

# Biology learning tasks variation during COVID-19 pandemic and its effect on students' self-efficacy

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**Abstract:** Changes in the learning process during the COVID-19 pandemic require quick adaptation from teachers and students to immediately achieve learning goals. However, it remains ineffective, resulting in a threat of learning loss. This condition can be overcome if students have confidence in their abilities or self-efficacy. It is important to do an analysis related to biology learning tasks taught by the teachers and students' self-efficacy. This study aims to analyze biology learning tasks variation during the COVID-19 pandemic and its effect on students' self-efficacy. This study used descriptive design with cross-sectional survey method. Samples were taken using the convenience sampling technique from five public schools. 446 students out of 465 total students and seven biology teachers participated in this study as respondents. The instruments used in this study were rubrics for quantifying learning tasks and self-efficacy questionnaires given to students after Biology Learning. The results show that all learning modes in Biology Learning during the COVID-19 pandemic have learning tasks that were more dominant in the low-level cognitive process. The dominant learning tasks include retrieval and comprehension, while learning tasks with a higher level of cognitive processing such as analysis, knowledge utilization, and metacognitive only cover a small part of the whole Biology learning process. There were no learning tasks that reached the highest level of cognitive process (self-system). The result of self-efficacy in all learning modes was high, but it was higher in learning modes that used hybrid learning. Biology learning tasks given by the teachers during the COVID-19 pandemic have an effect on students' self-efficacy.

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## Introduction

The COVID-19 pandemic, with its dangerous virus, has forced the government to limit people's movement in public spaces (social distancing) (Limiansi *et al.*, 2020), affecting various dimensions of life, such as education (Heo *et al.*, 2021; Ichsan *et al.*, 2020; Ikhwan, 2021; Khoirudin *et al.*, 2021; Rajib & Sari, 2022; Shidik, 2021). For several schools, online learning (Khaleyla *et al.*, 2021; Limiansi *et al.*, 2020; Pawicara & Conilie, 2020) and hybrid learning are great solutions for learning during the pandemic without spreading the virus (Aldhahi *et al.*, 2022; Muliadi *et al.*, 2021; Wijoyo, 2021). This causes many changes in learning methods, places to study, and learning facilities (Heo *et al.*, 2021; Ikhwan, 2021).

Changes in the learning process from offline to online and hybrid learning require quick adaptation from both teachers and students so that they can immediately achieve their learning goals (Rajib & Sari, 2022; Tauhidah *et al.*, 2021). This adaptation requires teachers and students to be able to operate technology-based learning (Heo *et al.*, 2021; Salsabila *et al.*, 2020). However, the adaptation process is not easy and has its own consequences for education (Aldhahi *et al.*, 2022; Ikhwan, 2021). Online learning and hybrid learning do provide convenience in the transfer of information between teachers and students during the pandemic. Learning can continue even though face-to-face meetings between teachers and students are limited (Limiansi *et al.*, 2020). However, several studies have stated that learning during the COVID-19 pandemic is less effective and not optimal, especially in

biology learning (Ferdyan *et al.*, 2020; Muliadi *et al.*, 2021; Putri & Solikhah, 2021; Sakti & Sulung, 2020; Salsabila *et al.*, 2020).

In their study, Ferdyan *et al.*, (2020) stated that biology learning has a wide scope of essential material, but it cannot be delivered optimally to students during this pandemic. Some of the influencing factors are the limited opportunities for teachers to deliver learning materials (Putri & Solikhah, 2021; Rajib & Sari, 2022), lack of readiness in online learning (Heo *et al.*, 2021; Salsabila *et al.*, 2020), unstable network conditions, lack of learning facilities (Adi *et al.*, 2021; Syahmina *et al.*, 2020), limited learning activities, limited learning media, and tasks that do not support the learning (Rajib & Sari, 2022).

The same thing also happened to hybrid learning, where variations in learning tend to be the same (Syahmina *et al.*, 2020). The teacher only provides material to students through discourse (Adiansyah *et al.*, 2022) or discussion of simple questions so that students cannot practice their reasoning skills (Sari, 2013). These limitations can affect boredom in learning (Pawicara & Conilie, 2020) and reduce student motivation (Adi *et al.*, 2021; Pratiwi, 2021; Salsabila *et al.*, 2020; Shidik, 2021). According to Pawicara & Conilie, (2020), boredom is a dead end in learning due to continuous pressure. Boredom reduces students' retrieval and concentration, making them prone to failure in understanding the lesson (Syahmina *et al.*, 2020).

