



MOTIVATING UNDERGRADUATES ACADEMIC PERFORMANCE AND RETENTION THROUGH BUZZ GROUP STRATEGY IN EKITI STATE, NIGERIA

Tunji Henry Ogunyebi^{1*}

¹Department of Science Education, Bamidele Olumilua University of Education, Science and Technology, Ikere, Ekiti, Nigeria

Original Scientific Article

Received: 22/06/2025

Accepted: 22/07/2025

ABSTRACT

This paper examined the motivational effects of buzz group strategy in motivating undergraduates' performance and retention in Ekiti State, Nigeria. The study adopted a quasi-experimental pre-test, post-test, control group design. Three null hypotheses were generated and tested at 0.05 level of significance. The sample for this study comprised 120 selected 200 Level students from the three public universities in Ekiti through purposive sampling technique. The instrument that was used for the study was Science Education Performance Test (SEPT). It is a self-designed instrument that consisted of information on bio-data of the respondents and 40 multiple-choice items. Expert judgments were used to ensure face and content validity. Split-half method was used to determine the reliability and reliability Coefficient of 0.74 was obtained. The data were analyzed using inferential statistics of t-test. The study found out that there was a significant difference between the posttest performance means scores of students exposed to buzz group strategy and conventional strategy. It was also revealed in the study that there was no significant difference between the posttest performance and retention means scores of students exposed to conventional strategies. Based on this finding, it was recommended among other things that the state government should organize a seminar among the lecturers in universities on the effective use of buzz group strategies in their various classes to enhance learning outcomes.

Key words: Buzz Group, Strategy, Performance, Retention, Science Education

INTRODUCTION

It is impossible to overstate the growing recognition of the role that science plays in a country's technical and socioeconomic advancement. Kenney and Zysman (2016) assert that science is a tool for political, technological, and economic advancement. A digital platform economy is developing, where businesses like Amazon, Facebook, Google, and Uber, among others, are building online frameworks that facilitate a variety of human endeavors. This

* Correspondence author: Tunji Henry Ogunyebi, Department of Science Education, Bamidele Olumilua University of Education

E-mail: ogunyebi.tunji@bouesti.edu.ng

<https://orcid.org/0000-0002-7378-6679>

makes it possible for fundamental shifts in the way we work, interact with one another, provide value to the economy, and vie for the profits that follow. Although they are by no means the only aspect of the quickly restructuring global economy, their consequences are clear and noticeable. Science and technology have greatly contributed to the convenience and comfort of man; the usefulness and relevance of science and technology to sustainable development is therefore not in doubt. Science is the concerted human effort to understand the history of the natural world and how the natural world works, with observable physical evidence as the basis of understanding. It is done through observation of natural phenomena and/or through experimentation that simulate natural processes under controlled conditions. It is a systematic enterprise that builds and organizes knowledge in the form of testable explanations and predictions about the universe.

Since there is scarcely any aspect of life that is not impacted by advances in science and technology, these fields have had a significant impact on every aspect of human endeavour in the twenty-first century in a variety of ways. Man's current life on Earth is largely dependent on his understanding and use of scientific concepts, information, and technological advancements. Without a doubt, technology has a significant impact on all aspects of life. With the aid of contemporary technology, numerous intricate and crucial procedures can be completed more easily and effectively. Applications of technology have brought about positive changes in living. The field of education has undergone a transformation thanks to technology. The importance of technology in schools cannot be ignored. In fact, with the onset of computers in education, it has become easier for teachers to impart knowledge and for students to acquire it. The use of technology has made the process of teaching and learning all the more enjoyable (Raja, & Nagasubramani, 2018).

Inadequate definitions of scientific concepts can make learning science more difficult and hinder students' comprehension of scientific concepts, according to research by Wong, Chu, and Yap (2020). By suggesting that teachers highlight five common definitional elements/object/system, nature/characteristics, cause/effect, mathematical expression/equation, and condition/reference frame—their article offers a framework for defining scientific concepts in elementary, secondary, and university education. These elements can aid students in understanding scientific concepts. Both students and teachers may benefit from this approach, which science teachers can use to help students evaluate and reinterpret scientific ideas in the classroom.

