STUDENTS' PERCEPTIONS OF SOCIAL MEDIA-SUPPORTED BIOLOGY LEARNING AT AN INDONESIAN SENIOR HIGH SCHOOL: A QUALITATIVE STUDY

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ABSTRACT

This study explored students' perceptions and experiences of using social media and related digital platforms to support biology learning at SMA Negeri 7 Semarang. The study focused on students' perceptions of these platforms as learning resources, the ways in which different platforms were used for biology learning activities, and the benefits and challenges associated with their use. A qualitative descriptive design was employed, using individual semi-structured interviews with 20 students who were purposively recruited based on predefined eligibility criteria, including prior experience using social media or related digital platforms for biology-related learning activities. The findings indicate that students perceived these platforms as useful for accessing supplementary learning resources, communicating and collaborating with peers, and supporting the preparation of learning materials. At the same time, participants reported several challenges, including distraction from non-academic content, difficulties in interpreting written communication, and uncertainty regarding the credibility of online information. These findings suggest that the educational value of social media and related digital platforms is perceived by students as context-dependent, with their usefulness shaped by the specific learning purposes for which the platforms are used and the challenges encountered during their use.

Keywords: Social Media, Biology Learning, Education, Positive and Negative Influences

INTRODUCTION

Social media refers to digital platforms that enable users to create, share, communicate, and interact with content within networked online environments. In educational contexts, social media can extend learning beyond the physical classroom by providing opportunities for communication, information exchange, collaboration, and access to user-generated or educational content (Greenhow & Lewin, 2016). In the present study, social media refers primarily to platforms used by students for communication, information sharing, and access to learning-related content, particularly WhatsApp, YouTube, and Instagram. Other digital platforms reported by participants, such as Google Meet and Canva, are treated as related digital learning platforms rather than as social media. Google Meet is considered a video-conferencing and synchronous communication platform, whereas Canva is considered a digital content-creation and visual-design platform. This distinction is important because these platforms serve different technological and pedagogical functions, although students may combine them within the same learning activities. Social media has become an important part of students' everyday digital lives, providing opportunities for self-expression, communication, information sharing, and interaction with others. In digital

youth culture, young people may also use social media to construct and present aspects of their identities and everyday experiences (Boyd, 2014).

However, the educational use of social media among adolescents should not be understood solely in terms of distraction or lack of control. Rather, students may use digital platforms for multiple purposes, including communication, information seeking, social interaction, and learning. Research involving Indonesian adolescents has shown that social media is used for social, practical, informational, and recreational purposes, while adolescents also recognise potential challenges such as distraction and exposure to unreliable information (Purboningsih et al., 2023). Similarly, research involving secondary-school students indicates that platforms such as WhatsApp, YouTube, and Instagram may be incorporated into students' everyday practices for both educational and social purposes (Rawat & Babu, 2024). These findings suggest that the educational relevance of social media lies not simply in whether students use these platforms, but in how they use them and for what purposes.

In educational contexts, learning media are used to convey information and support students' attention, engagement, and understanding during the learning process (Agustina, 2021). Appropriately designed digital media may help teachers represent complex material more clearly and provide students with additional learning resources. This is particularly relevant to biology learning, which involves abstract concepts, processes, structures, and phenomena that may be difficult for students to understand through textual explanations alone. Digital resources that combine verbal and visual representations may therefore provide additional opportunities for students to explore and organise information.

Mayer's (2009) Cognitive Theory of Multimedia Learning suggests that learners process information through interacting verbal and visual representations and that meaningful learning may occur when learners actively select, organise, and integrate these representations. From this perspective, multimedia resources available through platforms such as YouTube and visual-content creation tools such as Canva may provide potential support for students' engagement with biology-related information. For example, video-sharing platforms may provide access to explanations or demonstrations, messaging platforms may facilitate communication and group discussion, and visual-design platforms may support the preparation of presentations or other learning materials. However, the educational value of these platforms depends on how students actually use them and how they perceive their usefulness within particular learning contexts.

Despite the growing use of social media and related digital platforms in students' learning practices, an unresolved issue concerns how students themselves experience and interpret the use of these platforms for subject-specific learning. Previous research has highlighted the potential of social media to support communication, participation, collaboration, and access to learning resources (Greenhow & Lewin, 2016). At the same time, social media use may involve challenges, including distraction, exposure to irrelevant information, and difficulties in distinguishing useful information from unreliable content (Purboningsih et al., 2023). These contrasting possibilities indicate that the presence of digital platforms alone does not determine their educational value. Rather, understanding students' actual experiences and perceptions is important for identifying how different platforms are used, what learning functions students associate with them, and what challenges they encounter.