The ineffectiveness of biology learning during the pandemic is also caused by the learning process that requires students to study independently (Sakti & Sulung, 2020; Salsabila *et al.*, 2020). The teacher only gives assignments to students in the WhatsApp group without explanation about the assigned material (Putri & Solikhah, 2021). Students are forced to understand the assigned material independently (Salsabila *et al.*, 2020; Yustina *et al.*, 2020). The lack of teachers' explanation about the material will affect students' understanding or lack thereof (Rajib & Sari, 2022). Even if there is an explanation of the material, according to Sakti & Sulung (2020), the use of the WhatsApp application will only be effective in providing theory. Learning tasks in Biology need to be delivered textually and contextually (Jayawardana & Gita, 2020). Nurwendah and Suyanto (2019) stated that to achieve the objectives of Biology learning, the learning process should incorporate interaction between students and Biology objects in the environment. Teachers should be facilitators for student activities, where students act as the main subject in these learning activities (Jayawardana & Gita, 2020). Moreover, students should get more learning experience rather than just understanding the theory. Besides knowledge, skills and attitudes are also needed in learning (Rahmadani *et al.*, 2021; Sari, 2013), where students should use the concepts they have understood (Van *et al.*, 2000) to form new experiences (Far-Far, 2021) and use meaningful knowledge during the learning process (Marzano & Marzano, 2015).

The ineffectiveness of learning during this pandemic needs attention because in fact, most students have not been able to learn independently. Students find it difficult to sort out important or unimportant material when teachers give an assignment, resulting in the students receiving too much information (Mohzana *et al.*, 2021) and causing negative effects (Aldhahi *et al.*, 2022; Yang *et al.*, 2021) such as feeling lazy, loss of enthusiasm, tiredness, sleeping difficulty, stress, and boredom (Pawicara & Conilie, 2020). If these things are left for a long period of time, it can cause learning loss (Adi *et al.*, 2021; Mahsun *et al.*, 2021; Rajib & Sari, 2022), a situation where a generation loses the opportunity to gain knowledge due to a slow learning process (Pratiwi, 2021). Rajib and Sari (2022) state that learning loss has occurred during this pandemic. It can be seen from the decrease in student learning outcomes due to suboptimal learning process.

Low learning outcomes caused by ineffective learning and learning loss can actually be overcome if students have confidence in their abilities, which is also called self-efficacy (Bandura, 1994; Dachi & Perdana, 2021; Hibatullah *et al.*, 2022; Schunk & Pajares, 2002). Through self-efficacy, students believe that they have abilities or strengths to change certain situations or competencies (Marzano & Kendall, 2007; Wu *et al.*, 2012), which influence choices, goals, reactions, emotions, efforts, behavior, and students' adaptation process during learning (Saefudin *et al.*, 2021). According to Ahn and Bong (2018), Bandura (1994), and Ritchie and Williamon (2010), students who have strong self-efficacy are more likely to engage in challenging tasks, set more difficult goals, show more effective and efficient learning strategies, and last longer than students who have weak self-efficacy. Based on that, self-efficacy will help students to achieve independence in learning or to be self-regulated learners (Schunk & Pajares, 2002). Therefore, during this pandemic period, self-efficacy has a very important role for students in the learning process (Ahmed *et al.*, 2022; Saefudin *et al.*, 2021), especially to increase motivation that allows students to use their potential optimally (Hibatullah *et al.*, 2022; Wallace & Kernozek, 2017).

Based on the ineffectiveness of learning and its relationship to self-efficacy, especially in biology learning, it is important to conduct an analysis of the learning process carried out by teachers during the COVID-19 pandemic, especially regarding the learning tasks given by teachers and their relationship to student self-efficacy. Based on this background, this study aims to analyze biology learning task variation during the COVID-19 pandemic and its effect on students' self-efficacy. Furthermore, the results of this study are expected to provide consideration for teachers in designing

Biology learning strategies to make the learning process during and after the COVID-19 pandemic more effective and efficient without reducing students' self-efficacy.