According to Taber (2009), learning is an individual process in which every student must create their own knowledge. In order for learning to be personalized, students must be dedicated, interested, and actively involved in the process in order to comprehend and absorb the material. This suggests that learning can be successful and meaningful when students think critically about what they have learnt, become interested in the material, and create new knowledge based on what they have learnt. For students to acquire and comprehend science in a meaningful way, scientific instruction should be proactive and student-centered.

Kenny and Dyjur (2015). Research has been done on curriculum mapping as a method of representing the learning objectives, instructional strategies, and evaluation procedures for every course in a program. This allows for the creation of a synopsis of the learning plan for the entire program of study, allowing for the observation of the connections between the

various program elements. Curriculum mapping offers the chance to see the curriculum as a cohesive whole rather than as a collection of discrete courses. Examining the resulting data can result in insightful conversations about the curriculum, what is effective, and potential modifications for a redesign that would improve student learning experiences and highlight areas of strength and room for development. Hence, there is the need to find out teaching strategies that may make learning of Science Education more meaningful and interesting so as to improve students' performance and retention in the course. The choice of methods to be used depends on some factors such as; the concept to be taught, the targeted audience, available instructional materials and learning objectives to be achieved. In situations where appropriate learning strategies are used, it may arouse students' interest and enhance performance in the subject. Thus, in this study, buzz group is considered.

Buzz groups can be used as an alternate strategy by educators (teachers or lecturers) to optimise small group work in the classroom, according to Lubis, Wardani, and Harahap (2023). Students can use Buzz Group to solve problems that are presented during learning sessions. It is anticipated that by employing buzz groups, each student will have the opportunity to share information with the others in a small group project. As a result, when students investigate a topic in a short amount of time, their strengths both individually and collectively can be recognized. He stressed that the guidelines of Buzz Groups are following: (1) Write a carefully-phrased question or statement on a flip. (2) Divide the participants into small groups; three people to a group are ideal. (3) Have each group discuss the question/statement for about 10 minutes to produce a list of ideas. (4) Get the ideas from each group and write them on flipchart so that everybody can see. (5) At the end of the discussion, summarize briefly and make a positive link with what happens next. The "Buzz group" method is a group learning technique, which is carried out in the form of four- or two-person discussion. To put it another way, the students compare their answers two by two to look for any discrepancies. To get an equitable response, four-person groups are then formed. One representative from each group would report the evaluations' findings to the class at the conclusion. By doing this, individuals are able to share their knowledge, personal experiences, and potential diagnoses with their peers in a quiet manner. As a result, teaching through the Buzz group style will provide a chance to discuss a variety of topics.

This approach is a "middle-of-the-road teaching technique for instructors desiring to moderate levels of students' participation," according to Prayoga (2018). It has been observed that the lecture approach can be more suitable if a teacher's main goal is to impart detailed and extensive knowledge to his students. Additionally, it is frequently recommended that the class be divided into smaller groups if the instructor wants all of the students to actively participate in the lecture. Involving the entire group in a topic under study is implied by discussion. In this approach, both the teacher and students collaborate to meet mutually set goals. It is also a learner-centered strategy, allowing students an opportunity to take control and be responsible for their learning and it allows an opportunity for learning in an innovative, creative and interesting way for both students and teachers.

"The mastery of major concepts and principles, facts, skills, and strategic knowledge" is one definition of performance in education. Performance can occasionally be broken down into knowledge components in a more methodical manner. Performance-approach objectives were

initially characterized by achievement goal theory as aiming to outperform peers in order to show competence to outsiders (Senko & Dawson, 2017). However, the aims have been operationalized inconsistently in the study, with some studies focusing on the peer comparison part and others on the competence demonstration element. He also observed that students can learn both new concepts and skills while solving problems and improves when they are given the opportunity to discover and invent to be able to practice what they have learnt. Performance may be defined as the act of successful output which implies something that somebody has done successfully especially using his/her own efforts and skills.

