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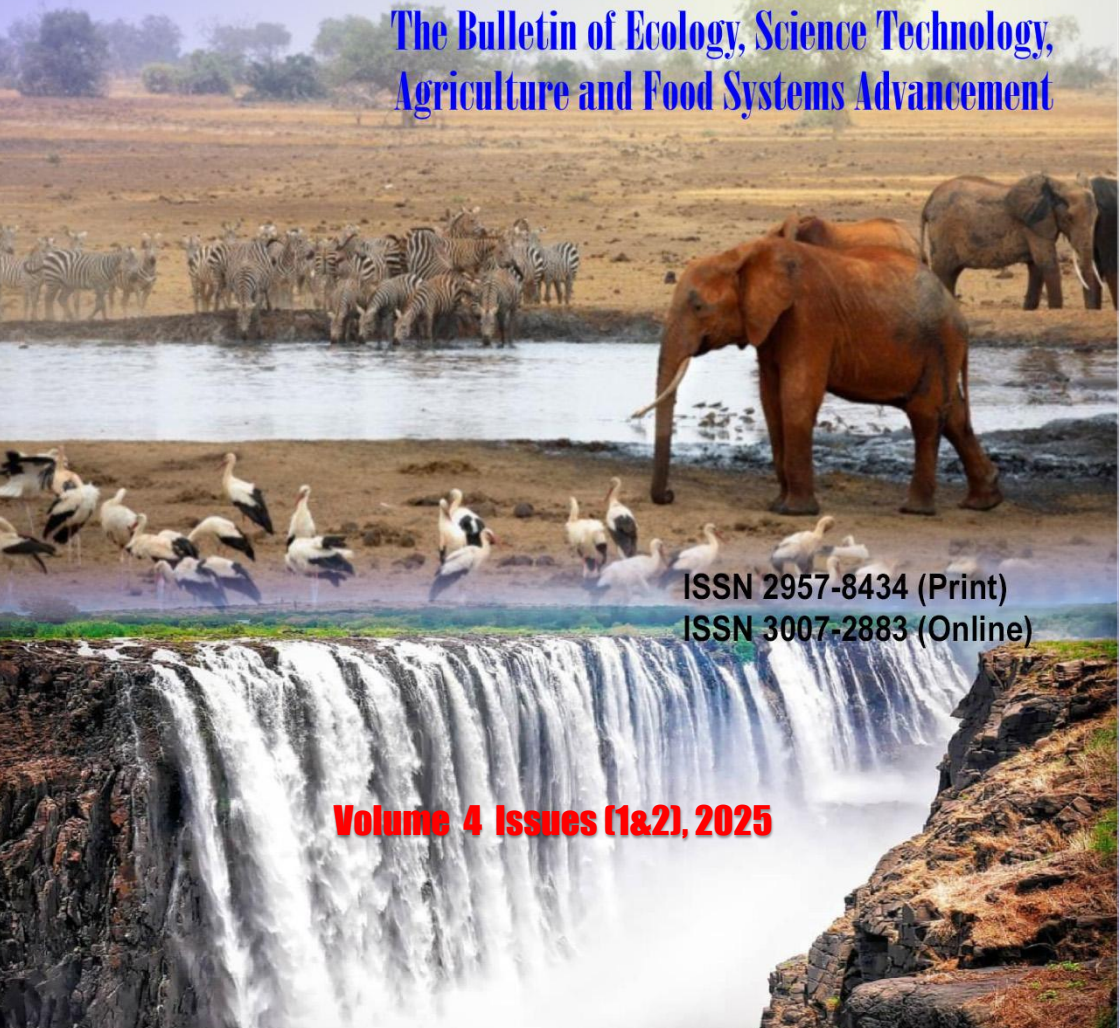
The Zimbabwe Ezekiel Guti University
The Bulletin of Ecology, Science Technology, Agriculture and Food Systems Advancement



ISSN 2957-8434 (Print)
ISSN 3007-2883 (Online)

Volume 4 Issues (1&2), 2025

Published by the Zimbabwe Ezekiel Guti University Press
Stand No. 1901 Barrassie Rd,
Off Shamva Road
Box 350
Bindura, Zimbabwe

Typeset by Divine Graphics
Printed by Divine Graphics

SUBSCRIPTION AND RATES
Zimbabwe Ezekiel Guti University Press Office
Stand No. 1901 Barrassie Rd,
Off Shamva Road
Box 350
Bindura, Zimbabwe
Telephone: ++263 8 677 006 136 | +263 779 279 912
E-mail: zegupress@admin.uz.ac.zw
http://www.zegu.ac.zw/press

About the Journal

JOURNAL PURPOSE

The purpose of *the Oikos - The Zimbabwe Ezekiel Guti University Bulletin of Ecology, Science Technology, Agriculture and Food Systems Review and Advancement* is to provide a forum for scientific and technological solutions based on a systems approach and thinking as the bedrock of intervention.