## Method

Descriptive research design with cross-sectional survey method was used in this study. The descriptive research design and cross-sectional method were carried out to find out the description or information related to the facts of learning tasks given by teachers during biology learning and facts about students' self-efficacy during the Covid-19 pandemic in several public high schools in Sukabumi at the same point in time. This method was used as it is more effective in terms of time and allows the data collection process from many research subjects, meaning that it could describe comparisons between research groups. Data collection techniques in this study were carried out by providing closed questionnaires on students' self-efficacy and video documentation of biology learning to analyze the learning tasks. Data was taken using convenience sampling from five public high schools in Sukabumi. Three 10th-grade classes were selected in each school to conduct observations related to biology learning (Table 1). Seven biology teachers participated in the study with the following distribution: (1) mode 1, teachers A and B taught students using video conference; (2) mode 2, teacher C only taught students through worksheets assignments; (3) mode 3, teacher D taught students via WhatsApp group; (4) mode 4, teacher E and F taught students using the practicum method in hybrid learning; and (5) mode 5, teacher G taught students through the discussion method in hybrid learning. In addition, from a total of 465 students, 446 respondents who had followed all stages in the study and filled out the questionnaire completely were selected. The respondents consisted of 99 students from learning mode 1, 90 students from mode 2, 84 students from mode 3, 99 students from mode 4, and 74 students from mode 5. A clearer sample distribution can be seen in Table 1. This study has been carried out in three months from February 2022 to April 2022 on the scope of biology learning material, especially the classification of Animalia and ecosystems.

Table 1. Sample Distribution in Biology Learning during the COVID-19 Pandemic

No	School Code	Learning Mode	Teachers	Total Students	Number of students who completed all research process
1	Senior High School A	Mode 1	A B	101 students	99 students
2	Senior High School B	Mode 2	C	93 students	90 students
3	Senior High School C	Mode 3	D	91 students	84 students
4	Senior High School D	Mode 4	E F	103 students	99 students
5	Senior High School E	Mode 5	G	87 students	74 students
Total			7 teachers	475 students	446 students

The instruments used in this study were the learning task quantification rubric and self-efficacy questionnaires that had been validated by two experts. The learning task quantification rubric is based on the new taxonomy of Marzano and Kendall (2007) which consists of six levels, namely level 1 (retrieval), level 2 (comprehension), level 3 (analysis), level 4 (knowledge utilization), level 5 (metacognition), and level 6 (self-system). The data obtained was in the form of documentation of learning activities in five schools. The data were grouped into several learning modes according to what the teachers taught. Each learning mode was analyzed for its learning task and then categorized based on the six taxonomy levels. After the categorization is complete, the learning task data was calculated and the percentage in each learning mode was compared to see the tendency of the complexity of each learning mode and its relationship to students' self-efficacy.

The self-efficacy questionnaire was made based on the self-efficacy instrument developed by Bandura (2006). The questionnaire consists of nine statements made into three levels, namely Level (level of confidence in the actions taken), Strength (level of confidence in completing a task), and Generality (width of confidence in one's abilities). The questionnaire used has been validated by experts and tested on students. The validity and reliability of the data tested have been analyzed. The results of the analysis show that all nine statements in the questionnaire are valid (average Sig. (2 tailed) = 0.000 < 0.05) and have a very high level of reliability (Cronbach's alpha = 0.971). The data obtained from the self-efficacy questionnaire was then averaged to see the level of students' self-efficacy. After

that, the data obtained were tested for normality and homogeneity. Then, an ANOVA test was carried out to see the difference in mean using the IBM SPSS statistic 25.

## Results and Discussion

### Biology Learning Task Variation during the COVID-19 Pandemic

The results from the observations of biology learning at Senior High Schools in Sukabumi show that there are five variations of learning modes carried out during the COVID-19 pandemic. Based on [Table 2](#), learning mode 1 was carried out by two online teachers, where teacher A carried out online learning through Zoom meetings and teacher B carried out online learning through Google Meet. Both of them carried out the learning process with discourse and Q&A methods. The difference only lies in the learning platform used by the teachers. Furthermore, learning mode 2 was carried out by one teacher (teacher C). Teacher C carried out online learning asynchronously by giving instructions on doing students' worksheets (Assignments) sent to students via WhatsApp group. Students were asked to study the material independently and answer some of the questions contained in the worksheets. Learning mode 3 was carried out by teacher D through online means and synchronously via WhatsApp group. In mode 3, the teacher distributed PowerPoint materials for students to read within 10 minutes. After that, students were directed to ask questions in the WhatsApp group if there was any unclear material. Then, Teacher D would help students understand the biology material that they did not understand.

