Inornatus: Biology Education Journal
Volume 4, Issue 2 (2024): 132 – 150
DOI: 10.30862/inornatus.v4i2.711

Discovery learning and Google sites: Its application in learning the process of urine formation

Ali Mustofa[1], Wachida Hayuana[2,*], Insar Damopolii[3], Ibrohim Ibrohim[2], Herawati Susilo[2]

[1]Program Studi Pendidikan Biologi, Universitas PGRI Ronggolawe Tuban, Indonesia
[2]Program Studi Pendidikan Biologi, Universitas Negeri Malang, Indonesia
[3]Program Studi Pendidikan Biologi, Universitas Papua, Indonesia Indonesia

*Corresponding author, email: wachidahhayuuana@gmail.com

Submitted:
01-09-2024

Accepted:
27-09-2024

Published:
02-11-2024

Abstract: In the application of discovery learning in the classroom, the main source of science information is not the teacher, but various other sources that can be easily accessed by students. Learning sources that can be flexibly accessed by students are Google sites. This study was conducted to analyze how the implementation of discovery learning and Google sites in learning the formation of human urine. The research was conducted in one of the high schools in Malang. The students involved were grade XI. Data were collected through observation, teacher reflection sheets, learning implementation sheets (student and teacher activities), and student response questionnaires. The research data were narrated based on observations and learning implementation and student responses were calculated using percentages. The research findings show that the implementation of discovery learning and Google sites in learning the formation of human urine has changed the learning conditions of students for the better. High school students can actively answer teacher questions, are able to work on student worksheets, can work together well, discuss actively and draw conclusions. Google sites are a medium that can help students to find information related to the learning being carried out. Student responses related to learning scored 78.95 which is included in the good category. Collaborative activities among students can run well. Students agree that they do not forget the responsibilities given by their group to each individual.

Keywords: Collaboration, discovery learning, Google sites, media, student responses

Abstrak: Dalam penerapan *discovery learning* di kelas, sumber utama informasi sains bukanlah guru, melainkan berbagai sumber lain yang dapat diakses dengan mudah oleh siswa. Sumber belajar yang dapat diakses oleh siswa secara fleksibel adalah *Google sites*. Penelitian ini dilakukan untuk menganalisis bagaimana implementasi discovery learning dan *Google sites* dalam pembelajaran pembentukan urin manusia. Penelitian dilakukan di salah satu sekolah menengah atas di Malang. Siswa yang terlibat adalah kelas XI. Data dikumpulkan melalui observasi, lembar refleksi guru, lembar keterlaksanaan pembelajaran (aktivitas siswa dan guru), dan angket respon siswa. Data penelitian dinarasikan berdasarkan observasi, keterlaksanaan pembelajaran dan respon siswa dikalkulasi menggunakan persentase. Temuan riset menunjukkan bahwa implementasi *discovery learning* dan *Google sites* dalam pembelajaran pembentukan urin manusia telah merubah kondisi pembelajaran siswa menjadi lebih baik. Siswa SMA dapat dapat aktif menjawab pertanyaan guru, mampu mengerjakan student lembar kerja siswa, dapat bekerja sama dengan baik, berdiskusi aktif dan menyusun kesimpulan. *Google sites* menjadi media yang dapat membantu siswa untuk mencari informasi terkait pembelajaran yang sedang dilaksanakan. Respon siswa terkait pembelajaran memperoleh skor 78,95 yang termasuk kategori baik. Kegiatan kolaborasi di antara siswa dapat berjalan dengan baik. Siswa setuju bahwa mereka tidak lupa akan tanggung jawab yang diberikan oleh kelompoknya kepada masing-masing individu.

Kata kunci: Kolaborasi, discovery learning, Google sites, media, respon siswa

INTRODUCTION

Biology learning empowers students to learn about themselves by analyzing, observing themselves and the environment so that they are able to formulate to develop the life they will face (Sitiatava, 2013). Based on this, biology learning must be ideal by making students free to think, work, and find ways to solve their problems (West et al., 2010). In biology learning, students must be able to work collaboratively with their group members to complete tasks and achieve common goals (Rusmalinda & Syaifudin, 2022). In the context of 21st century education, collaboration skills are becoming increasingly important because the ability to work with others is one of the keys to success in the future (Sudrajat et al., 2023).

Biology learning must be able to equip students with strong collaboration skills as part of the development of thinking skills, knowledge (cognitive), attitudes (affective), and skills (psychomotor), all of which are expected outcomes after learning biology (Marjan et al., 2014). Collaboration skills are one of the 21st century skills that need to be empowered (Widodo & Wardani, 2020). Collaboration skills must be mastered by students with the hope that they have the ability to collaborate in life in the 21st century. This is in accordance with the demands of modern biology which requires skills to increase the level of knowledge, competence, and skills of students (Matthews et al., 2010). Collaboration skills have become an important 21st century need and trend in every area of life. The importance of collaboration in learning is supported by various studies and educational standards, including those expressed by Matthews et al. (2010), which emphasizes the role of collaboration in increasing student engagement and knowledge retention.