This issue is particularly relevant in the context of biology learning at the secondary-school level in Indonesia. Although students may use a variety of digital platforms in their everyday lives, less is known about how these platforms are specifically incorporated into their biology learning activities within a particular school context. In addition, existing discussions of social media in education often emphasise its general educational affordances, while comparatively less attention is given to students' firsthand accounts of how different platforms are used for biology-related activities and how students perceive their benefits and limitations.

Therefore, this study addresses a practical and contextual gap by examining students' experiences and perceptions of social media and related digital platforms in biology learning at SMA Negeri 7 Semarang. Rather than assuming that social media produces measurable improvements in learning, the study seeks to understand the meanings and experiences students attribute to their use of these platforms.

Accordingly, this study contributes context-specific qualitative evidence concerning the use of social media and related digital platforms in secondary-school biology learning. The findings are expected to provide a more nuanced understanding of the ways students use platforms for accessing supplementary information, communicating and collaborating with peers, and supporting learning activities, while also identifying challenges that may need to be considered in classroom integration. Based on this focus, the study addresses the following research questions: (1) How do students perceive the use of social media and related digital platforms in biology learning? (2) How do students use different digital platforms to support biology learning activities? and (3) What benefits and challenges do students perceive when using digital platforms for biology learning?

METHODS

A qualitative descriptive design was employed, using individual semi-structured interviews to explore students' experiences and perceptions of social media use in biology learning. Twenty students from SMA Negeri 7 Semarang were purposively recruited to participate in the study. purposive sampling was used to select students who had direct and relevant experience with the phenomenon under investigation, namely the use of social media and related digital platforms in building learning.

To be eligible, participants had to 91) be enrolled as students at SMA Negeri 7 Semarang during the study period; (2) have used at least one social media or related digital platform for a biology-learning activity; (3) have used the platform for a specific learning purpose, such as accessing suplementary biology information, watching instructional videos, discussing biology-related assignments, communicating with peers, or preparing learning materials; and (4) be willing and able to describe their experiences and perceptions during an individual interviews. Participants was voluntary, and students were informed about the purpose and procedures of the study before providing the required consent.

Eligibility was assessed through a brief screening process conducted before the interviews. Students were asked whether they had personally used digital platforms for biology-related learning activities and to provide examples of the activities undertaken. Students whose experiences were limited to general social-media use unrelated to biology learning were not included. This criterion was intended to ensere that participants could provide firsthand accounts directly relevant to the research questions.

Data were collected through semi-structured interviews, which allowed respondents to provide answers freely but still directed towards the research objectives. Respondents were selected using purposive sampling techniques, specifically students who have experience using social media in the biology learning process. Interviews were conducted in person and focused on topics such as the effectiveness of social media, the challenges faced, and differences in usage patterns based on gender.

The data obtained were analyzed thematically to identify the main patterns and themes from the respondents' answers. Thematic analysis, as outlined by Braun and Clarke (2006), is an effective method for identifying, analyzing, and reporting patterns within data. It is particularly suited for studies exploring subjective experiences, such as student engagement with digital learning tools.

RESULTS AND DISCUSSION

Interview Process and Thematic Findings

The interviews with 20 students lasted approximately 20–30 minutes per participant. The interview questions addressed the types of digital platforms used for biology learning, the frequency and purposes of use, students' perceptions of their usefulness for understanding biology materials, challenges encountered during use, and perceived implications for their learning experiences. The interview data were analysed thematically to identify recurring patterns in students' accounts. The analysis generated several themes concerning the use of social media and related digital platforms in biology learning, including collaborative learning and communication, access to supplementary learning resources, support for understanding biology concepts, and challenges associated with attention and communication.

Teacher Perspective

One biology teacher at SMA Negeri 7 Semarang was also interviewed to provide contextual information about the use of digital platforms in biology learning. The teacher described the use of YouTube as one of the digital resources incorporated into biology learning activities. According to the teacher, YouTube can provide students with access to visual and explanatory materials that complement classroom instruction.

"I usually recommend YouTube videos when students need additional explanations, especially for biology topics that involve processes or structures that are difficult to explain only through textbooks. The videos help students see the process more clearly and review the material outside the classroom." (Teacher)

The teacher's account suggests that digital platforms can provide additional resources that complement classroom-based instruction. However, because only one teacher participated in the interview, this finding represents the perspective of an individual teacher and should not be interpreted as evidence of collective teacher agreement or as an independently measured increase in student participation. The teacher's account is therefore used as contextual evidence to complement the students' experiences rather than as evidence of the effectiveness of social media in improving learning outcomes.