Table 2. Biology Learning Mode Variations during the COVID-19 Pandemic

No	School Code	Learning Mode	Teacher	Learning form	Learning Platform	Learning Method
1	Senior High School A	Mode 1	A B	Online (Synchronous)	Zoom meeting Google meeting	Discourse and Q&A
2	Senior High School B	Mode 2	C	Online (Asynchronous)	WhatsApp group	Assignment
3	Senior High School C	Mode 3	D	Online (Synchronous)	WhatsApp Group	Discourse and Q&A
4	Senior High School D	Mode 4	E F	Hybrid Learning (Synchronous dan Asynchronous)	Limited offline learning, WhatsApp Group	Discourse, Discussion, Practice, Assignment
5	Senior High School E	Mode 5	G	Hybrid Learning (Synchronous dan Asynchronous)	WhatsApp Group and Google Classroom	Discourse, Discussion, Assignment

Learning modes 4 and 5 were hybrid learning, where students in each class were divided into 2 groups, offline groups and online groups. Both groups took turns carrying out offline learning at school. The learning process in mode 4 was carried out by two teachers (Teachers E and F). Both teachers carried out the learning process with discourse, discussion, and practical methods for groups of students who study offline and assignments for groups of students who study online. Meanwhile, learning mode 5 was carried out by teacher G using the discourse and discussion methods for offline group students, and assignments for online group students.

All learning modes were then analyzed with a learning tasks rubric based on the taxonomy of [Marzano and Kendall \(2007\)](#) to describe learning weights as shown in [Figure 1](#). Based on [Figure 1](#), it can be seen that in mode 1, there was a learning task that is more dominant at level 1 retrieval and level 2 comprehension. This happens as the learning carried out by the teacher was in the form of discourse and Q&A. The rest are spread at level 3 analysis when the teacher gave questions to be analyzed by students, and level 5 metacognition that is not too complex. Meanwhile, learning tasks at level 4 (using knowledge) and level 6 (self-system) do not exist. Learning at level 4 requires students to use the knowledge they acquired while in mode 1, students only listen to discourse from the teacher. In addition, the learning task at level 6 requires students to have a self-system where students must assess the importance of the knowledge as well as assess their beliefs, emotions, and motivations. This is not done by the teacher during the lesson.

Mode 2 is different, in which the learning provided by the teacher was an assignment through the student worksheet. However, the learning tasks carried out by students cover level 1 to level 5, even though they have not reached level 6. This is because the worksheet provided by the teacher was sufficient to provide complete learning guidance to students. Students were directed to recognize and

understand the material, carry out an observation to identify data where the students must use their knowledge, and reflect on the material they have learned. Then, biology learning in mode 3 is not that different from mode 1, where the percentage of learning tasks is dominant at levels 1 and 2, and only a small part of learning tasks was classified into level 3 and level 5. When viewed from the learning carried out by the teacher in mode 3, students only understand the material, ask questions, and answer the teacher's questions through the WhatsApp group. As such, it appears that the learning carried out only directs students to recognize and understand the material provided. Learning tasks that reach level 3 were only one or two short questions that students must answer, while the learning task that reaches level 5 was only the one where students must monitor the clarity of the material that had been given.