According to York, Gibson, and Rankin (2015), "academic success" is one of the most commonly used concepts in higher education educational research and assessment. In order to investigate how the term is used and operationalized across several academic domains, this research does an analytical literature survey. Test results, grade point average, and degree are typically used to quantify academic success, which is a measure of the knowledge acquired during the educational process.

Retention, according to the Oxford advanced learners dictionary (7th edition) is the ability to remember a piece of information acquired over a period of time. The longer the period a student remembers what has been learnt the better the retention and vice-versa. Researchers who have attempted to study the trace decay theory have encountered several methodological issues over time (Wickelgren 1972). Controlling for the events that take place between learning and recall is one of the main issues facing researchers. It is obvious that the period of time between learning something and remembering it could be occupied by a variety of events, making it challenging to determine if any forgetting occurs due to knowledge loss or other intervening factors. Teaching methods or approaches, especially in the learning of science and technology are expected not only to enable students acquire knowledge but to retain same over a long period of time and discovery learning can assist in improving the understanding, critical thinking skills, problem solving skills, communication skills of learners, increase the involvement of learners, both individually and socially, in exploring and critically solving problems.

Buzz sessions are ideal for developing the ability of decision-making, evaluation, and divergent thinking in students. Nevertheless, few studies have been conducted on this educational method, which yielded contradictory results. Ikromah (2015) conducted a study to assess the distinctions between the Buzz group and audiovisual lectures used to educate inmates about AIDS in Indonesia. The findings showed that there was no discernible difference between the aforementioned teaching methods. However, the Buzz group approach was contrasted with direct education for reading in 2015 for kids in Indonesia's Java Islands, and the results showed a considerable favourable impact of the Buzz group methodology (Wijayadi, 2015).

Ningsih & Suryani (2021) found out in their study to determine the effectiveness of the Buzz Group discussion method on improving the collaboration ability of elementary school students. The research design was a quasi experiment, non equivalent control group design. The sample was taken by purposive sampling and obtained class SD Negeri Muncar 01 as the experimental class and SD Negeri Muncar 02 as the control class. The results showed: 1) There were differences in the use of the large group method and the buzz group discussion,

this was evidenced by the independent sample T-test with a significance level of < 0.05 , namely $0.00 < 0.05$, 2) There was an influence on the use of the buzz discussion method groups towards increasing the ability of student cooperation, this is evidenced by a simple linear regression test with a significance level of < 0.05 , namely $0.44 < 0.05$, and 3) There is an increase in students' cooperation abilities, this is evidenced by the paired sample T-test. Test with a significance level of < 0.05 , namely $0.00 < 0.05$ after using the buzz group discussion method.

In their study, Prastyawan and Jamilah (2024) examine the efficacy of the Buzz Group strategy, which is a promising method for improving students' writing abilities. This quasi-experimental study, which was carried out at a vocational school in Tuban, examined the writing skills of two groups of tenth-grade students: one that received conventional lecture-based instruction and the other that was taught using the Buzz Group technique. The study involved 61 students randomly assigned to the experimental group (X TKJ A) or the control group (X TKJ B). Pre-and post-test scores were analyzed using the Wilcoxon Signed Rank test, revealing significant improvements in the writing abilities of the Buzz Group participants. While both groups had similar baseline scores, the post-test results showed a marked improvement in the experimental group (mean score= 88.50) compared to the control group (mean score= 65.81). The p-value of 0.000 led to rejecting the null hypothesis, confirming the Buzz Group strategy's efficacy in improving writing skills. In summary, this study provides empirical evidence that the Buzz Group technique significantly enhances the writing capabilities of vocational school students.

