

Enhancing Teaching Methods and Student Interactions through Online Collaborative Tools in Biology Education.

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ABSTRACT: Integration of online collaborative tools into Biology education has significantly transformed teaching methods and student interactions. The objective of this study is to explore how these digital platforms assist pedagogical practices and collaborative learning among students in general. Online collaborative tools, which include discussion forums, shared document editors, and virtual lab environments, provide innovative ways in order to engage students beyond traditional classroom settings. They help to facilitate real-time collaboration, which allow students to work together on projects, share resources, and solve problems collectively. For educators, these tools provide different opportunities such as the implementation of interactive teaching strategies, management of group activities more efficiently, and also offer personalized feedback. This research investigates the impact of these tools on both students learning outcomes as well as teachers' effectiveness, stating of their potential to support diversity in learning styles and promote active engagement. Data were collected through distribution of questionnaires among educators and students on online platform across various institutions. Findings indicate that online collaborative tools improve students' understanding of complex Biological concepts and also enhance their communication and teamwork skills greatly. There is greater efficiency of teachers' management of the classroom activities and greater flexibility in delivering content. The study concludes that online collaborative tools are great assets in modern Biology education, by offering a range of benefits that contribute to more dynamic and interactive learning environments. It is recommended that future research should explore long-term impacts and best practices for integrating these tools into diverse educational contexts.

KEYWORDS: Collaborative Tools, Biology Education, Students, Teachers, Transform.

I. INTRODUCTION

The term teaching method simply means the general principles, management strategies and pedagogy used for classroom instruction. There are different types of teaching methods; the choice of the one to use depends on what is suitable for individual, educational philosophy preferred, the demographic of the classroom, the subject area and the mission statement of the school. Theresa (2015) stated that teaching methods include: discussion method, questioning/socratic method, team teaching method, modeling method, simulation method, role playing method, inquiry method, discovery method, demonstrative method, etc. Vikoo (2003) as reported by Theresa (2015) state that types of teaching methods can be listed under three main categories which are: Cognitive development methods, Affective development methods and Psychomotor development methods. Student interaction means the process by which students relate with one another to assist each other, bring about relationship and collaborate with one another. This serves as an effective way for students to ask for assistant from each other and improve their relationships.

Collaborative tools are the technology tools that assist individuals and groups to communicate with one another, collaborate, and interact together in online environments so as to achieve a common task or goal, share or exchange information among the members, and construct meaningful knowledge (Alahmari, 2018). Online collaborative tools have been in application in sciences and education in general as a means to access and make use of digital technology so as to provide participants with a means of doing research and collaborate (Centie: Centre for Networking Technologies for the Information Economy, 2004, Edna:

Education Network of Australia, 2004, TLF: The Learning Federation, 2004). There are different types of online collaborative tools or collaborative software, in which all of them involve computer programs which allow people to work together collectively even when they may be remotely located from each groupware (Techtarget, 2007, Forakerdesign, 2007, McDonald, 2003, Gutwin and Greenberg, 2000). In order to improve learning experience in Biology online collaborative tools like used of virtual labs, online interactive quizzes, video lectures, virtual reality (VR) and augmented reality (AR) applications, online discussion forums, collaborative projects (by using tools like Google docs or Microsoft teams), making use of online platform such as WhatsApp, Facebook, etc. to do peer review, as well as the use of live webinars. By incorporating these online collaborative tools into Biology education, one can create a more interactive and engaging learning environment for students.

As a result of increase shift towards online education, there is a vital need to enhance teaching methods and increase student interaction in biology courses through the effective implementation of online collaborative tools. This study aims to investigate the impact of incorporating these tools on student engagement, learning outcomes, and overall course satisfaction in biology education. The purpose of this study is to investigate how online collaborative tools can enhance teaching methods and student interaction in Biology Education. By exploring the use of these tools in an educational setting, it was aimed that the overall learning experience for students and teachers alike will improve. This study is significant because it has the potential to revolutionize the way Biology is taught in schools and universities. By utilizing online collaborative tools, we can create a more dynamic and interactive learning environment that engages students in new and exciting ways. This can lead to improved retention of information, increased student participation, and ultimately, better academic performance. Additionally, this study can help to identify best practices for incorporating online collaborative tools into Biology Education, which can be applied to other subjects and disciplines as well. Overall, the results of this study have the potential to greatly impact the field of education and improve the learning outcomes of students in the STEM (i.e science, technology, engineering, and math) fields.