CONTRIBUTION AND READERSHIP

Natural scientists, engineering experts, technologists, multidisciplinary teams are encouraged.

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Oikos - The Zimbabwe Ezekiel Guti University Bulletin of Ecology, Science Technology, Agriculture and Food Systems Review and Advancement

ISSN 2957-8434(Print)
ISSN 3007-2883(Online)

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The journal is a forum for the discussion of ideas, scholarly opinions and case studies of natural and physical science with a high proclivity to multidisciplinary approaches. The journal is produced bi-annually.

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LEVERAGING SOCIAL MEDIA TO ENRICH BIOLOGY EDUCATION: INSIGHTS FROM A PERI-URBAN CASE STUDY

CHARITY C. CHADZIMURA[1], MARTINA MADYANGOVE[2] AND ALBERT MUTASA[3]

Abstract

The integration of social media in biology education has advanced significantly, particularly in peri-urban settings. The study uses a mixed methods approach to assess the impact of social media on student participation, content, communication, assessment techniques, knowledge retention, inquiry-based and collaborative learning. The findings show that social media facilitated inclusive, interactive and collaborative learning experiences, accommodating students from diverse backgrounds. Technology-based platforms like Instagram, Twitter and Facebook, encourage peer-to-peer learning and foster a community of inquiry. Teachers report enhanced communication with students and parents, leading to increased support and appreciation for biology education. The research underscores the potential of social media as a transformative educational resource.

Keywords: digital literacy, science education, inclusive, technology, complex.

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INTRODUCTION

The study explores the use of social media in biology education, focusing on peri-urban areas with limited access to resources. It aims to understand how students engage with biology content, how social media facilitates collaboration and how teachers and students perceive its use. The research aims to provide insights for integrating social media into biology curricula and contribute to the ongoing discourse on digital education. The study emphasises the importance of adaptable educational strategies and evidence-based recommendations for educators to harness the power of social media to enhance student engagement and learning in biology education.

The use of social media in educational practices has greatly increased and biology education is not excluded. In Zimbabwe, peri-urban areas and educational institutions face unique challenges and opportunities. Peri-urban regions, categorised by their transitional nature between urban and rural environments, often experience a blend of agricultural practices and urbanisation, which can significantly influence educational dynamics. These social media platforms, including Twitter, Facebook and WhatsApp, have emerged as powerful tools for enhancing educational experiences. The platforms facilitate communication, collaboration and engagement among students and educators. In biology education, these social media platforms can be used for sharing resources, discussing scientific concepts and fostering a community of learners. For example, educators can utilise these platforms to disseminate information about local biodiversity, environmental issues and conservation efforts, which are particularly pertinent in peri-urban contexts where urban expansion often threatens natural habitats (Munyoro *et al*., 2022). Moreover, social media allows for the integration of multimedia resources, such as videos and infographics, which can enhance understanding of complex biological concepts. This multimodal approach caters to diverse learning styles, making biology more accessible to a broader audience. Additionally, social media can facilitate real-time feedback and discussions, enabling students to engage with the material actively and collaboratively (*ibid*.). Despite the potential benefits, the use of social media in education within peri-urban areas is not without challenges. One significant issue

is the digital divide, where disparities in accessing technology and the internet can hinder equitable participation in social media-based learning. Many students in peri-urban regions may lack reliable internet access or the necessary devices to engage fully with online educational content. This can exacerbate existing educational inequalities and limit the effectiveness of social media as a learning tool (*ibid.*).

Additionally, the informal nature of social media can lead to challenges in maintaining academic integrity and ensuring the quality of information shared. Educators must steer the complexities of moderating discussions and guiding students in discerning credible sources from misinformation. This is very important, particularly in biology education, where accurate scientific knowledge is essential (*ibid.*).

Regardless of these challenges, leveraging social media in biology education within peri-urban contexts offers many opportunities for enrichment. The social media can raise a sense of community among students, encouraging collaboration and peer support. It can also serve as a bridge between formal education and real-world applications, allowing students to connect with local environmental organisations, participate in citizen science projects and engage with ongoing research initiatives (*ibid.*). Additionally, social media can enhance the visibility of peri-urban ecological issues, raising awareness and prompting action among students and the broader community by engaging with local environmental challenges through social media, students can develop a sense of agency and responsibility towards their environment, fostering a culture of sustainability and conservation (*ibid.*).

Furthermore, the informal nature of social media can lead to challenges in maintaining academic integrity and ensuring the quality of information shared. Educators must navigate the complexities of moderating discussions and guiding students in discerning credible sources from misinformation. This is particularly crucial in biology education, where accurate scientific knowledge is essential (Madden and Zickuhr, 2011).