In collaborative learning, students have the opportunity to compare, contrast, and contrast with peers, present and defend different ideas by exchanging diverse and different beliefs (Riaz & Din, 2023). This skill is considered a priority skill in developing student performance (Hole, 2015). The basis of this statement lies in the ability to disseminate knowledge and collaborate with others in developing new knowledge (Hole, 2015). Knowledge collaboration occurs through the process of discussion and knowledge sharing (Hassan et al., 2021). With collaborative skills, students will be proficient in mobilizing and providing energy for others to form a common vision in solving a problem (Hidayati, 2019). In fact, this collaborative attitude has not been optimally educated because there are still many teachers who apply monotonous learning methods and use root materials that are still conventional or are still in the form of printed media and are not interactive so that the active participation of students in learning is still very low (Octaviana et al., 2022).

Based on the facts in the field, collaboration skills still need to be empowered. Research by Sipayung et al. (2019) revealed that based on questionnaire data given to students, around 65% of students prefer to listen rather than speak or ask questions when collaborating. 70% of students cannot provide arguments or solutions when discussing in groups. Research by Hidayati (2019) reported that the indicators of collaboration skills

studied included responsibility, respecting others, contributing, organizing work, working as a team. The results of the study showed that the indicators of collaboration skills from the lowest to the highest were working as a team, organizing work, contributing, respecting others, responsibility. Therefore, an appropriate learning strategy is needed to improve students' collaboration skills as provisions to face challenges that develop along with the development of the 21st century.

One strategy that is expected to empower is by providing teaching materials that can stimulate interest and thinking skills and can be studied independently so that students are more focused according to learning objectives (Dita et al., 2024; Nasir et al., 2020; Setyantoko et al., 2023). One of the learning media that can be used by students independently is Google Site. Google Sites is an application that can be used as a supporting media for web-based learning (Bhagaskara et al., 2021). Google Sites allows users to store and display various information in one place, including text, images, links, and videos (Sevtia et al., 2022). Google sites are learning media for the 21st century that help students understand biological concepts (Aulia & Riefani, 2021). Google sites can improve student learning outcomes (Dzulfikry et al., 2024).

Google sites is a part of Google Workspace for Education that can be used to create websites easily. Google sites have simple features that we can use to create a website page. Even laypeople can use it. The easy use of Google sites makes many people use it for various types of activities, both for social media for self-branding, personal notes, creating creative content, promoting merchandise, spreading ideas and concepts, and can also be used in the world of education. In learning, Google sites in learning increases the effectiveness of student learning (Pubian & Herpratiwi, 2022). Google sites can be created either personally or collaboratively with several people. Easy and fast access to use and can be created collaboratively to add attachment files and information from other Google applications such as Google Docs, Sheets, Forms, Calendars, and others make this application widely used.

In addition to appropriate learning media, learning models are also needed to determine success in learning (Nurlaili et al., 2021; Pambudi et al., 2022). The learning model has a syntax that can be used by teachers to carry out the learning process. According to Arends (2012), discovery learning is a learning model that is centered on students and prioritizes active learning experiences. Students are encouraged to find and express their ideas related to the topics being studied. The discovery learning model can empower all students' abilities to search and investigate systematically, critically, and logically so that students can construct their knowledge, attitudes, and skills (Gulo, 2022). The application of discovery learning in biology learning aims to enable students to build their knowledge independently (Ristanto et al., 2022).

In biology education, discovery learning emphasizes student engagement to acquire knowledge comprehensively, with the assistance of teachers and peer groups (Janssen et al., 2014; Santi, 2023). Through the discovery learning model, biology teachers act as motivators

and instructors to help students discover biological concepts in learning activities (Noviyanti et al., 2019; Styers et al., 2018). Discovery learning aids students in activating existing knowledge for new knowledge creation and integrating new information with previous knowledge (Nusantari et al., 2021; Sartono et al., 2018). To face a problem and identify the core of the problem and the questions that must be answered, students need a discovery learning model (Großmann & Wilde, 2019; Reynolds & Chiu, 2013).

The material taught to students is the excretory system which is one of the materials that can cause misconceptions in students. Based on the research results of Aprilanti et al. (2016) showed that there are still misconceptions in the sub-concepts of the function and organs of the excretory system, the kidneys as an excretory organ, factors and processes of urine formation, the liver as an excretory organ, the lungs as an excretory organ, the skin as an excretory organ, the composition and physical properties of urine, and disorders of the excretory system. These findings are supported by research by Simorangkir dan Napitupulu (2020) which found that students had difficulty understanding and explaining the process of urine formation in humans. Based on this, it is hoped that through learning using the discovery learning model assisted by Google sites media, students' collaboration skills can be empowered.

METHOD

This research was conducted to analyze how the implementation of discovery learning and Google sites in learning the formation of human urine. The research was conducted in one of the high schools in Malang. The research is divided into several stages.