II. LITERATURE REVIEW

Collaborative learning is used when the objective is to allow students learn through group work, whereas collaborative teaching is used in teaching to facilitate the task(s) and assessment(s) of the learners (Dahal, *et al.*, 2020). He also stipulated that this kind of learning systems are usually utilized to support learning tasks that are normally designed by the facilitators and which its completion is by the learners. He further cited that Dahal and Pageni (2019) stated that the Learning Management Systems (LMS) are the possible powerful systems that is being employed during the e-learning processes and that they both explained that facilitators use LMS to create and evaluate the overall impression of the courses while the learners use it to perform the learning tasks, to submit content, and to communicate with their classmates and the facilitators. Moodle (Modular Object-Oriented Developmental Learning Environment) and google apps such as docs, slides, sheets, and Jamboard are among popular and extensively used open-source LMS is one of the more popular and extensively used open-source LMS for a collaborative task(s). These collaborative tools (i.e Moodle and google apps) assist in supporting and managing learning tasks without replacing the facilitators (Dahal, *et al.*, 2020). Both Moodle system and google apps can be utilized in Biology education in the traditional classroom, online and also distance learning system.

Collaborative tools in Moodle includes forum discussion, workshop, chat, comment box, and wiki while in google apps collaborative tools are docs, slides, sheet, jamboard, etc.

Arslan, *et al.* (2020) reported that virtual reality (VR) and augmented reality (AR) applications, were developed rapidly in recent years and they are at the fore as a highly effective technique that have the possibility of interacting visually with the objects they give to the user. These applications are among the vital collaborative tools that enhance viable interactions among students most especially in Biology education. In research done by Nesterov, *et al.* (2017) they stated that AR technologies have been replacing expensive laboratory equipment nowadays and that the level of interest among students' has increased because of the interaction of these technologies with students. Saidin, *et al.* (2015) investigated their studies

on the usefulness of AR for education. According to their investigation, they stated that AR's merge with education has drawn the attention of many researchers because it has allowed students to interact among themselves in realistic experiences in various fields of their studies such as in Medicine, Chemistry, Mathematics, Physics, Geography, Biology, Astronomy and History.

III. METHODOLOGY

This study employed a descriptive survey method in order to describe and evaluate how Teaching Methods and Students Interactions through Online Collaborative Tools in Biology Education can be enhanced. The researcher created questionnaire titled Enhancing Teaching Methods and Student Interactions through Online Collaborative Tools in Biology Education and shared it online on educational platforms for a period of a week. The sampling techniques used for this study was voluntary response sampling. A total of 150 respondents responded to the questionnaire out of which 102 were students (higher institutions and secondary school students) and 48 of them were teachers (higher institutions and secondary school Biology teachers inclusive). The questionnaire has two sections; first section focus on gathering personal information useful for the research while the second section was based on questions structure to gather the information on how teaching methods and students interaction in Biology education can be enhanced through online collaborative tools. The questionnaire included seven structured questions that enhanced gathering of information for this research. The questions were provided with options to ease response of the respondents in which each respondent is expected to choose in accordance to their opinion on the questions. The data gotten were analyzed using simple descriptive statistic of frequency and percentage.

IV. RESULTS AND DISCUSSION SECTION A OF THE QUESTIONNAIRE

Table 1: Demographic Information of the Respondents

S/N	Variables		Frequency	Percentage
1	Gender	Male	57	38%
		Female	93	62%
2	Age range	Below 20	18	12%
		20 – 30	75	50%
		Above 30	57	38%
3	Occupation	Teacher	48	32%
		Student	90	60%
		Other	12	8%
4	Marital status	Married	45	30%
		Single	105	70%

Table 1 above shows that 57 (38%) of the respondents were male while 93 (62%) were female. The age range of the respondents were grouped into three; 18 (12%) were below 20, 75 (50%) were between 20 -30 while 57 (38%) were above 30. The occupation of the respondents were teachers 48 (32%), students that were 90 (60%) and other apart from the two were 12 (8%). The marital status of the respondents was also gathered; 45 (30%) were married while 105 (70%) were single.

SECTION B OF THE QUESTIONNAIRE

Structure questions used to gather information on how to enhance teaching methods and students' interactions through online collaborative tools in Biology Education.

