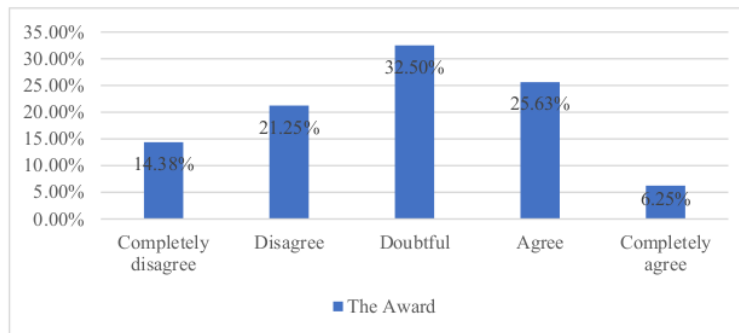


Figure 8. The Award

The results obtained from the average appreciation indicator were 14.38% of students strongly disagree, 21.25% of students disagreed, 32.50% of students expressed doubt, 25.63% of students agreed, and 6,25% of students stated that they strongly agreed. This percentage shows that some students get appreciation in learning from both teachers and parents. Giving learning awards to students can influence learning motivation so that students do not give up easily and remain enthusiastic in learning, especially in online learning. In (Teo et al., 2023) research, it was reported that there was a relationship between extrinsic motivation and learning performance and students' psychological well-being in online learning situations.

The second indicator is the learning environment contained in questions number 25, 26, and 27.

Table 13. Learning environment

No.	Statement	Score				
		1	2	3	4	5
1	My home area for studying is quite peaceful and comfy, allowing me to concentrate on online biology lectures	7,5%	17,5%	21,25%	37,5%	16,25%
2	My parents always accommodate my educational demands, such as stationery, reference books, internet quotas, and so on	1,25%	1,25%	7,5%	33,75%	56,25%
3	I can't concentrate on online biology lessons because of signal problems	11,25%	15%	27,5%	25%	21,25%
Average		6.67%	11.25%	18.75%	32.08%	31.25%

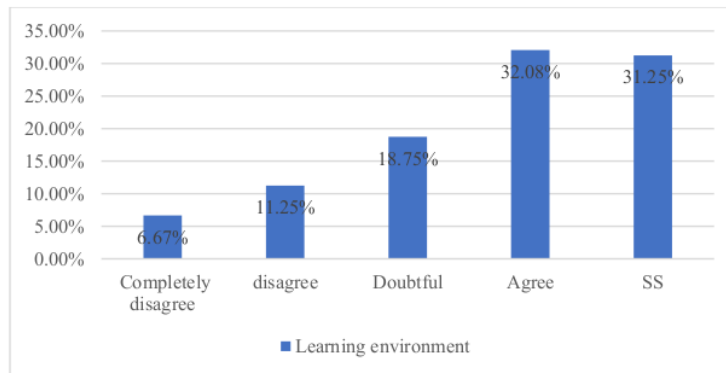


Figure 9. Learning environment

The results obtained from the average learning environment indicator were 6.67% of students strongly disagree, 11.25% of students disagreed, 18.75% of students expressed doubt, 32.08% of students agreed, and 31.25% of students stated that they strongly agreed. The percentages show that the majority of students have a good and supportive learning environment during distance learning or online learning. During online learning, the learning environment has an important role for students because it greatly influences student learning concentration.

The third indicator is the learning resources found in question numbers 28, 29, and 30.

Table 14. Learning resources

No.	Statement	Score				
		1	2	3	4	5
1	As a learning resource, I use media or other sources	0%	2,5%	10%	42,5%	45%
2	I can learn more about biology by using websites on my cell phone or laptop	1,25%	0%	1,25%	47,5%	50%
3	The use of mobile phones and laptop computers drives me to achieve great academic results.	0%	1,25%	18,75%	51,25%	28,75%
	Average	0.42%	1.25%	10.00%	47.08%	41.25%