Students' Experiences of Using Digital Platforms for Biology Learning

The student interviews indicated that social media and related digital platforms were incorporated into biology learning for several purposes. Students described using WhatsApp and Google Meet primarily for communication and group discussion, YouTube for accessing additional explanations and learning materials, and Canva for preparing presentations and other visual learning materials. Instagram was also described as a source of biology-related visual information.

These accounts indicate that students did not use all platforms in the same way. Rather, the perceived function of each platform was associated with the type of learning activity being undertaken. Communication-oriented platforms were used to coordinate and discuss learning tasks, video-based platforms were used to obtain additional explanations, and visual-design tools were used to develop learning products.

"We use WhatsApp to discuss biology assignments and share information with group members. If someone does not understand the task, we usually ask in the group and discuss the answer together." (Student S01)

"I often watch YouTube videos when the explanation in class is not enough for me. Sometimes the video explains the material step by step, so it is easier to understand."

(Student S02)

"We use Canva to make biology presentations because it helps us organise the material and make the presentation more attractive and easier to follow." (Student S03)

These accounts suggest that students perceived digital platforms primarily as complementary resources rather than as replacements for classroom instruction. The platforms provided additional opportunities to communicate with peers, access explanations, and prepare learning materials. This finding is consistent with research suggesting that social media can extend learning opportunities through communication, collaboration, and access to educational resources (Greenhow & Lewin, 2016).

Collaboration and Communication

Collaboration emerged as one of the functions associated with students' use of digital platforms. Several students described using WhatsApp and Google Meet to communicate with classmates and discuss biology-related assignments or materials. These platforms enabled students to continue discussions outside the classroom and coordinate group tasks without requiring all members to meet physically.

"When we have a group assignment, we use WhatsApp to divide the tasks and discuss the biology material. We can still communicate even when we are not at school." (Student S04)

Another student explained:

"*Google Meet is useful when we need to discuss a presentation together. We can explain our ideas and ask questions, although sometimes the connection is not stable*." (Student S06)

The students' accounts indicate that digital platforms supported the social dimension of biology learning by enabling them to exchange information, ask questions, discuss difficult materials, and coordinate group assignments. This finding reflects the collaborative potential of social media and networked digital environments, where communication and information sharing can support interaction among learners (Greenhow & Lewin, 2016; Pusporini et al., 2022).

The finding can also be understood in relation to collaborative learning, in which knowledge construction may occur through interaction, discussion, and negotiation of meaning among learners. When students discuss biology concepts with peers, different interpretations and levels of prior knowledge may be brought into the discussion. Such interaction may provide opportunities for students to clarify their understanding and negotiate interpretations of learning materials (Kholil et al., 2024). However, the present findings should be interpreted as evidence of **students' perceived opportunities for collaboration**, rather than as evidence that social media directly improves collaborative learning outcomes.

Access to Supplementary Biology Learning Resources

Another theme concerned students' use of digital platforms to obtain information beyond the materials provided during classroom instruction. Students particularly identified YouTube as a source of additional explanations, demonstrations, and visual materials related to biology topics. Some students reported turning to online resources when the explanation provided in class or in textbooks was considered insufficient for their understanding.

"I use YouTube to find other explanations about biology topics. Sometimes one video is difficult to understand, so I search for another video that uses simpler language or clearer pictures." (Student S07)

Similarly, another student stated:

"*The textbook gives the main information, but YouTube provides examples and animations. This helps me learn more about the topic."* (Student S09)

The students' accounts suggest that digital platforms functioned as supplementary learning resources by enabling students to search for alternative explanations and representations of biology concepts. This use is consistent with the potential of social media and digital environments to extend access to learning resources beyond formal classroom settings (Greenhow & Lewin, 2016). However, the findings describe students' **perceived usefulness and patterns of use** rather than demonstrating objectively improved learning outcomes.

Perceived Support for Understanding Biology Materials

Students also described digital platforms as useful when they encountered biology concepts that they considered difficult to understand. Video-based explanations and visual representations were perceived as particularly helpful because they could provide alternative ways of presenting biological processes, structures, and concepts.