Table 2: What is your current role in the field of Biology Education?

S/N	Role	Frequency	Percentage
1	Researcher	15	10%
2	Teacher	51	34%
3	Students	84	56%

Table 2 above shows that 15 (10%) of the respondents were researcher in the field of Biology, 51 (34%) were teachers and 84 (56%) were students.

Table 3: How frequently do you use online collaborative tools in your teaching/learning process?

S/N	Frequency of usage	Frequency	Percentage
1	Always	81	54%
2	Occasionally	51	34%
3	Just once	6	4%
4	Not at all	12	8%

Table 3 above shows that 81 (54%) of the respondents always use online collaborative tools, 51 (34%) of them occasionally use it, 6 (4%) of them used it just once while 12 (8%) have not use it before.

Table 4: Which online collaborative tools have you used in Biology Education before?

S/N	Online collaborative tools used before	Frequency	Percentage
1	Virtual labs	42	28%
2	Online interactive quizzes	39	26%
3	Video lectures	27	18%
4	Online discussion forums	30	20%
5	Collaborative projects (by using tools like google docs or Microsoft teams)	36	24%
6	Social media platform (such as whatApp and facebook)	66	44%
7	The use of live webinars	18	12%
8	Other	6	4%

Table 4 above shows that most of the respondents (66 i.e 44%) have make used of social media platform as online collaborative tools while the least of them (6 i.e 4%) make use of other collaborative tools apart from the one listed in the table above.

Table 5: How do you perceive the effectiveness of online collaborative tools in enhancing interaction and engagement?

S/N	Effectiveness of online collaborative tools	Frequency	Percentage
1	Very effective	63	42%
2	Effective	75	50%
3	Not effective	6	4%
4	Undecided	6	4%

Table 5 above shows that most of the respondents (75 i.e 50%) believed that online collaborative tools is effective in enhancing interaction and engagement while 6 (4%) of the respondents believed that online collaborative tools is not effective and 6 (4%) of them cannot decide maybe it is effective or not.

Table 6: In your opinion, what specific features or aspects of online collaborative tools are most beneficial for Biology Education?

S/N	Features most beneficial	Frequency	Percentage
1	Video conferencing	48	32%
2	Integration with Biology specific tools	48	32%
3	Real-time collaboration	66	44%
4	Access to digital libraries and resources	63	42%
5	Progress tracking and feedback features	21	14%
6	All	3	2%

Table 6 shows the opinion of the respondents on aspects of collaborative tools that are most beneficial for Biology Education. Most of them (66 i.e 44%) agree that Real-time collaboration is the most beneficial aspects while least of them (3 i.e 2%) were of the opinion that all the listed aspects are most beneficial for Biology Education.

Table 7: What are the main challenges you have faced when implementing online collaborative tools in Biology education?

S/N	Challenges	Frequency	Percentage
1	Technology issues	63	42%
2	Engagement and participation	95	63.3%
3	Communication barrier	75	50%
4	Social isolation	48	32%
5	Privacy and security concerns	21	14%

Table 7 above shows that engagement and participation is the greatest main challenge (63.3%) faced by the respondents while the least main challenge (14%) faced by them is privacy and security concerns.

Table 8: How do you believe online collaborative tools can be further improved to better support Biology teaching and learning?

S/N	How online collaborative tools can be improved	Frequency	Percentage
1	Enhanced virtual lab simulation	72	48%
2	Better integration with existing curriculum	75	50%
3	More immersive 3D models and visualization	39	26%
4	Improved user interface and accessibility	57	38%
5	Increased collaboration features	60	40%

Table 8 above shows that most of the respondents (50%) believed that better integration with existing curriculum can be used to further improve to better support Biology teaching and learning while the least of them (26%) believed that more immersive 3D models and visualization can be used.

DISCUSSION

It is very essential to enhance teaching methods and students' interactions through online collaborative tools in Biology Education. We are in technological era, the period of using traditional teaching and collaboration need to be upgraded into the new trend. In this study it was discovered that most people often

used collaborative tools in their teaching/learning process, although there are still few that still clue with traditional ways. Online collaborative tools most often used in Biology Education according to the discovery of this study is social media platforms such as the use of whatApp and facebook. This might probably be as a result of the widely usage and attachment to mobile phone by most people. Other collaborative tools include virtual labs, online interactive quizzes, video lectures, online discussion forums, collaborative project by using google docs or Microsoft teams, and the use of live webinars. It was discovered that these online collaborative tools are averagely effective in enhancing teaching methods and students' interaction in Biology Education.