Despite challenges faced, the integration of social media into biology education in peri-urban contexts offers significant opportunities for enhancing learning experiences. By addressing the barriers to access and ensuring the quality of information shared, educators can harness the potential of social media to enrich biology education and empower students to engage with their environment meaningfully.

PURPOSE OF THE STUDY

The aim of the study is to explore and analyse the potential of social media as a pedagogical tool to enhance engagement, collaboration and learning outcomes in biology education within a peri-urban context.

RESEARCH OBJECTIVES

1. Determine which social media platforms are most commonly used by students and educators for biology education in peri-urban areas.
2. Evaluate the level of student engagement with biology content shared on social media.
3. Analyse biological content (videos, articles, discussions) that generate the most interest and interaction among students.
4. Formulate recommendations for effectively integrating social media into biology curricula based on findings from the case study.

RESEARCH QUESTIONS

1. Which social media platforms do students and educators in peri-urban areas use most frequently for biology education?
2. What is the level of student engagement with biology-related content on various social media platforms?
3. What types of biological content receive the highest levels of interest and interaction among students on social media?
4. What best practices can be recommended for integrating social media into biology curricula based on insights gained from the study?

LITERATURE REVIEW

The integration of social media into education has gained traction in recent years, particularly in enhancing science education in peri-urban and developing contexts. Research indicates that social media can significantly enhance student engagement in biology. For instance, Rautela (2022) observes that platforms like Instagram and Facebook create interactive learning environments where students actively participate by sharing their projects and receiving feedback. However, this engagement is crucial in peri-urban areas, where traditional educational resources may be scarce. Bui (2023) asserts that the role of social media in promoting collaborative learning and students can work together on biology projects, share resources and discuss concepts in real-time. Additionally, the collaborative aspect fosters a sense of community among students, enhancing their learning experience and making biology more accessible. In developing countries, students often struggle to find quality educational materials. Chau and Bui (2023) highlight that these social media platforms provide access to a wide range of scientific resources, including videos, articles and expert discussions.

However, the access to these social media platforms can significantly enhance students' understanding of complex biological concepts. Wang *et al*. (2022) discuss how educators utilise social media for professional development. By connecting with peers and accessing resources, teachers can improve their teaching strategies and better integrate technology into biology education. This professional networking is vital for teachers in peri-urban and developing areas, where professional development opportunities may be limited. Despite the benefits, challenges remain in the effective use of social media in education. Chen and Xiao (2022) point out that varying levels of digital literacy among students and teachers, as well as unequal access to technology, can hinder the integration of social media into educational settings. These factors are particularly pronounced in peri-urban and developing contexts, where infrastructure may not support widespread technology use. Several studies conducted in different contexts align with the findings of this literature review. For example, Iwamoto and Chun (2020) explore the emotional impacts of social media on students, noting

that while it can foster positive engagement, it may also lead to anxiety due to social comparison. Similarly, research by Alharbi *et al*. (2021) in Saudi Arabia, demonstrates that social media could enhance collaborative learning in science education, echoing the findings of Bui (2023).

THEORETICAL FRAMEWORK

Social media integration in biology education can benefit from the Constructivism and Social Learning Theory, developed by Albert Bandura and the Technological Pedagogical Content Knowledge (TPACK) framework (Mishraa and Koehler, 2006). Constructivism emphasises active learning, social interaction and personal relevance in knowledge construction (Piaget, 1952; Vygotsky, 1978). Social media platforms facilitate problem-solving, critical thinking and community interaction, making learning more relevant. The Constructive and Social Learning Theory emphasises learning through observation, imitation and modelling. Social media platforms create communities for learning, enhancing understanding and motivation. The interactivity of social media can increase student engagement, as peers actively participate and share knowledge, fostering a culture of learning. Social media platforms facilitate collaborative learning, allowing students to engage in discussions, share resources and co-create knowledge (Vygotsky, 1978). This framework is particularly relevant in peri-urban settings, where traditional educational resources may be limited and social media can bridge the gap by providing access to diverse educational materials.

Mishraa and Koehler (2006) posit that the TPACK framework emphasises that effective teaching integrates and enhances the core components, i.e., the Content Knowledge (CK), pedagogical knowledge (PK) and technological Knowledge (TK). These processes allow educators through social media to integrate the three components into biology teaching and learning, allowing information sharing among students and, thus, increasing understanding of some complex biological concepts. An educator may create a social media page like Facebook for sharing biology-based audio-visual, online books and self-participatory quizzes which boosts interaction and reinforces learning.