"*The topic of the human circulatory system was difficult for me because there are many processes to remember. After watching an animation on YouTube, I could understand how the blood moves through the heart and the body*." (Student S10)

Another student explained:

"Pictures and diagrams made with Canva help me remember the parts of a cell. When the information is presented visually, I can understand the relationship between the parts more easily." (Student S12)

This finding can be interpreted through Mayer's (2009) Cognitive Theory of Multimedia Learning, which proposes that learners can construct meaningful understanding when verbal and visual representations are appropriately selected, organised, and integrated. In the present study, students' accounts suggest that multimedia resources available through platforms such as YouTube and Canva were perceived as providing additional representations of biology content. Nevertheless, because the study relied on students' interview accounts rather than direct measures of achievement or conceptual understanding, the finding should be interpreted as perceived support for understanding, rather than evidence of improved learning performance.

Challenges in Using Digital Platforms

Although students described several potential benefits, the interviews also revealed challenges associated with using digital platforms for biology learning. Students reported experiences related to divided attention and communication difficulties when digital platforms were used alongside non-learning content or when communication occurred without direct face-to-face interaction.

"Sometimes I open YouTube to study biology, but I become distracted by other recommended videos. I may start watching entertainment videos instead of continuing with the biology material." (Student S14)

Another student stated:

"When we discuss an assignment through WhatsApp, sometimes the message is misunderstood because we cannot hear the person's tone or immediately ask for clarification." (Student S16)

These accounts indicate that the same digital environment that provides access to learning resources may also expose students to competing information and activities. The presence of non-educational content may make it more difficult for students to maintain attention on a learning task. This finding can be discussed in relation to the media multitasking literature, which has associated frequent switching between different media activities with difficulties in maintaining attention and processing information efficiently (Ophir et al., 2009). Importantly, in the present study, this literature is used to interpret the students' reported experiences of distraction, rather than to claim that media multitasking caused poorer learning outcomes.

The interviews also indicated that digital communication may create opportunities for misunderstanding when students discuss learning tasks without the immediate clarification available in face-to-face interaction.

"In online group discussions, not everyone responds at the same time. Sometimes we understand the instructions differently, so we need to discuss them again in person." (Student S18)

This suggests that the educational value of digital platforms is influenced not only by the availability of technological resources but also by how communication and learning activities are organised. Consequently, the integration of digital platforms into biology learning requires appropriate guidance regarding the purpose of platform use, the selection of reliable learning resources, and the management of attention during online activities.

The interview process lasted 20-30 minutes per respondent. The interview questions cover aspects such as the types of social media used, the frequency of use, the effectiveness of social media in aiding the understanding of biology material, the challenges faced, and how social media affects their learning outcomes. All interviews were recorded and analyzed to identify the main themes that emerged from the experiences of students. This rich qualitative dataset enables the researcher to capture nuanced understandings of student experiences, making the findings contextually grounded and relevant to the implementation of digital pedagogy in biology classrooms.

Use of Social Media and Related Digital Platforms in Biology Learning

The interviews indicated that students used social media and related digital platforms for several biology learning activities. The platforms reported by participants included WhatsApp, YouTube, Google Meet, Canva, and Instagram. However, students used these platforms for different purposes rather than treating them as interchangeable learning tools. WhatsApp was primarily used to communicate with classmates, discuss biology assignments, and coordinate group activities. Google Meet was used to facilitate synchronous discussions and group meetings, particularly when students could not meet physically. YouTube was used to access supplementary explanations, demonstrations, animations, and other biology-related learning materials. Canva was used to prepare presentations and visual learning materials, while Instagram was reported as an additional source of biology-related visual information.

Table 1/Study-Specific Use of Digital Platforms in Biology Learning

Platform	Classification	Learning-related use reported by participants
WhatsApp	Social/messaging platform	Group discussion, information exchange, assignment coordination
YouTube	Video-sharing/social media platform	Supplementary explanations, demonstrations, animations, and biology-related videos
Google Meet	Video-conferencing platform	Synchronous discussion and group meetings
Canva	Digital content-creation and visual-design platform	Presentation preparation and visual learning materials
Instagram	Social networking/content-sharing platform	Access to biology-related visual information

One participant explained, “We usually use WhatsApp to discuss biology assignments, and if we do not understand the material, we search for an explanation on YouTube. For presentations, we use Canva to make the material more attractive” (Student 03).

The students' accounts suggest that digital platforms served complementary functions within their biology learning activities. Communication-oriented platforms supported interaction and coordination among students, whereas content-sharing and visual-design platforms provided additional resources for accessing or presenting biology-related information. These findings indicate that students selected platforms according to the requirements of particular learning activities rather than using social media as a single, uniform form of learning media.

The use of these platforms was particularly evident in collaborative learning activities. Students reported using WhatsApp and Google Meet to exchange information, discuss biology materials, divide responsibilities, and coordinate group assignments.