1. Preliminary stage. At this stage, interviews were conducted with subject teachers, analysis of learning activities, and analysis of teaching modules. From the results of the analysis that had been carried out, teachers had used learning models such as discovery learning, project-based learning, and integrated technology in their learning. At this stage, the research team conducted observations at school to determine the learning conditions. The learning activities carried out were presentations related to the results of products made by students. The products made were in the form of learning media for the human organ system. When the analysis of class conditions was carried out, presentations were made by two groups who presented the results of their work. When conducting the practicum, we found several interesting things at this time, namely:
    a. There are students who are busy playing with their cellphones when other groups are presenting.
    b. There are children who do not sit according to their groups and are busy completing other groups' assignments.
    c. The groups are not divided heterogeneously but homogeneously and the selection of groups is not random but based on their own wishes.
    d. When presenting, students tend to read directly from the internet, and there is no interaction between the presenter and the audience

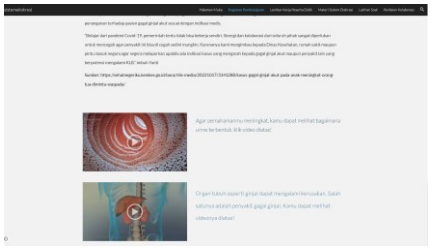
e. Many children do not pay attention to other students when presenting and are busy talking to other friends.
f. Some groups do not pay attention, but work on unfinished tasks.
g. After the group has presented and returned to their seats, they no longer pay attention to other groups presenting, and are busy playing with their cellphones.
h. There is one student who does not join his group, besides this student is really inactive. After being confirmed with the teacher, it turns out that this student is not active in all class activities, even this student once said that if he could not join a group during learning and did not get a grade, it was not a problem.

When analyzing the lesson plan, the teaching module provided is the excretion system. From the results that have been analyzed, the teaching module created is in accordance with the independent curriculum lesson plan in general. The focus of the lesson plan developed is adjusted to the learning objectives, namely analyzing the causes of kidney failure and comparing the differences in the process of urine formation in kidney failure sufferers with healthy people. Based on the learning objectives, the trigger question is about Hemodialysis or dialysis in kidney sufferers. Students are directed to think, for example, "why do people have to have dialysis?, What organs have problems in sufferers?, Why do these problematic organs cause dialysis sufferers?." Based on the lesson plan created, it is explained that the learning model used is discovery learning.

2. Improvement of learning tools. At this stage, improvements are made to learning tools in the form of lesson plans and media based on Google sites. Lesson plans are prepared based on discovery learning.
3. Implementation of learning tools. At this stage, the teaching modules and Google sites media that have been prepared are implemented in learning.

Data were collected through observation, teacher reflection sheets, learning implementation sheets (student and teacher activities), and student response questionnaires. The first data analysis was in the form of a narrative, which explained how the process of implementing discovery learning and Google sites media in learning the process of urine formation. The second analysis was related to teacher reflection on the learning that he had implemented. The third data analysis was related to student responses to learning by calculating the percentage of their responses.

a. Learning objectives view



b. Material containing video

c. Student worksheet integrated into Google sites

d. Material containing explanations and images

e. Exercises

Figure 1. Google sites view

.

RESULTS AND DISCUSSION

The results of the implementation of discovery learning syntax

The results of the implementation of the learning process based on the discovery learning syntax are explained as follows.

Stimulation stage

Based on the results of the students' work in the stimulation stage, it is known that most groups are able to write questions and opinions about cases of kidney failure in children. Changes in learning by directing the use of discovery learning in teaching provide benefits in improving student performance, and active learning (White et al., 2013). The following are examples of questions that are in accordance with the article, including: "Why does urine color change?, What causes urine volume to decrease?, What efforts are made to prevent kidney failure?, Why does kidney failure attack children, and is it related to diet?". However, there are also questions that lead to misconceptions such as "Why does semen in children with kidney failure change color to brown?" and "Can cases of acute kidney failure that have claimed hundreds of children's lives be included in the legal aspect?". In addition, there are also groups that express their opinions, such as: "Preventing kidney failure is a very important

action by adopting a clean lifestyle and eating nutritious, balanced foods. Always monitor the health of children with kidney failure and consult with health workers."

Based on the data analysis, it can be concluded that most students were able to understand and explore the topic of kidney failure in children through their questions and opinions. Students showed a good understanding of the factors that influence this condition, such as changes in urine color and decreased urine volume, as well as the importance of prevention through a healthy lifestyle and balanced diet. For example, one student responded to a question about kidney function by accurately identifying the role of the nephron, while another student correctly explained the impact of dehydration on urine concentration, indicating a deep understanding of the biological processes involved. However, there were also several questions that showed misconceptions, such as the relationship between semen color and kidney failure, as well as questions about the legal aspects of acute kidney failure cases. This suggests that there is room for further understanding and explanation of this topic.

Problem identification stage

At this stage, students are asked to choose and write down one of the most essential problems from the problems that have been formulated. The results at this stage vary greatly regarding the questions made by students. The essential questions formulated by students include: "if we have been living a clean life but still get kidney failure, what causes the kidney failure?, is kidney failure experienced by children related to diet and health?, what should be done if a child gets kidney failure?". From this question, it shows that students have been able to formulate their essential questions. However, there are also groups that have not understood the instructions from this stage so that the questions formulated turn into statements, for example "the number of kidney failure diseases that occur in children can be caused by several factors such as lack of drinking water, parents who do not fulfill children's nutrition and unhealthy lifestyles". This shows that although most students have been able to formulate essential questions well, further guidance and explanation are still needed to ensure that all students understand the instructions and can formulate questions correctly. Discovery learning with minimal guidance causes students to be less than optimally involved in learning, so it is necessary to consider students' learning behavior (Xu et al., 2018). So that in learning, teachers still provide guidance to students so that they can identify problems correctly.