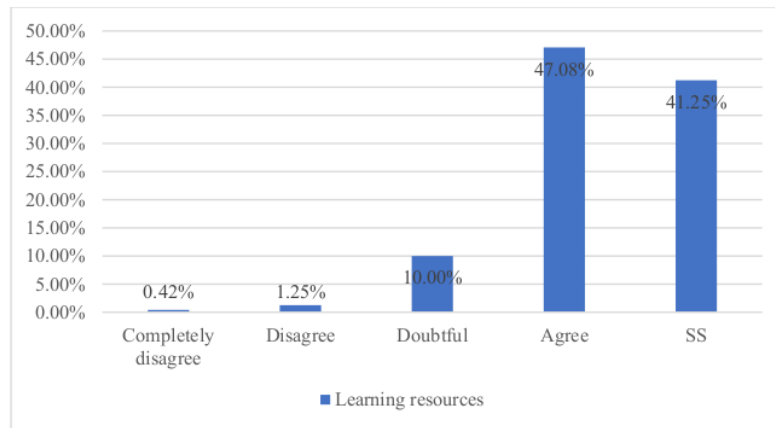


Figure 10. Learning resources

The average indicator of learning facilities generated the following results: 0.42% of students severely disagree, 1.25% of students disagree, 10.00% of students express doubt, 47.08% of students agree, and 41.25% of students reported that they highly agreed. This statistic demonstrates that the majority of students have learning facilities that can support learning, and the usage of media and other learning resources substantially facilitates learning; of course, this can create learning motivation for students, particularly during the online learning period. The availability of supporting facilities such as laboratories, as well as the freedom/autonomy of learning provided by teachers, may stimulate their sense of responsibility and contribute in enhancing motivation and learning achievement. The researchers received the average results of the ten indicators that led to the outcomes as follows (Admiraal et al., 2022).

Table 15. The mean of learning motivation indicators

No	Indicator	Scale				
		Completely disagree	Disagree	Doubtful	Agree	Completely agree
1	Dedicated to learning and completing assignments	1.88%	1.88%	6.25%	37.50%	52.50%
2	Tenacious within the face of adversity	8.75%	13.33%	15.42%	34.58%	27.92%
3	Demonstrate a desire for success	7.92%	18.75%	28.33%	31.67%	13.33%
4	Have interest in self-directed learning	3.33%	8.75%	32.08%	37.50%	18.33%
5	It takes courage to let go of things in which you have faith	2.50%	7.50%	26.25%	41.25%	22.50%
6	Have a future-oriented mindset	1.67%	3.33%	18.75%	47.50%	28.75%
7	Ways of learning	4.06%	14.38%	34.06%	34.38%	13.13%
8	The award of learning	14.38%	21.25%	32.50%	25.63%	6.25%
9	Learning environment	6.67%	11.25%	18.75%	32.08%	31.25%
10	Learning resources	0.42%	1.25%	10.00%	47.08%	41.25%
	Average	5.16%	10.17%	22.24%	36.92%	25.52%

Based on the ten indicators included in student learning motivation, an average of 5.16% of students strongly disagreed, 10.17% of students did not agree, 22.24% of students expressed doubt, 36.92% of students agreed, and 25.52% of students strongly agreed. According to the study's findings, there were more or less similarities in student learning motivation during the pandemic, such as students struggling to understand the material provided by the teacher and the presence of factors that influence student motivation, such as external and internal factors. Students who are used to face-to-face learning will struggle with online learning; additionally, students may feel burdened with tasks given on a regular basis while they still do not understand the content offered by the teacher. This can undoubtedly impair student enthusiasm to learn. Environmental factors might also have an impact because negative circumstances can make it harder for pupils to concentrate on online learning. Gender disparities influence student motivation and learning results in addition to the internal and environmental factors that influence students' learning motivation. Boys are more motivated to engage in experimental learning in math and science (Weinberg et al., 2011).

This research has been conducted in accordance with scientific procedures but there are some research limitations, namely as follows.

1. Data collection in this study used a questionnaire that was distributed online using Google Forms to all students of class XI Science Senior High School in Jakarta. This made researchers unable to see and supervise directly when students filled out the questionnaire because during the pandemic all students carried out distance or online learning.
2. The research sample, sample was taken using the Quota Sampling technique in which the researcher distributed the questionnaire to all students of class XI Science Senior High School in Jakarta, and the sample size was determined based on the respondent's data which was estimated to be relatively adequate for the research data.

Conclusion

Based on the results of the data analysis determined by the responses of the respondents, several students claimed that they found it difficult to concentrate when learning biology online. This certainly has an impact on the learning motivation of Jakarta's class XI Science Senior High School. However, based on the 10 markers of learning motivation examined, it can be stated that students exhibit high levels of motivation when learning biology online. This can be seen by looking at the average proportion of each indicator that shows positive outcomes.

Acknowledgment

Thank you to the Faculty of Teacher Training and Education, Universitas Muhammadiyah Prof. Dr. Hamka for funding the publication of this research.

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