In light of Rahmawan & Hidayah (2023). Misconceptions regarding the teaching strategies used in chemistry classes served as the impetus for their investigation. The purpose of this study is to ascertain how students' collaboration and cognitive skills in relation to redox content are affected by the Focus Group Discussion approach. A quasi-experiment is the research methodology employed. The findings demonstrated that using the focus group discussion method to apply learning was more successful than using the lecture method. The average scores on the pretest and posttest were 62.79 and 74.85, respectively, according to the statistical analysis test of the experimental class's cognitive ability. In the control class, the average pretest and posttest scores were 61.76 and 69.41, respectively. The results of the cooperation skills analysis test of the experimental class obtained an average value of 63, 35, and 75, 76. In the control class, the average pretest and posttest scores were 29.65 and 38.47, respectively. Overall, the data showed that the application of the Focus Group Discussion learning method was able to improve the cognitive abilities and cooperation skills of students in understanding abstract concepts in redox material. Thus, the Focus Group Discussion method is potential to be applied in other STEM learning materials to encourage active attitudes and critical thinking of students in learning.

Using the buzz group technique is one alternate method for increasing teaching and learning efficacy; it is a component of group work. Qureshi, Raza, Qureshi, Khaskheli, and Yousufi (2023) asserted that creating classrooms for active learning is increasingly a component of overall educational initiatives in higher education institutions to get students involved and motivated to learn. For this reason, research has been done on the impact of social aspects on collaborative learning and engagement, which will affect students' learning outcomes. The

study examined whether social factors and students' learning performance are mediated by collaborative learning and engagement, as well as if social factors can foster collaborative learning and engagement. Constructivism theory has been utilized to observe the student's learning behavior. Data have been collected through questionnaires from university students. Findings evaluated through structural equation modeling (SEM), shows that social factors, i.e. interaction with peers and teachers, social presence, group work increases their learning outcomes. It is also important to know that group work usually implies small group that consist of four – six students. By doing group works the students have more opportunities to exchange the information. It means that group work is a way for acknowledging and utilizing individual students' additional strengths and expertise with a small group of students exploring a topic in limited time frame and their opportunities for their collaborative product. In addition, group work makes possible co-operative than competitive learning for the emphasis on group task and group achievements. Secondly, group work makes possible a bigger amount of individual participation that occurs in the class teaching situation. Thirdly, students in discussion group have a chance to improve their speaking and listening skills. He said that in large class there are tendency for a few students to dominate and for the other members of the class to participate only occasionally or not at all. The teacher can get wider degree of participation by calling on nonparticipants. Buzz group are also helpful as warm up device. Some classes have difficulty in getting started on their discussion, perhaps because the class members are shy, or perhaps they are afraid to say something that might be wrong. Buzz group also help classroom group to become involved in a new subject.

Ahmad (2020) looked at the effects of buzz group sessions on the oral communication anxiety and critical listening skills of EFL students. Additionally, the study looked into the connection between oral communication anxiety and critical listening. Thirty-seven students from IAU University's Jubail College of Education took part in the study. Before and after the introduction of buzz group sessions, they took pre-tests in oral communication anxiety and critical listening. Buzz groups were used once a week for the whole semester. Participants' anxiety over oral communication greatly decreased, but their critical listening skills did not significantly increase, according to statistical analysis using the paired-samples t-test. Moreover, a positive correlation was found between critical listening and oral communication apprehension. Therefore, it was concluded that the buzz group technique can be used to reduce the oral communication apprehension of EFL students.

The efficacy of student-centered BGs in comparison to conventional teacher-centered histology instruction was examined by Romeike & Fischer (2019). According to the study's findings, the buzz group cooperative learning approach improves students' academic performance and retention of information by raising mean scores and lowering standard deviations. Students who employ the buzz group method gain from increased self-esteem, focused attention spans, and active involvement in the course, among other advantages. In comparison to traditional teaching approaches, students also become more engaging with one another. Greater social ties are fostered within the group as a result of this increased engagement.