Data collection stage

At this stage, 2 articles are presented as reading material for students to work on in the data processing section. In the application of discovery learning in the classroom, the main source of scientific information is not the teacher, but various other sources that can be easily accessed by students (Makoolati et al., 2015). Based on the results at this stage, each

group makes a resume or important notes about these two articles. Important notes written by students include: causes of kidney failure, types of kidney failure and how to overcome kidney failure. This shows that students have succeeded in understanding and extracting important information from the readings given. They have shown a good understanding of the topic of kidney failure, including the factors that cause this condition, types of kidney failure, and coping strategies that can be used.

Data processing stage

Based on the data analysis at the data processing stage, it can be concluded that most students have understood the concept of kidney failure, including causal factors such as lifestyle and hereditary factors. Students have also understood the process of urine formation in the kidneys and the differences between kidney failure sufferers and healthy people. Students have shown a good understanding of the characteristics of kidney failure sufferers and know that kidney failure occurs due to damage to the nephron, Bowman's capsule, and glomerulus. However, there are some students who still have misconceptions, such as kidney failure caused by lack of oxygen in the nephron. This shows that although most students have understood the concept of kidney failure well, further explanation and learning are still needed to overcome existing misconceptions. Lack of guidance in implementing discovery learning results in less than optimal support for students, causing students to become frustrated due to the cognitive load they experience, which ultimately results in misconceptions (Kirschner et al., 2006).

Data verification stage

Based on the data analysis at the verification stage, it can be concluded that students have succeeded in connecting lifestyle and kidney failure. They understand that unhealthy lifestyles, such as smoking, alcohol consumption, lack of drinking water, and lack of physical activity, can be factors that cause kidney failure. In addition, they are also aware that hereditary factors can contribute to the risk of kidney failure. This shows that students have understood important concepts in the context of kidney failure and the factors that influence it. They have demonstrated a good understanding of how lifestyle and hereditary factors can affect kidney health. Students' knowledge of learning is important because it indicates that they have understood the learning (Nasir et al., 2024).

Conclusion Stage

Based on the results of the conclusions written by students, it shows that the conclusions written are mostly not in accordance with the objectives conveyed by the model teacher, there are only 2 groups that are able to write them well, such as "kidney failure is caused by an unhealthy lifestyle, patients with kidney failure can maintain their health by undergoing dialysis to replace kidney function". This shows that further guidance and

explanation are still needed to help students formulate conclusions that are in accordance with learning objectives.

Results of analysis of student learning activities

Table 1. results of observations of student activities

Syntax	Description	Evaluation		Observer's Notes 1	Observer's Notes 2
		Yes	No		
Stimulation	Students answer questions given by the teacher as a stimulus for students to enter into learning.	✓		Students actively answer questions. However, initially they were confused about writing questions or statements.	Students engage in responding to questions posed by the instructor for a duration of 10 minutes. However, students are confused about making questions or statements.
Problem Statement	Students form groups to discuss	✓		The group of students is divided into 6 groups	Students form heterogeneous groups
	Students discuss to identify the problems they encounter	✓		Students identify problems by scanning the QR code on the student worksheet.	Students actively discuss the problems in the student worksheet by asking several questions.
	The group leader divides the tasks to each member of the group.	✓		Each group member worked on the assigned tasks, but there were two students who did not appear to be actively involved in groups 3 and 5.	Almost all groups work together to complete the student worksheets that are given, in addition, the group leader also tries to give tasks that must be done by each group member.
Data collection	Students work in groups to collect information from various sources to support statements in identifying problems.	✓		Students were initially confused when working on the student worksheet, but finally they were able to complete it. Google site is used by students to obtain the information they need.	When collecting data, students had not utilized Google Slides to search for clear sources of information related to kidney failure, but students were not careful in obtaining the information they needed.

Data Processing	Students work in groups to discuss and analyze the results of the information they obtain from various sources.	✓	Students can discuss with each other regarding the information they have obtained, but there are two people who appear not to be actively discussing.	Students actively discuss the information they get and look for sources of information from Google site learning media.
Verification	Students carry out careful examination to prove whether or not the statement that was previously stated is true with alternative findings, connected with the results of data processing.	✓	Students can relate cases of kidney failure to a person's lifestyle, and compare the process of urine formation in normal and abnormal kidneys.	Students are able to describe the characteristics of someone suffering from kidney failure by looking at how the urine formation process occurs.
Generalization	Students make conclusions based on the data that has been obtained and analyzed together.	✓	Students can conclude what they found. When making a presentation, students who were not actively involved in the discussion can present their findings well.	Students can conclude what they have found and are able to conclude how the urine formation process works.

Based on the results of the implementation that has been carried out, learning takes place actively and students have been able to collaborate to learn the excretory system material using discovery learning. The use of discovery learning can help empower students' collaboration skills (Syafii, 2022). Based on the analysis that has been carried out, all students work together to complete the student worksheet that has been given. Based on a total of 23 students, only three students were not active in participating in learning, even one student who was previously not active at all when conducting the student needs analysis participated in completing the assigned tasks.