Community of Practice (CoP) Framework
This framework emphasises the importance of social learning through interaction and collaboration among peers (Georghiades, 2000). In a biology education context, social media can facilitate the formation of communities where students and educators share knowledge, resources and experiences related to biology topics.

Flipped Classroom Model
In this model, traditional learning environments are inverted. Students can use social media to access instructional content outside of class, such as videos or articles and then engage in discussions or hands-on activities during class time. This approach can enhance engagement and deepen understanding of biology topics. Bachiller and Badía (2020) identify various technologies and tools that support flipped learning, such as video creation tools, learning management systems (LMS) and collaborative platforms. The review also highlights specific pedagogical activities that enhance the effectiveness of flipped classrooms and discusses the challenges faced by educators and students in this model (Liand Li, 2022).

Gamification
Incorporating game-like elements into learning experiences can motivate students and enhance their engagement. Social media can be used to create challenges, quizzes, or competitions related to biology, encouraging students to participate actively and collaboratively. Gamification leverages game design elements such as points, badges and leader boards to create a more engaging learning environment (Christy and Fox, 2014). This can lead to increased motivation and participation among students (Chadzimura *et al.*, 2025), as they strive to achieve rewards and recognition for their efforts (Codish and Ravid, 2014). Research indicates that gamified learning environments can enhance student cooperation, knowledge retention and overall satisfaction with the learning process (Borges *et al.,* 2013).

A lot of researches have been going on in the field of biology science and social media and this research picked the related literatures from different sources to contributing to the research.

Al-Balushi and Al-Azri (2020) found that social media can be an effective tool for promoting student engagement and motivation in biology classes. Khan *et al*. (2020) explore the use of social media for collaborative learning in biology education and learn that it can enhance student learning outcomes. Other researches have also explored the potential of social media for promoting scientific literacy and critical thinking in biology education. For example, Lin *et al*. (2022) found that social media can be an effective tool for promoting scientific literacy and critical thinking in biology classes. Wang *et al*. (2022) investigate the use of social media for promoting biology education in informal settings and find that it can be an effective way of promoting public engagement with science. The peri-urban case study was conducted in a secondary school located in a peri-urban area. The study involved biology students and biology educators for biology classes at Ordinary and Advanced levels. The students were asked to use social media to share their thoughts and ideas about biology concepts and to engage in online discussions with their peers. The results of the study show that social media can be an effective tool for promoting student engagement and motivation in biology classes. The students reported that social media helps them to better understand biology concepts and develop their critical thinking and problem-solving skills. Chadzimura *et al.* (2025) note that students learn to troubleshoot common technical issues and navigate challenges improving their critical thinking. The results of the peri-urban case study suggest that social media can be a valuable tool for enriching biology education. The study's findings are consistent with previous research on the use of social media in biology education. As such, educators and policymakers can consider leveraging social media to promote student engagement, motivation and learning outcomes in biology education.

Social media use brought in greater contribution in the teaching and learning of biology education which brings in the baseline for this research. Some of the notable and tangible benefits are given below.

Enhancing Student Engagement

Research indicates that social media platforms significantly boost student engagement in science education. Ferguson and Dukes (2024) highlight how social media can create interactive learning environments that motivate students to participate actively in their education. Pérez-Pérez and Morales (2024) highlight that these social media enable students to exchange ideas, participate in discussion and improve their understanding of complex biological concepts. Chadzimura *et al.* (2025) also highlights that practical courses like the International Computer Driving Licence (ICDL) enhance student engagement and fosters critical thinking. This is particularly beneficial in peri-urban areas where traditional engagement methods may be less effective due to resource limitations.

Social media as a resource for biology teaching

Varela and Gutiérrez (2020) deliberate how biology educators use social media platforms to promote student engagement and increase knowledge retention. In concurrence, Rahman and Khan (2020) highlight how these platforms provide access to real-time scientific research, discussions on current biological issues (e.g., climate change, conservation) and opportunities for students to connect with biologists and researchers.

Facilitating Collaborative Learning

Ferguson (2024) shows that social media serves as a powerful tool for collaborative learning among students. A recent study by Rahman and Khan (2020) found that platforms like Facebook and WhatsApp enable students to collaborate on science projects, share resources and discuss complex concepts, thereby enhancing their understanding of the subject matter. This collaborative aspect is crucial in peri-urban settings, where students may have limited opportunities for face-to-face interaction. In another write-up, Chadzimura *et al.* (2025) note that technology-based courses like the ICDL facilitate collaboration and equips students with good communication skills.

Access to Resources and Expertise

Social media provides students in developing contexts with access to a wealth of educational resources and expert knowledge (De Toro *et al.* 2023). Research has shown that students can connect with educators and professionals globally, gaining insights that would otherwise be unavailable to them. This access is vital in peri-urban areas, where educational resources may be scarce. Rahman and Khan (2020) examine the role of social media in education with a focus in science subjects like biology and air how these platforms have transformed the way biology content is delivered and shared, making learning more incredible, inclusive and accessible.