Online collaborative tools have specific features or aspects that are most beneficial for Biology Education. In this study it was discovered that real-time collaboration is the most beneficial feature or aspect. Other features in order of their benefits are access to digital libraries and resources, video conferencing, interaction with Biology specific tools, and progress tracking and feedback features. Despite all the benefits of online collaborative tools there are some challenges that can be faced by the users. In this study the greatest challenge face by users is engagement and participation of other collaborators. Other challenges are communication barrier, technology issues, social isolation, privacy and securities concerns with the usage of online collaborative tools. There is need to improved online collaborative to better support Biology teaching and learning activities. In this study it was discovered that online collaborative tools can be further improved best with better integration with existing curriculum. Other means include enhancing of virtual lab simulation, increasing collaborative features, improving user interface and accessibility and more immersive 3D models and visualization.

V. CONCLUSION

In conclusion the use of online collaborative tools in Biology Education is a valuable tool for enhancing teaching methods and promoting student interaction in the classroom. In order to enhance teaching methods and student interaction through online collaborative tools it is recommended that

- i. There should be provision of training and support for both educators and students on how to effectively use online collaborative tools.
- ii. Encouragement of active participation and engagement by assigning collaborative tasks that require students to work together, discuss concepts and solve problems as a team.

REFERENCES

- Alahmari, A., (2018) A MixedMethods Study of the Implementation of CollaborativeTechnology Tools for Enhancing Collaboration and Student Technology Tools for Enhancing Collaboration and Student Engagement in Online Learning: Faculty Experiences and Student Perspectives. Theses and dissertations, Illinois State University
- Arslan, R., Kofoglu, M. &Dargut, C. (2020). Development of Augmented Reality Application for Biology Education. *Journal of Turkish Science Education*, 17 (1), 62-72.
- Bower, M., &Wittmann, M. (2009). Pre-service teachers' perceptions of LAMS and Moodle as learning design technologies. Proceedings of the 4th International LAMS and Learning Design Conference, Sydney, Australia, pp. 28–39.
- CeNTIE: Centre for Networking Technologies for the Information Economy, (2004), CSIRO Australia, 6 March 2006, <http://www.ict.csiro.au/page.php?cid=22>.
- Dillenbourg, P., Eurelings, A., &Hakkarainen, K. (Eds.). (2001). European perspectives on computer-supported collaborative learning. Proceedings of the First European Conference on Computer-Supported Collaborative Learning. University of Maastricht.
- Dahal, N.,Luitel, B.,C., Pant, B.,P., Shrestha, I.,M., and Manandhar, N.,K., (2020) Emerging ICT Tools, Techniques and Methodologies for Online Collaborative Teaching and Learning Mathematics,Mathematics Education Forum Chitwan, September 2020, Issue 5, Year 5
- EdNa: Education Network of Australia, (2004), education.au Ltd, 10 March 2006, <http://www.edna.edu.au/edna/page1.html>.

- Mazza, R., & Milani, C. (2004). GISMO: A Graphical Interactive Student Monitoring Tool for Course Management Systems. International Conference on Technology Enhanced Learning, Milan, pp. 1–8.
- Nesterov, A., Kholodilin, I., Shishkov, A., & Vanin, P. (2017) Augmented reality in engineering education: Opportunities and advantages, Communications-Scientific letters of the University of Zilina, 19(4), 117-120.
- Saidin, N. F., Halim, N.D.A., & Yahaya, N. (2015). A review of research on augmented reality in education: advantages and applications. International Education Studies, 8(13), 1.
- Theresa, E., D., (2015) Different Teaching Methods: A Panacea for Effective Curriculum Implementation in the Classroom. *International Journal of Secondary Education. Special Issue: Teaching Methods and Learning Styles in Education. Vol. 3, No. 6-1, 2015, pp. 77-87.* doi: 10.11648/j.ijsedu.s.2015030601.13
- TLF: The Learning Federation, (2004), Curriculum Corporation and education.au, 8 March 2006, <http://www.thelearningfederation.edu.au/tlf2/>.
- Vikoo, B. (2003). Learning theories and instructional process. Owerri. Springfield Publishers Ltd.