Implementation observation results

Table 4. Results of implementation observations

No	Documentation	Description
1.		The results of the observations that have been carried out by students working together to work on the student worksheet that has been given by the teacher. Students open the student worksheet and google slide to complete the questions in the student worksheet. During the learning process, the teacher distributed two student worksheets to each group, but students chose to use one student worksheet used to write answers, this was because students chose to access the student worksheet on google slide even though initially students felt confused to find the student worksheet on Google sites.
2.		In group five they were able to identify problems from reading and the internet, and relate them to their understanding. In this group they were able to work together to complete the student worksheet together, but there was one group member who was not active when working on the student worksheet. The cooperation in this group was good because during the presentation all group members were able to present well, and none were more dominant than the others.
3		In this group, there are students who were not active at all during the initial analysis, but when learning, these students (red color) were willing to work together with their friends to work on student worksheets and look for additional answers from Google Slides.
4		During the learning process, this group was the most active during the learning process. This is because this group is able to use student worksheets with Google sites simultaneously. This group is also very visible in utilizing technology when searching for answers on Google sites and searching for additional information from the internet. In addition, there is one student (red color) who is able to analyze the articles presented and verify them with the data on Google Slides. One of the students also wants to explain to his friends about the process of urine formation in someone suffering from kidney failure.

Results of teacher teaching activities

Table 5. Results of teacher activity observations

Syntax	Description	Evaluation		Observer's Notes 1	Observer's Notes 2
		Yes	No		
Stimulation	The teacher asks questions that lead students into problems in learning.	✓		The teacher asks questions to guide students	The teacher asks questions to students by providing a little explanation to stimulate students regarding the material to be studied.
Problem Statement	The teacher guides students in the process of identifying problems	✓		The teacher goes to each group to help students identify problems in the group	The teacher provides input and instructions to each group to read the news provided in the student worksheet and provides instructions on how to identify problems.
Data collection	The teacher assigns students to collect information from various sources.	✓		The teacher assigns, but it is still not detailed, so some students are confused in doing it. As a result, the data collection process takes a long time.	When collecting data, students have difficulty collecting information related to kidney failure and patients who do not experience kidney failure, but teachers may forget to tell students to search for information on Google Slides.
	The teacher guides students in collecting information	✓		Guidance is more intensive because some students are confused about working on the assignments.	The teacher guides students to collect information by giving instructions to students to be able to search for information sources on Google Slides.
Data Processing	The teacher monitors students in processing the information that has been collected.	✓		The teacher has monitored all groups well until they have finished	The teacher actively goes to each group to ask if they have any difficulties.

			managing the information.	
Verification	The teacher guides students in proving the data obtained with the problems discussed.	✓	The teacher has done well	The teacher has guided students to prove the data obtained.
Generalization	The teacher asks students to draw conclusions based on the data that has been obtained and analyzed together and to correct any misconceptions that occur.	✓	Teachers can direct students to make conclusions	Teachers can guide students to make good conclusions

Student worksheet analysis results

Based on the results of the analysis of the student worksheet after the learning process was carried out, it was found that the student worksheet that had been developed still had weaknesses in the problem identification section. The operational word in problem identification is "Choose and write in the box below one of the most essential problems from the problem that has been formulated". Based on the results of the discussion with the team. The instructions are clear but in fact and practice students are accustomed to formulating problems. This was validated by the class teacher who stated that students were more accustomed to the operational word formulating problems. so, in the future in this problem identification section, the operational word for formulating problems is given.

Teacher reflection

Based on the learning that has been implemented, learning uses the discovery learning model. All learning steps are carried out well starting from the stimulation stage, problem identification, data collection, data processing, data verification and conclusions. Learning begins by opening the class and continues with the provision of Apperception and brainstorming related to the phenomenon of "Hemodialysis or dialysis in kidney patients". At this stage, students are directed to think, for example, why do people have to have dialysis?, What organs of the body are problematic in patients?, why do these problematic organs cause dialysis patients?. In fact, in this apperception, students still do not understand the concept of hemodialysis and there are students who have the wrong concept of interpreting hemodialysis as dialysis. Students state that dialysis is blood that is removed and "washed". When asked how "washed" the students could not answer. In this case, the teacher responded and explained the learning objectives. Furthermore, the teacher divided students into 6 study groups.

In the ongoing learning processes I guide each group to work on the student worksheet. In addition, before the student worksheet. However, there are several things that I reflect on, namely:

a. The model teacher does not emphasize the stages of discovery learning syntax more strongly and is not explained by providing examples.
b. The student worksheet that has been prepared is operational in its implementation. However, students still have difficulties in understanding the meaning of the instructions for completing the student worksheet. For example, at the stimulation and problem identification stage, students have difficulties in understanding the meaning of the instructions, whether to formulate a question or a statement.
c. The model teacher at the beginning of the learning process has explained the learning objectives to be achieved. However, students have not been able to conclude the learning properly. This can be seen in the conclusions that are not in sync with the learning objectives.