Teacher Professional Development

Rahman and Khan (*ibid.*) postulate that social media also plays a significant role in the professional development of educators. Studies indicate that teachers who engage in social media networks can share best practices, innovative teaching strategies and resources related to science education (*ibid.*). This is particularly important in peri-urban contexts, where teachers may face challenges in accessing professional development opportunities. Bringing life-long learning also enhances the teaching and learning processes. Chadzimura *et al.* (2025) state that ICDL encourages continuous learning by offering advanced modules with practical hands-on learning.

Addressing Challenges

Despite the benefits, challenges remain in the effective use of social media in education. Issues such as digital literacy, access to technology and privacy concerns can hinder its implementation. In peri-urban areas, these challenges may be more pronounced due to infrastructural limitations.

METHODOLOGY

Research Design

The research follows a mixed-method approach, combining qualitative (interviews, focus groups) and quantitative (surveys) data collection. The primary focus is on understanding perceptions, experiences and engagement levels, while surveys provide statistical insights. This

approach allows researchers to triangulate data, offering a deeper and more tone perspective.

Context: The study is set in a peri-urban area with specific characteristics which may influence educational practices and access to resources. The selected peri urban area consists of participants who reside in the area and other students who commute for services from high- and low-density suburbs. In terms of technology, the participants proved to have good digital literacy.

Participants: A diverse group of students and biology educators from local schools was selected through purposive sampling to ensure a representative sample of experiences and perspectives.
The case has a deeper understanding of the science subjects evidenced by good pass rates at both Ordinary and Advanced levels recorded in previous years. In terms of the content, the case offers good curriculum which speaks to the expectations of the standard STEM subjects aligning to the set SDG4.

Sampling methods: A total of 36 participants consisting of students and educators. Educators in this research referred to Biology teachers and students referred to biology students. Focus groups were based on diversity in age, gender and academic performance.

Data Collection Methods
Responses from the selected participants provided both quantitative and qualitative insights into the nuances of their experiences, allowing for a deeper understanding of the context and individual perspectives. Semi structured interviews were used as a primary source of data, where the stratified sampling method was employed to pick from the population. The research conducted semi-structured interviews with educators and students to gather in-depth insights and surveys. Also, the focus groups were used as data sources where the research organised focus group discussions to explore collective experiences regarding social media use in biology education. For data analysis, the research outlined the thematic analysis process for identifying key themes and insights from the data.

Focus Groups: Conducting group discussions to capture collective insights and facilitate dialogue among participants about social media's impact on learning was also a source.
In-depth Interviews: The study conducted semi-structured interviews with educators and students managed to enhance the effective collection to gather in-depth insights contributing to the research.
Surveys: The surveys measured variables such as frequency of social media use, types of content engaged with and self-reported understanding of biology concepts.

Data analysis
Basing on interviews, focus group discussions and document analysis; data triangulation was employed to ensure reliability and validity of findings. Thematic analysis was conducted to identify emergent patterns and themes; aimed at understanding the impact of social media in biology education.

Interview data analysis
Coding included the transcribing process of the responses and identifying recurring themes such as access to resources, engagement and collaboration. Theme identification was one including grouping the responses into broader categories and also the selection of compelling direct quotes to emphasise and illustrate key points or provide qualitative evidence of the impact of data.

Survey data analysis
Informed by gathering qualitative insights from a larger sample of students, teachers on the use and or impact of social media in biology education. The approach used included the descriptive statistics to summarise the responses such as percentage of students using social media for studying biology, preferred social media platforms, frequency of use, among others. The analysis also looked for trends or patterns in how certain groups use social media differently for learning.

Focus group analysis
The method was used to obtain in-depth qualitative insights into the social dynamics and experiential perspectives of students and teachers. The ability of the focus group to provide a more nuanced understanding

of how social media is perceived and used in biology education was highly commended. Some interaction dynamics were taken care of through paying attention to group interactions, checking on how student collaborate, share, interact on different platforms and if they feel empowered in sharing action-based ideas.

Integration and Synthesis of Data

This included the combination of insights from the three highlighted data collection tools to form a comprehensive understanding of the role of social media in biology education in a peri urban setup. The triangulation process cross-checked the finding from different data sources to validate the conclusions of research.