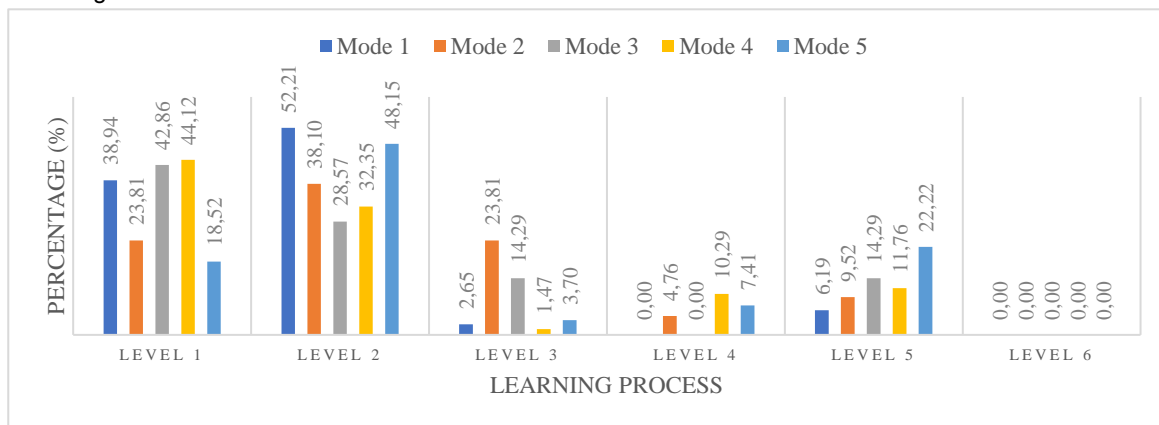


Figure 1. Learning Task Weight in Each Learning Mode

Where Level 1: Retrieval; Level 2: Comprehension; Level 3: Analysis; Level 4: Using Knowledge; Level 5: Metacognition; and Level 6: Self-system

Furthermore, biology learning in mode 4 was carried out through hybrid learning. Students could learn offline in the classroom even though it was still limited, and they must take turns with online groups. The learning tasks in learning mode 4 already cover level 1 to level 5, although the weights were still more dominant at level 1 and level 2. This happens because the learning that occurs is quite varied. Students not only listen to the material given by the teacher but also conduct group discussions, work on students' worksheets, and carry out practicum. Thus, the process of using knowledge (level 4) in mode 4 is higher than in other learning modes. Students in the online group also do the same thing, where students have to work on worksheets and carry out practicum even if they are not accompanied by a teacher. The learning load is even heavier because the learning that should be done in a group must be done by one student. The same thing also happens in mode 5 where learning has been carried out in a hybrid manner. The learning tasks carried out by students also cover level 1 to level 5. However, in mode 5, the learning weight is more dominant at level 2 because hybrid learning is not very effective when compared to mode 4. Learning was mostly carried out in an online manner through assignments in Google Classroom. Even when there was offline learning, there are still more discourse from the teacher before group discussions are held. However, in mode 5, the weight of level 5 learning task 5 is higher than in other learning modes because the teacher monitors the students' understanding of knowledge more often.

### Effect of Learning tasks Variation on Student's Self-Efficacy

It turned out that the difference in biology learning modes during the pandemic has an effect on students' self-efficacy, although the results were not significantly different. This can be seen in the results of the analysis of self-efficacy data in [Table 3](#), [Table 4](#), and [Table 5](#). The data on students' self-efficacy that has been obtained through the survey process was then processed to obtain an average value in each learning mode. After that, the normality test and homogeneity test were carried out. The results show that self-efficacy is distributed normally and homogeneously. As such, further statistical analysis can be carried out using a parametric statistics test.



**Table 3. Normality test Kolmogorof-Smirnov**

Mode	Statistic	df	Sig.
1	0,068	99	.200*
2	0,081	90	0,200
3	0,072	84	.200*
4	0,049	99	.200*
5	0,100	74	0,062