The instructor acts as a facilitator or a coach rather than a lecturer or deliverer of knowledge with students being knowledge gatherers and synthesizers. Students are able to deeply

understand the lessons when they learned it in smaller meaningful group. It is against the above mentioned, that this study examined the effects of buzz group instructional strategy on undergraduates' performance and retention in Science Education in Ekiti State, Nigeria.

There have been numerous reports of the decline in science undergraduates' performance and their propensity to forget scientific knowledge. One cannot ignore the reality, though, that certain schools lack qualified educators who are always faced with the problem of finding the best teaching strategies that could improve student achievement and accommodate student diversity. The researcher has also noticed that many students still choose not to participate in class discussions after learning about science concepts through activities that cater to different learning styles and intelligences. This could be because they are bored with the traditional chalk-and-talk method. Some students might even think the classes are challenging.

The objectives of this study was to examine the effect of buzz group strategy in motivating students' performance and retention in science Education in Ekiti State, Nigeria. In addition, the study will find out the performance and retention levels of students exposed to buzz group strategy and those exposed to conventional method. The outcome of this effort will be used to suggest steps that can motivate and improve students' performance and retention science Education

The following null hypotheses were generated and tested;

1. There is no significant difference between the posttest performance mean scores of students exposed to the buzz group strategy and conventional strategy
2. There is no significant difference between the posttest retention mean scores of students exposed to buzz group strategy and conventional strategy.
3. There is no significant difference between the posttest performance mean scores and retention mean scores of students exposed to buzz group strategy

Methodology

The study was a quasi-experimental pre-test, post-test, control group design. The pre-test was to establish the knowledge base line of the students that was used for the study while the post-test will measure the level of academic performance of the students after treatment. The design of the study is represented as follows: Experimental Group = 01 X1 02 , Control Group =03 X2 04. Where 01,03, represent pre-test. X1= Buzz group strategy X2= Conventional method. Also, 02,04, represent post-test.

The population of the study consisted of all the Science Education Students in the universities in Ekiti, Nigeria, who are in the second years of study (200Level) for 2023/2024 academic session. They are made up of boys and girls from the department. The total number of 200Level for the session is 410 students. The samples were 120 students selected through multistage sampling procedures. The first stage involved using purposive sampling technique to select 200Level students, because 300&400Level were on Teaching Practice at the time of research. The second stage involved the use of proportional sampling to select based on the population of each school, while gender is taken into consideration.

The instrument that was used for this study is Science Education Achievement Test (SEAT). It is a self-designed instrument. Section A of the SEAT consisted of information on bio-data of

the respondents while Section B consisted of 40 multiple-choice items that covers all the content of the chosen topics used as achievement test. Same test was re-arranged and administered as the posttest for retention. Expert judgments were used to ensure face and content validity. Test-retest method was used to determine the reliability and reliability Coefficient of 0.74 was obtained. In testing this hypothesis, the scores were subjected to t-test analysis at 0.05 level of significance.

RESULTS

Table 1 shows that there is a significant difference between buzz group strategy and conventional method ($t = 4.93$, $p < 0.05$) therefore, the null-hypothesis is rejected. This implies that there is a significant difference between posttest performance means scores of students exposed to buzz group and conventional strategies. The buzz group has a mean score of ($\bar{x} = 17.54$) and conventional method ($\bar{x} = 13.22$).

In testing hypothesis: “There is no significant difference between the posttest retention mean scores of students exposed to buzz group strategy and conventional strategy” the mean total scores and standard errors obtained from posttest retention mean scores of students exposed to buzz group strategy and conventional strategy were subjected to t-test analysis at 0.05 level of significance.

Table 1. Independent Sample t-test of posttest performance means scores of buzz group and Conventional method

Strategy	N	Mean $\bar{x}$	Std. Dev.	Df	t	p
BUZZ GROUP	60	17.54	3.98	119	4.93	0.015
CONVENTIONAL	60	13.22	2.54			

Table 2. Shows that there is significant difference between the post-test retention mean scores of students exposed to buzz group and conventional method ($t = 3.91$, $p < 0.05$). This means that the t-value is significant at $p = 0.05$. Therefore, the null hypothesis is rejected. This implies that there is significant difference between the posttest retention means scores of students exposed to buzz group and conventional method. The result ascertains the difference in ability of the students in the two groups prior to introduction of the treatment.