Respondents by Gender

Figure 1: shows that of the o f the total participants (24 are male)

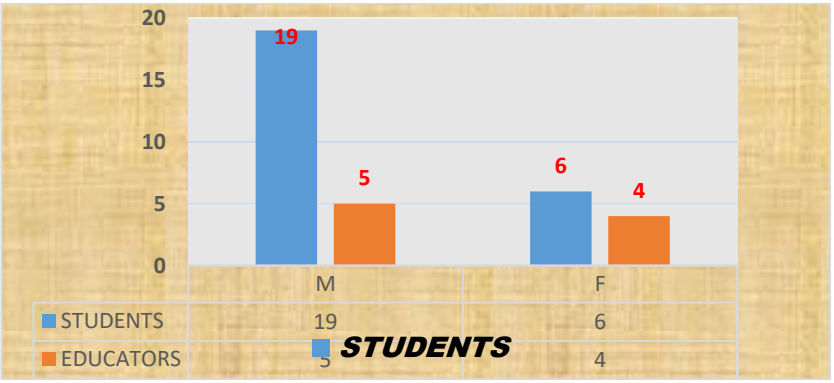

Figure 1: Participants by gender

The analysis speaks to the perceptions raised that biology is culturally defined as a difficult subject as also mentioned by one of the educators that enrolment in the STEM subjects in still a challenge.

Why Educators integrate the social media to enhance in biology education

From the interviews conducted, there is high representation of the following as key attributes as to why the educators prefer the use of social media in biology teaching in the peri urban area. Five (5) educators indicated that social media enhances communication in the teaching of biology. The use of audio, user-friendliness and the ability to offer multimedia each got 100% as excellent ways of presenting facts in biology teaching and learning.

Figure 2 below shows a presentation on as to why educators prefer the use of social media in the teaching and learning.

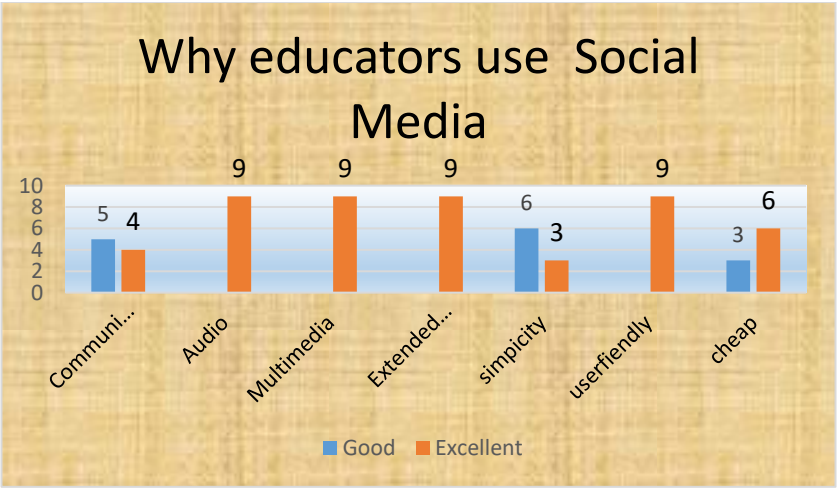

Figure 2 Benefits of social media

From the presentation in figure 2 above, participants indicated reasons why they prefer using social media in the teaching and learning of biology as a science subject. All educators indicated that they prefer social media because of its ability to accommodate audio facilities in the teaching and learning; the fact that learning time is extended since there is room to extend educational hours. Most interestingly all educators indicated that social media is user friendly and also allows room to deliver multi-faceted content.

Table 1: Social Media Users

Variable	Category	Students (N=24)	Educators (N=9)	Total (N=36)
Frequency of Social Media Use	Daily	12 (50.0%)	5 (55.6%)	17 (47.2%)
	Weekly	8 (33.3%)	3 (33.3%)	11 (30.6%)
	Monthly	4 (16.7%)	1 (11.1%)	5 (13.9%)
Types of Content Engaged with	Videos	10 (41.7%)	3 (33.3%)	13 (36.1%)
	Articles	8 (33.3%)	4 (44.4%)	12 (33.3%)
	Discussions	6 (25.0%)	2 (22.2%)	8 (22.2%)
Self-Reported Understanding of Biology	Low (1-2)	5 (20.8%)	1 (11.1%)	6 (16.7%)
	Moderate (3)	12 (50.0%)	5 (55.6%)	17 (47.2%)
	High (4-5)	7 (29.2%)	3 (33.3%)	10 (27.8%)

Frequency of Social Media Use: There is a high frequency of use of social media. Both students and educators evidently used it mostly daily (50% of students and 55,6% of educators). This could be because the participants also indicated the user-friendliness of the social media in the teaching and learning of Biology

Types of Content: Multimedia engagement as seen in videos and articles are the most engaged-with content types, highlighting a preference for visual and written resources in learning biology.