\*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

**Table 4. Homogeneity test**

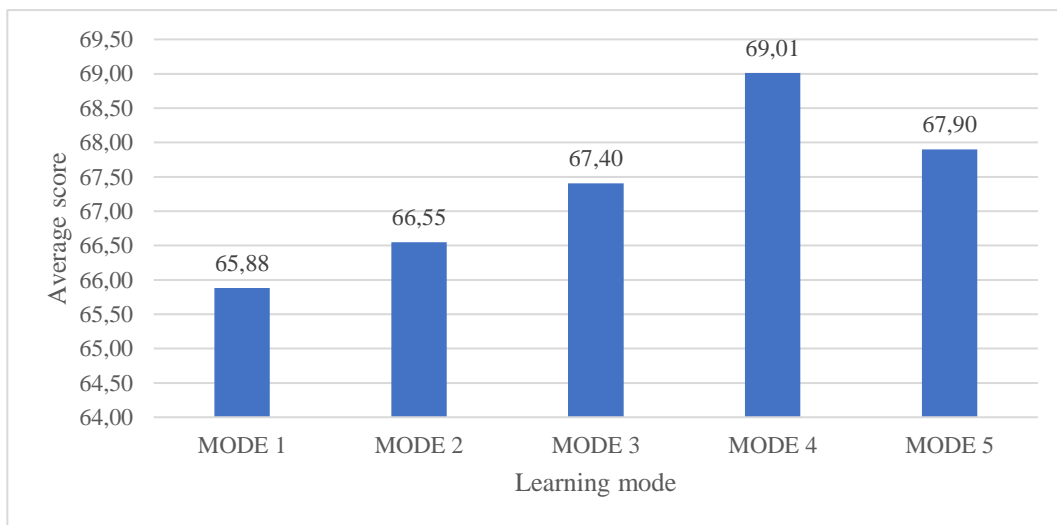
Self-efficacy	Lavene Statistic	df1	df2	Sig.
Based on Mean	0,881	4	441	0,475
Based on Median	0,984	4	441	0,416
Based on Median and with adjusted df	0,984	4	435,664	0,416
Based on trimmed mean	0,896	4	441	0,466

To find out the difference in the average self-efficacy score of each learning mode, an ANOVA test was carried out, which can be seen in [Table 5](#). Based on the table, it can be seen that the F value of self-efficacy is 0.757. When compared with the F table value (2.392), it has a smaller value ( $0.757 < 2.392$ ). It means that the average value of each biology learning mode is not significantly different. This can be seen from the average score of students' self-efficacy in [Figure 2](#), where the score is in the range of 65 to 69. The score indicates that most students answered "sure" in the statements from the self-efficacy questionnaire.

**Table 5. ANOVA Test**

Self-efficacy	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	566.778	4	141.695	0.757	0.553
Within Groups	82498.591	441	187.072		
Total	83065.370	445			
Between Groups	566.778	4	141.695	0.757	0.553

In addition, [Figure 2](#) shows that although the average score of students' self-efficacy is not statistically significant, the average self-efficacy score of students who study with hybrid learning (mode 4 and mode 5) is higher when compared to students who study biology online (modes 1, 2, and 3). According to a study conducted by [Wijoyo \(2021\)](#), hybrid learning conducted during the pandemic period became a special attraction for students because they could be more active in the learning process, resulting in a positive effect on learning engagement and self-efficacy. Students continue to learn independently, but they are guided more by the teacher.


**Figure 2. Average Score of Students' Self-efficacy**

This proves the statement revealed by [Pawicara and Conilie \(2020\)](#) that although online learning is the best learning solution during the COVID-19 pandemic, it also has disadvantages in its implementation. One of them lies in students' self-efficacy or beliefs, which are lower than those of hybrid learning. The self-efficacy of students in online learning is low because they are more expected to understand the material independently without being accompanied by a teacher directly ([Anitasari et al., 2021](#); [Salsabila et al., 2020](#)). In fact, more assignments are given to them ([Ilma et al., 2022](#)). According to [Nadolski et al. \(2005\)](#), students who are given too many and too complex tasks will find it difficult to master complex skills. This certainly needs to become a concern as grade 10th students just entered high school. Students still need to adapt ([Tamba & Santi, 2021](#)) to the school environment, teachers, and also new learning methods, which is certainly not easy ([Ikhwan, 2021](#)). When students are given learning tasks to understand biological material independently, they become unsure of their abilities, as self-efficacy is also influenced by the students' learning environment ([Schunk & Pajares, 2002](#)).

[Figure 2](#) also illustrates that learning mode 1 has the lowest average self-efficacy score. If it is observed from the learning tasks given by the teacher, students only listen to discourse and engage in a Q&A session through Google Meet or Zoom meetings. According to a study conducted by [Putri and Solikhah \(2021\)](#), learning platforms that use video conferences such as Zoom and Google Meet are the right choice because they are quite effective for the learning process. However, the learning method carried out is only in the form of discourse and Q&A. According to a study conducted by [Herzamzam \(2021\)](#), such practice can reduce students' self-efficacy as their passive attitude during the learning process makes them doubt their abilities.