Student response

Table 6. Student responses to learning

No	Pernyataan	Strongly agree	Agree	Disagree	Stongly Disagree	Total Score
1.	I always try to actively participate in learning	42.11	57.89	0.00	0.00	85.53
2.	Learning is boring	0.00	5.26	84.21	10.53	76.32
3.	Learning makes me sleepy	0.00	15.79	84.21	0.00	71.05
4.	I do and submit assignments on time	21.05	78.95	0.00	0.00	80.26
5.	I pay attention to the teacher when studying in class on the excretory system material	21.05	78.95	0.00	0.00	85.53
6.	Google site-based textbooks help me understand the material well	15.79	68.42	15.79	0.00	76.32
7.	I enjoy discovery-based learning for learning the excretory system	26.32	73.68	0.00	0.00	81.58
8.	I am active in group work	36.84	63.16	0.00	0.00	84.21
9.	I sometimes forget the responsibilities given by the group	5.26	10.53	68.42	15.79	73.68
10.	I want discovery learning to be used in future biology learning	10.53	78.95	0.00	10.53	75.00
		Average				78.95

Based on the data in Table 6, it shows that the students' responses to learning using discovery learning and Google sites are good. They agree that discovery learning and Google sites do not make them bored, sleepy and forget their responsibilities in the group. Based on

the good responses from students, it seems that they are trying to follow the learning well, are able to complete tasks until they are finished, are focused on learning, and they feel happy. The good response from students to discovery learning and Google Site proves that this learning is able to attract their attention and activate them to be involved in learning (Nusantari et al., 2021; Tambunan & Siagian, 2022).

From the responses of these students, it can also be revealed that collaborative activities among students can run well. This is evidenced by their responses that they agree as much as 63.16% and strongly agree 36.84%. This indicates that discovery learning and Google sites make them active in group work, they even agree that they do not forget the responsibilities given by their group to each individual.

CONCLUSION

This study concludes that the implementation of discovery learning and Google Sites in learning about the formation of human urine has significantly improved the quality of student learning. High school students became more active in answering teacher questions, were able to work on student worksheets, and were able to work together well, discuss actively, and draw conclusions appropriately. Google Sites proved to be an effective medium in helping students find information related to the learning being carried out. Although there were still some students who were not fully active in learning, the results of observations showed that even students who were initially inactive were finally able to engage in collaboration with their friends to complete assignments. Student responses to learning showed a score of 78.95 which was included in the good category, indicating that collaborative activities among students could run well and they felt responsible for the tasks given by the group. This study shows the effectiveness of combining the discovery learning method with digital resources such as Google Sites in increasing student engagement and understanding of complex biological processes. Future research can explore the long-term impact of this method on student academic performance and knowledge retention, as well as consider other broader significant impact measurements in the context of education.

REFERENCES

Aprilanti, H., Qurbaniah, M., & Muldayanti, N. D. (2016). Identifikasi miskonsepsi siswa pada materi sistem ekskresi manusia kelas XI MIA SMA Negeri 4 Pontianak. *Jurnal Bioeducation*, *3*(2), 63–77. https://doi.org/10.29406/188

Arends, R. (2012). *Learning to Teach Ninth Edition*. The Mc Graw Hill Companies, Inc.

Aulia, D., & Riefani, M. K. (2021). Google Site as a Learning Media in the 21st Century on the Protista Concept. *BIO-INOVED: Jurnal Biologi-Inovasi Pendidikan*, *3*(3), 173–178.

Bhagaskara, A. E., Firdausi, A. K., & Syaifuddin, M. (2021). Penerapan Media Webquest Berbasis Google Sites dalam Pembelajaran Masa Pandemi Covid-19 di MI Bilingual Roudlotul Jannah Sidoarjo. *Jurnal Bidang Pendidikan Dasar*, *5*(2), 104–119. https://doi.org/10.21067/jbpd.v5i2.5541

Dita, K. I., Nunaki, J. H., Nasir, N. I. R. F., Winarno, N., Damopolii, I., & Latjompoh, M. (2024). Flipbook digital sistem peredaran darah manusia: Dampaknya terhadap hasil belajar siswa. *Biogenesis*, *20*(2), 55–70. http://dx.doi.org/10.31258/biogenesis.20.2.55-70

Dzulfikry, R., Bundu, P., & Saud, S. (2024). Interactive Biology media learning development based on Google Site to developing the learning result. *Journal of Multidisciplinary Academic Business Studies*, *1*(3), 269–282. https://doi.org/10.35912/jomabs.v1i3.2096

Großmann, N., & Wilde, M. (2019). Experimentation in biology lessons: Guided discovery through incremental scaffolds. *International Journal of Science Education*, *41*(6), 759–781. https://doi.org/10.1080/09500693.2019.1579392

Gulo, A. (2022). Penerapan Model Discovery Learning Terhadap Hasil Belajar Peserta Didik Pada Materi Ekosistem. *Educativo: Jurnal Pendidikan*, *1*(1), 307–313. https://doi.org/10.56248/educativo.v1i1.54

Hassan, M. A., Habiba, U., Majeed, F., & Shoaib, M. (2021). Adaptive gamification in e-learning based on students' learning styles. *Interactive Learning Environments*, *29*(4), 545–565. https://doi.org/10.1080/10494820.2019.1588745

Hidayati, N. (2019). Collaboration skill of biology students at Universitas Islam Riau, Indonesia. *International Journal Of Scientific & Technology Research*, *8*(11), 208–211.