Understanding of Biology: The majority of participants self-report a moderate understanding of biology concepts, with a smaller percentage indicating low or high understanding.
One respondent highlighted that:

> *"I use social media everyday but I had never thought of using it for learning. Biology concepts videos I saw on WhatsApp and other social platforms made me understand the plant physiology."*

Another respondent said:

> *"I had issues in understanding plant physiology but the audios I got from the online lesson recording posted on Twitter skilled me up. Truly, biology has become my best subject."*

Students expressed that social media fosters peer learning and discussions making biology feel less intimidating.

Preferred Social Media Platforms for Learning Biology
YouTube: 70% (21 students)
WhatsApp: 23.3% (7 students)
Instagram: 6.7% (2 students)
Facebook: 0% (no students chose this platform)
From the analysis it is noted that YouTube is the most popular platform for learning biology, followed by WhatsApp for communication and peer collaboration. Instagram's use is minimal, indicating a preference for video-based content. YouTube is also because of its ability to accommodate different learning style like audio visual. Pictorial, texts and even the ability to replay the experiments was of high noting.

FINDINGS

The research findings were noted and presented in themes.

Theme 1: Innovative Teaching Practices

The research indicates that besides just facilitating communication, the social media have so many benefits which facilitates and enhances the imparting of biology education as seen from the analysis from students and biology educators. Through the use of social media, the educators indicated that the use of other incoming technologies, which may be combined with social media, led to the understanding of complex tasks. The use of technology indicated that the students improved the attitudes towards the subjects and also improved the pass grade, where Complex tasks are simplified.

A teacher and guardian said:

> *"I am quite happy because my child preferred other science subjects than biology because it's difficult. I was shocked by his last term passes. Upon asking my child, he said biology is the easiest because all the lessons are recorded and can replay then now and again. Unochimaster (you understand it better)."*

Frequency of Social Media Use in Teaching Biology:

Very Often (5): 50% (3 teachers)
Occasionally (4): 33.3% (2 teachers)
Rarely (3): 16.7% (1 teacher)
Never (1): 0%

The findings show that half of the teachers use social media frequently for teaching, with the majority using it occasionally. This suggests that social media are integrated into the biology curriculum to varying extents.

Theme 2: Student Engagement and Collaboration

It was noted that social media fosters interaction, collaboration and engagement among students in biology teaching and learning. The responses below were recorded from the interviews with the educators.

Facilitating Interaction
An overwhelming 85% of respondents reported using social media platforms to access biology content, with YouTube being the most popular platform (80% of respondents) with high interaction

Promoting Collaboration
The use of the social media led to high collaboration and enhanced peer to peer learning

Enhancing Engagement
Student engagement requires a lot of discussion since most arguments are based on the student engagement.

Perceived Effectiveness of Social Media for Student Engagement:
Highly Effective (5): 33.3% (2 teachers)
Effective (4): 50% (3 teachers)
Neutral (3): 16.7% (1 teacher)
Most teachers agree that social media is effective for engaging students, with half of them rating it as very effective. This suggests that social media helps in keeping students engaged in biology education.

Access to Resources

YouTube was the most commonly used platform for learning biology concepts, with 75% of students and 60% of teachers utilising it to access educational videos and tutorials.

Theme 3: Challenges and Limitations
There were some challenges experienced by the students and educators during the teaching and learning processes.

1. Access to Technology (ability to have the gadget)
Digital Divide: Not all students have equal access to the necessary devices (like smartphones and computers) and reliable internet connections. This digital divide creates disparities in learning opportunities, leaving some students at a disadvantage.
One participant clearly said:

> *We trained long back before the coming of computers. There is need to have workshops and teach us how to use the virtual reality technologies.*

Resource Limitations: In peri-urban or underfunded schools, the lack of infrastructure and resources hinders the effective use of social media for educational purposes. Educators may struggle to implement technology-driven strategies if their students cannot participate.

One participant stated:

> *In my class, half of the class they don't have laptops and mobile phones, sharing is the option but it's difficult when teaching complex tasks.*

2. Misinformation

Credibility Issues: Social media is rife with misinformation, making it difficult for students to discern credible sources from unreliable ones. This challenge is particularly significant in biology, where misunderstandings can lead to misconceptions about scientific concepts and health-related information.

Critical Thinking: Educators must emphasise the importance of critical thinking, problem-solving and media literacy to help students evaluate the quality and reliability of the information they encounter on social media. However, teaching these skills can be time-consuming and complex.

3. Varying Levels of Digital Literacy

Skill Disparities: Students have varying levels of digital literacy, impacting their ability to engage effectively with social media tools. Some may be proficient in using social media for personal communication, but lack the skills to use it for academic purposes.

Teacher Preparedness: Educators themselves may also have differing levels of comfort and expertise in social media. Teachers need professional development and training to effectively incorporate social

media into their teaching practices and to guide students in its responsible use.