As one participant stated, “When we have a group assignment, we use WhatsApp to divide the tasks and share information. Sometimes we also use Google Meet to discuss the assignment when we cannot meet at school” (Student S05).

These findings suggest that digital platforms provided students with opportunities to maintain communication and coordinate learning activities beyond the physical classroom. The findings are consistent with previous research indicating that social media can support communication, collaboration, and access to learning resources when integrated into appropriate educational activities (Greenhow & Lewin, 2016). However, in the present study, these platforms are interpreted as resources that students perceived as supporting collaboration, rather than as evidence of objectively improved collaborative learning outcomes.

Students also reported using YouTube and other digital resources to obtain supplementary information when they needed additional explanations of biology concepts. Video-based materials were perceived as useful because they provided alternative explanations and visual representations of biological processes and structures.

One participant reported, “I use YouTube when the teacher’s explanation is not enough for me. The videos usually show animations of the process, so it is easier to understand topics such as the human circulatory system” (Student S02).

This finding suggests that students used digital platforms to supplement

rather than replace classroom instruction. The availability of alternative explanations allowed students to search for materials that they perceived as clearer or more accessible. Such use is consistent with the potential of digital environments to extend students' access to learning resources beyond formal classroom settings (Greenhow & Lewin, 2016).

Risks and Challenges

Although students reported several ways in which digital platforms supported their biology learning, the interviews also revealed several constraints. Participants reported three principal constraints: distraction from non-academic content, difficulty interpreting written communication, and uncertainty about the credibility of online information.

One participant explained, “Sometimes I open YouTube to find a biology video, but then I see other recommended videos and start watching them. In the end, I spend more time on entertainment than on studying” (Student S07).

Students described situations in which the same platforms used to access biology-related materials also exposed them to entertainment or other non-academic content. For example, students could encounter unrelated or recommended content while searching for learning materials. This experience indicates that access to educational resources and exposure to competing content may occur within the same digital environment.

Another participant stated, “When we discuss an assignment through WhatsApp, sometimes I misunderstand the message because I cannot hear the person’s tone. I may think the message means one thing, but my friend intended something different” (Student S04).

Students also reported that written communication through messaging platforms could sometimes result in misunderstanding. The absence of facial expressions, tone of voice, and immediate clarification could make it difficult for students to interpret the intended meaning of messages related to assignments or group discussions.

A participant also expressed concern about the reliability of online information: “We cannot immediately believe everything we find on social media. Sometimes the explanation looks correct, but we still need to compare it with the textbook or ask the teacher” (Student S06).

Finally, students expressed concerns about determining whether information obtained from social media and other online platforms was accurate and reliable. This concern is particularly relevant when students independently search for biology-related information, as the availability of multiple sources does not necessarily indicate that all sources provide scientifically accurate information.

Taken together, these findings indicate that students' experiences with social media and related digital platforms involved both opportunities and constraints. The platforms provided access to supplementary information and supported communication and collaboration, but students also encountered distraction, communication difficulties, and concerns regarding information credibility. Therefore, the findings do not support a uniformly positive or negative interpretation of digital platform use. Instead, they highlight the importance of examining how students use particular platforms for specific learning purposes and the challenges they experience in doing so.

CONCLUSION

This study explored students' experiences and perceptions of using social media and related digital platforms in biology learning at SMA Negeri 7 Semarang. The findings indicate that participants used different platforms for different learning purposes. YouTube was perceived as useful for accessing supplementary explanations and visual learning resources, while WhatsApp and Google Meet supported

communication, group discussion, and coordination of learning activities. Canva was used to support the preparation of presentations and other visual learning materials, while Instagram was identified as an additional source of biology-related visual information.

The findings also indicate that students perceived several benefits associated with the use of these platforms, particularly in relation to access to supplementary information, communication with peers, collaboration, and the presentation of biology-related materials. At the same time, participants reported three principal constraints: distraction from non-academic content, difficulties in interpreting written communication, and uncertainty regarding the credibility of online information. These findings demonstrate that students' experiences with digital platforms involve both opportunities and challenges rather than a uniformly positive or negative effect on learning.

Overall, the findings suggest that the educational value of social media and related digital platforms is closely associated with how students use them for particular learning purposes. The platforms appear to function primarily as complementary resources that extend communication, access to information, and learning activities beyond conventional classroom instruction. However, the findings should be interpreted within the context of the study, which involved 20 students and one biology teacher at a single secondary school. The study therefore does not establish causal effects on learning outcomes or support generalisations to other schools or student populations. Instead, it provides context-specific qualitative insight into how students experience and perceive the use of digital platforms in secondary-school biology learning.

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