Hole, T. N. (2015). Developing collaboration as a transferrable skills in biology tertiary education. *Literacy Information and Computer Education Journal*, *6*(3), 1971–1975. https://infonomics-society.org/wp-content/uploads/licej/published-papers/volume-6-2015/Developing-Collaboration-as-a-Transferrable-Skills-in-Biology-Tertiary-Education.pdf

Janssen, F. J. J. M., Westbroek, H. B., & van Driel, J. H. (2014). How to make guided discovery learning practical for student teachers. *Instructional Science*, *42*(1), 67–90. https://doi.org/10.1007/s11251-013-9296-z

Kirschner, P. A., Sweller, J., & Clark, R. E. (2006). Why Minimal Guidance During Instruction Does Not Work: An Analysis of the Failure of Constructivist, Discovery, Problem-Based, Experiential, and Inquiry-Based Teaching. *Educational Psychologist*, *41*(2), 75–86. https://doi.org/10.1207/s15326985ep4102_1

Makoolati, N., Amini, M., Raisi, H., Yazani, S., & Razeghi, A. (2015). The effectiveness of Guided Discovery Learning on the learning and satisfaction of nursing students. *Hormozgan Medical Journal*, *18*(6), 490–496. https://hmj.hums.ac.ir/Article/87685

Marjan, J., Arnyana, I. B. P., & Setiawan, I. G. A. N. (2014). Pengaruh Pembelajaran Pendekatan Saintifik Terhadap Hasil Belajar Biologi Dan Keterampilan Proses Sains Siswa MA. Mu allimat NW Pancor Selong Kabupaten Lombok Timur Nusa Tenggara Barat. *Jurnal Pendidikan Dan Pembelajaran IPA Indonesia*, *4*(1), 1–12. https://ejournal-pasca.undiksha.ac.id/index.php/jurnal_ipa/article/view/1316

Matthews, K. E., Adams, P., & Goos, M. (2010). Using the Principles of BIO2010 to Develop an Introductory, Interdisciplinary Course for Biology Students. *CBE Life Sciences Education*, *9*(3), 290–297. https://doi.org/10.1187/cbe.10-03-0034

Nasir, N. I. R. F., Damopolii, I., & Nunaki, J. H. (2020). Pengaruh pembelajaran inkuiri terhadap level berpikir siswa SMA. *Bioilmi: Jurnal Pendidikan*, *6*(2), 112–119. https://doi.org/10.19109/bioilmi.v6i2.6948

Nasir, N. I. R. F., Mahanal, S., Ekawati, R., Damopolii, I., Supriyono, S., & Rahayuningsih, S. (2024). Primary school students' knowledge about animal life cycle material: The survey study. *Journal of Research in Instructional*, *4*(1), 253–262. https://doi.org/10.30862/jri.v4i1.320

Noviyanti, E., Rusdi, R., & Ristanto, R. H. (2019). Guided Discovery Learning Based on Internet and Self Concept: Enhancing Student's Critical Thinking in Biology. *Indonesian Journal of Biology Education*, *2*(1). https://doi.org/10.31002/ijobe.v2i1.1196

Nurlaili, R., Zubaidah, S., & Kuswantoro, H. (2021). Pengembangan E-module Berbasis Discovery Learning untuk Meningkatkan Kemampuan Berpikir Kritis Siswa Kelas XII Berdasarkan Penelitian Analisis Korelasi Kanonik dari Persilangan Tanaman Kedelai. *Jurnal Pendidikan: Teori, Penelitian, dan Pengembangan*, *6*(2), 213–219. https://doi.org/10.17977/jptpp.v6i2.14451

Nusantari, E., Abdul, A., Damopolii, I., Alghafri, A. S. R., & Bakkar, B. S. (2021). Combination of Discovery Learning and Metacognitive Knowledge Strategy to Enhance Students' Critical Thinking Skills. *European Journal of Educational Research*, *10*–(4), 1781–1791. https://doi.org/10.12973/eu-jer.10.4.1781

Octaviana, F., Wahyuni, D., & Supeno, S. (2022). Pengembangan e-lkpd untuk meningkatkan keterampilan kolaborasi siswa SMP pada pembelajaran IPA. *Edukatif: Jurnal Ilmu Pendidikan*, *4*(2), 2345–2353. https://doi.org/10.31004/edukatif.v4i2.2332

Pambudi, G. D., Winangsih, F., Nunaki, J. H., Nusantari, E., & Damopolii, I. (2022). Encouraging students' metacognitive skills through inquiry learning. *Inornatus: Biology Education Journal*, *2*(1), 43–52. https://doi.org/10.30862/inornatus.v2i1.272

Pubian, Y. M., & Herpratiwi, H. (2022). Penggunaan Media Google Site Dalam Pembelajaran Untuk Meningkatkan Efektifitas Belajar Peserta Didik Sekolah Dasar. *Akademika: Jurnal Teknologi Pendidikan*, *11*(01), 163–172. http://dx.doi.org/10.34005/akademika.v11i01.1693

Reynolds, R., & Chiu, M. M. (2013). Formal and informal context factors as contributors to student engagement in a guided discovery-based program of game design learning. *Learning, Media and Technology*, *38*(4), 429–462. https://doi.org/10.1080/17439884.2013.779585

Riaz, M., & Din, M. (2023). Collaboration as 21st Century Learning Skill at Undergraduate Level. *Sjesr*, *6*(1), 93–99. https://doi.org/10.36902/sjesr-vol6-iss1-2023(93-99)

Ristanto, R., Sabrina, A., & Komala, R. (2022). Critical Thinking Skills of Environmental Changes: A Biological Instruction Using Guided Discovery Learning-Argument Mapping (GDL-AM). *Participatory Educational Research*, *9*(1), 173–191. https://doi.org/10.17275/per.22.10.9.1