4. Privacy and Safety Concerns

Data Privacy: The use of social media raises concerns about student privacy and data security. Educators must navigate policies and best practices to protect students' personal information while promoting collaborative learning.

Cyberbullying: The anonymity of social media can lead to negative behaviours, such as cyberbullying. Educators need to create a safe environment where students can engage without fear of harassment or discrimination.

5. Distraction and Engagement

Attention Management: Social media can be distracting, with students often tempted to engage in non-educational activities during study time. This can detract the intended educational benefits and reduce overall engagement with biology content.

Ethical considerations

Throughout the data analysis process, ethical considerations were paramount. Informed consent was obtained from all participants, ensuring their understanding of the study's purpose and their right to withdraw at any time. Data confidentiality was maintained and findings were reported in a way that protects participant anonymity.

Expected outcomes

The analysis aims to provide a nuanced understanding of how social media can be leveraged to enhance biology education in peri-urban settings. By identifying key factors that contribute to effective social media use, the findings offer valuable recommendations for educators seeking to integrate these tools into their teaching practices.

DISCUSSION

For biology educators, the research has brought onto the dashboard some important ramifications. These observations not only demonstrate how social media might revolutionise biology instruction, but also

provide more general uses that can be advantageous in a range of learning environments.

1. Enhancing Access to Resources

Bridging Resource Gaps: Educators often face challenges related to limited access to educational resources.

- Social media provides a platform for accessing a wealth of information, research articles and educational content that can supplement traditional teaching materials.
- Social media creates a mobile laboratory whose contents can be replayed several times. This democratisation of resources can help level the playing field for students who may not have access to advanced laboratories or libraries.

Connecting with Experts: social media can facilitate connections with scientists, educators and experts in the field, allowing students to engage with current research and real-world applications of biology. This exposure can enhance students' motivation and interest in the subject.

2. Promoting Collaborative Learning

Fostering a Collaborative Culture: The case study underscores the importance of collaboration among students.

- By encouraging collaborative projects and peer learning through social media. Educators can create a supportive learning environment that enhances teamwork and communication skills and essential competencies in both academic and professional settings.
- Enhanced problem-solving skills development.

Peer Support Networks: Social media can serve as a platform for students to form support networks, sharing knowledge, clarifying doubts and motivating each other. It serves as a bridging hub where students may experience isolation or a lack of academic support.

3. Encouraging Active Engagement

- ***Interactive Learning Experiences***: Insights demonstrate that social media can foster active engagement which shifts learning from passive to active and can enhance comprehension and

retention of biological concepts, making lessons more impactful.

- ***Real-Time Feedback***: Social media allows for immediate feedback between educators and students.

4. Culturally Relevant Pedagogy

- ***Culturally Responsive Practices***: The unique socio-cultural dynamics of peri-urban settings can be reflected in discussion, content and even the articles they generate from the presentations.
- ***Local Issues and Applications***: Using social media to discuss local environmental issues, health concerns, or biological phenomena can make biology education more applicable to students' lives.

RECOMMENDATIONS

The following recommendations can enhance technology and biology teaching in peri urban schools.

1. There is need to set up (upskill or redesign) District biological and technology hubs at district and/or provincial levels to support the services at local level.
2. *Provide Training and Support.* **Professional Development for Educators**: Offer ongoing blended training for teachers on effective social media integration strategies. **Student Workshops:** Organise workshops to improve students' digital literacy, focusing on how to critically evaluate information, engage constructively in online discussions and use social media tools effectively for academic purposes.
3. *Encourage Collaborative Projects.* **Group Assignments**: Design collaborative projects that require students to use social media to research, share findings and present their work. This can foster teamwork and communication skills, while deepening their understanding of biology. **Peer Learning Networks**: Create opportunities for students to form peer learning networks on social media platforms that facilitate discussion, resource sharing and support among students working on similar topics.

4. *Incorporate Multimedia Content.* **Diverse Learning Materials**: Encourage the use of various multimedia formats inclusively, such as videos, podcasts and infographics, to present biological concepts. This not only caters to different learning styles, but also makes the content more engaging and relatable.
5. *Monitor and Evaluate Engagement*. **Feedback Mechanisms:** Implement regular feedback sessions where students can share their experiences and suggestions for improving social media integration. This can help educators adjust their approaches and enhance student engagement.

CONCLUSION

This research highlights the benefits of integrating social media into biology curricula. It emphasises the increased interaction between students and teachers, access to diverse resources and the development of critical skills like digital literacy and critical thinking. The case study also highlights the importance of contextual learning and making learning more meaningful. The findings can be applied to various educational settings, serving as a model for enhancing teaching practices and student engagement.

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