Furthermore, learning modes 2 and 3 have average self-efficacy scores that are slightly higher than learning mode 1, but they are not higher than learning mode 4. In modes 2 and 3, teachers teach students on the same platform, namely WhatsApp. The difference lies in the way the material is delivered. In learning mode 2, the process of delivering material occurs asynchronously with assignments only, while in learning mode 3, the process of delivering material occurs synchronously. It turned out that the difference in the delivery of the material affects the students' self-efficacy scores. According to [Limiansi et al. \(2020\)](#), this occurs because synchronous learning provides space for students to receive information faster. Teachers can also provide feedback to students easily so that misconceptions can be cleared up immediately. In addition, the lower self-efficacy in learning mode 2 occurs because the teacher only gives independent assignments to students. This also happened in a study conducted by [Sakti and Sulung \(2020\)](#), where students became objects who only received orders from their teachers who gave independent assignments without additional material, resulting in them losing their enthusiasm ([Ilma et al., 2022](#); [Pawicara & Conilie, 2020](#)). Therefore, learning mode 3 has a higher average self-efficacy score than learning mode 2, even though the learning task on the student worksheet given by the teacher in mode 2 has more varied weights than the learning task in mode 3.

Learning modes 4 and 5 have a higher average self-efficacy score than other learning modes. This certainly happens because hybrid learning is carried out in modes 4 and 5. When compared to online learning, hybrid learning is more effective because according to [Syahmina et al. \(2020\)](#) and [Limiansi et al. \(2020\)](#), online learning provides limited space and time for teachers and students in learning so that students do not acquire the entire knowledge. In addition, online learning using WhatsApp groups, Zoom meetings, and Google Meet is only effective for theoretical learning ([Sakti & Sulung, 2020](#)). It holds especially true for the WhatsApp group platform, which only provides one-way communication, making learning less efficient ([Limiansi et al., 2020](#); [Putri & Solikhah, 2021](#)). Meanwhile, in hybrid learning, teachers are more innovative, which in turn makes students more active in learning and increases their enthusiasm for learning ([Wijoyo, 2021](#)). Because of these reasons, the self-efficacy in modes 4 and 5 is higher than in other learning modes.

Based on these findings, it can be seen that the learning tasks given by the teacher have an effect and a potential relationship with self-efficacy. This finding strengthens the findings of a study conducted by [Wu et al. \(2012\)](#), which states that self-efficacy has a strong relationship with learning strategies. This explains that teachers need to be more creative and innovative in teaching so that the self-efficacy of students increases and their learning experience can become optimal. Based on the findings, the results of this study are expected to provide consideration for teachers in designing Biology learning strategies to make the learning process during and after the COVID-19 Pandemic more effective and efficient without reducing students' self-efficacy.

## Conclusion

Based on the study that has been done, it can be concluded that the results show that all learning modes in Biology Learning during the COVID-19 pandemic have learning tasks that were more

dominant in low level cognitive process. The dominant learning tasks included retrieval (level 1) and comprehension (level 2), while learning tasks with a higher level of cognitive processing such as analysis (level 3), knowledge utilization (level 4), and metacognitive (level 5) only cover a small part of the whole Biology learning process. There were no learning tasks that reached the highest level of cognitive process (level 6, self-system). The values of self-efficacy in all learning modes were high, but they were higher in learning modes that used hybrid learning. Biology learning tasks given by the teacher during the COVID-19 pandemic have an effect on students' self-efficacy. Therefore, it can be seen that the learning tasks given by the teacher have a potential relationship with self-efficacy. The results of this study explain that teachers need to be more creative and innovative in teaching so that the students' self-efficacy increase and their learning experience becomes optimal. Thus, the results of this study are expected to provide consideration for teachers in designing Biology learning strategies to make the learning process during and after the COVID-19 pandemic more effective and efficient without reducing students' self-efficacy.

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## Conflicts of Interest

Authors state there is no conflict of interest.

## Author Contributions

D.U. T: author, data collection, analysis and interpretation of results; A. R. and Y. H.: help an analysis data, interpretation of results, and supervised the findings of this research.

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