Rusmalinda, R., & Syaifudin, A. (2022). Keefektifan model discovery learning dengan team assisted individualization (D-TAI) terhadap keterampilan kolaborasi peserta didik. *Al-Ikmal: Jurnal Pendidikan*, *1*(1), 59–76. https://journal.iaidalampung.ac.id/index.php/al-ikmal/article/view/26

Santi, T. K. (2023). The Exploration of the Surrounding Nature Approach with the Discovery Learning Model for Biology Learning Outcomes. *Jurnal Penelitian Pendidikan IPA*, *9*(6), 4443–4449. https://doi.org/10.29303/jppipa.v9i6.3508

Sartono, N., Rusdi, R., & Handayani, R. (2018). Pengaruh pembelajaran process oriented guided inquiry learning (pogil) dan discovery learning terhadap kemampuan berpikir analisis siswa sman27 Jakarta pada materi sistem imun. *BIOSFER: Jurnal Pendidikan Biologi*, *10*(1), 58–64. https://doi.org/10.21009/biosferjpb.10-1.8

Setyantoko, E., Nunaki, J. H., Jeni, J., & Damopolii, I. (2023). Development of human digestive system e-module to improve students' learning outcomes during pandemic. *AIP Conference Proceedings*, *2540*, 020002. https://doi.org/10.1063/5.0105782

Sevtia, A. F., Taufik, M., & Doyan, A. (2022). Pengembangan Media Pembelajaran Fisika Berbasis Google Sites untuk Meningkatkan Kemampuan Penguasaan Konsep dan Berpikir Kritis Peserta Didik SMA. *Jurnal Ilmiah Profesi Pendidikan*, *7*(3), 1167–1173. https://doi.org/10.29303/jipp.v7i3.743

Simorangkir, A., & Napitupulu, M. A. (2020). Analisis kesulitan belajar siswa pada materi sistem ekskresi manusia. *Jurnal Pelita Pendidikan*, *8*(1), 1–11. https://doi.org/10.24114/jpp.v8i1.11247

Sipayung, H. D., Rahmatsyah, Sani, R. A., Bunawan, W., & Lubis, R. H. (2019). Effect of collaborative inquiry learning model to 4C student skills in high school. *Jurnal Pendidikan Fisika*, *8*(1), 29–38. https://doi.org/10.22611/jpf.v8i1.10639

Sitiatava, P. R. (2013). *Desain Belajar Mengajar Kreatif Berbasis Sains*. Diva Press.

Styers, M. L., Van Zandt, P. A., & Hayden, K. L. (2018). Active Learning in Flipped Life Science Courses Promotes Development of Critical Thinking Skills. *CBE—Life Sciences Education*, *17*(3), ar39. https://doi.org/10.1187/cbe.16-11-0332

Sudrajat, A. K., Ibrohim, I., Susilo, H., & Purwinda, A. D. (2023). Perceptions of prospective biology teachers about collaboration in the prospective teacher training program. *JPBI (Jurnal Pendidikan Biologi Indonesia)*, *9*(3), 394–401. https://doi.org/10.22219/jpbi.v9i3.29097

Syafii, I. (2022). Pengaruh model pembelajaran discovery learning terhadap keterampilan kolaborasi siswa pada materi larutan penyangga. *Jurnal Pendidikan Indonesia : Teori, Penelitian, Dan Inovasi*, *2*(5). https://doi.org/10.59818/jpi.v2i5.340

Tambunan, M. A., & Siagian, P. (2022). Pengembangan media pembelajaran interaktif berbasis website (Google sites) pada materi fungsi di SMA Negeri 15 Medan. *Humantech : Jurnal Ilmiah Multidisiplin Indonesia*, *1*(10), 1520–1533. https://doi.org/10.32670/ht.v1i10.2166

West, J., Hopper, P. F., & Hamil, B. (2010). Science Literacy: Is classroom instruction enough. *National Forum of Teacher Education Journal*, *20*(3), 1–6. http://www.nationalforum.com/Electronic%20Journal%20Volumes/West,%20Jeff%20Science%20Literacy-Is%20Classroom%20Instruction%20Enough%20NFTEJ%20V20%20N%203%202010.pdf

White, J., Paslawski, T., & Kearney, R. (2013). 'Discovery learning': An account of rapid curriculum change in response to accreditation. *Medical Teacher*, *35*(7), e1319--e1326. https://doi.org/10.3109/0142159X.2013.770133

Widodo, S., & Wardani, R. K. (2020). Mengajarkan Keterampilan Abad 21 4C (Communication, Collaboration, Critical Thinking and Problem Solving, Creativity and Innovation) di Sekolah Dasar. *MODELING: Jurnal Program Studi PGMI*, *7*(2), 185–197. https://doi.org/10.69896/modeling.v7i2.665

Xu, J., Campisi, P., Forte, V., Carrillo, B., Vescan, A., & Brydges, R. (2018). Effectiveness of discovery learning using a mobile otoscopy simulator on knowledge acquisition and retention in medical students: A randomized controlled trial. *Journal of Otolaryngology-Head & Neck Surgery*, *47*(1), 1–8. https://doi.org/10.1186/s40463-018-0317-4