In testing hypothesis “There is no significant difference between the posttest performance mean scores and retention mean scores of students exposed to buzz group strategy”. the mean total score and standard error obtained from the posttest performance mean scores and retention mean scores of students exposed to buzz group strategy were subjected to t-test analysis at 0.05 level of significance.

Table 2. Independent sample posttest retention mean scores of students exposed to buzz group and conventional strategies

Strategy	N	Mean $\bar{x}$	Std. Dev.	df	t	p
BUZZ GROUP	60	15.80	3.002	119	3.91	0.026
CONVENTIONAL	60	12.27	2.145			

The result of the table 3 shows there is no significant difference between the post-test performance mean scores and retention mean scores of students exposed to buzz group method ($t = 0.512$, $p > 0.05$). This means that the t-value is not significant at $p = 0.05$. Therefore, the null hypothesis is not rejected. This implies that there is no significant difference between the posttest performances means scores of students exposed to buzz group method. The result ascertains the equivalent ability of the students in the two groups but insignificant difference due to few weeks between the two tests.

Table 3: The t-test showing the posttest performance mean scores and retention mean scores of students exposed to buzz group strategy

Group	Variable	N	Mean	SD	df	t	p
BUZZ-GROUP METHOD	Performance	60	17.54	3.989	59	0.512	0.477
	Retention	60	16.80	3.002			

DISCUSSION

The study's results supported hypothesis 1, which states that there is a substantial difference between the mean posttest scores of students exposed to the buzz group technique and those subjected to the traditional strategy. This is consistent with a study conducted by Ningsih and Suryani (2021) on the efficacy of the Buzz Group discussion method in enhancing elementary school students' capacity for collaboration. The study discovered that the use of the Buzz Group discussion method groups had an impact on students' cooperation and performance. Hypothesis 2 of the study also showed that students exposed to buzz group strategy and those exposed to traditional strategy had significantly different posttest retention mean scores. Romeike & Fischer's (2019) research on the effectiveness of student-centered BGs versus traditional teacher-centered histology instruction lends credence to this. The results of the study show that by increasing mean scores and decreasing standard deviations, the buzz group cooperative learning strategy enhances students' academic performance and information retention. Among other benefits, students who use the buzz group method have improved self-esteem, longer attention spans, and more active participation in the class. Students also start interacting with each other more than they would with traditional instructional methods. They were of the opinion that, teaching methods or approaches, are expected not only to enable students acquire knowledge but to retain same over a long period of time and discovery learning can assist in improving the understanding, critical thinking skills, problem solving skills, communication skills of learners, increase the involvement of learners, both individually and socially, in exploring and critically solving problems.

Since both techniques entail student participation and engagement, hypothesis 3 found no significant difference between the posttest performance mean scores and retention mean scores of students exposed to the buzz group strategy. This was further corroborated by the findings of Qureshi, Raza, Qureshi, Khaskheli, and Yousufi (2023), who claimed that in order to engage and inspire students to learn, active learning classrooms are becoming a more significant part of total educational endeavours in higher education institutions. Because of this, group projects, social presence, peer and teacher contact, and collaborative learning and engagement all improve students' learning results. Thus, the study discovered that students who were exposed to the buzz group tactic outperformed those who were exposed to the traditional way.

CONCLUSION

The results of this study showed that the buzz group approach was better to the traditional way for imparting science education. The buzz group educational technique has the potential to improve student performance and retention because it lets students build their own meanings and scaffold what they are learning with their classmates. Additionally, it has been determined that a more active teaching approach will greatly enhance students' interest and performance in science classes. In order to further improve the course's learning outcomes, lecturers must help their students in this direction.

Recommendations

Based on the findings, the researcher considers the following recommendations necessary:

1. Science Education lecturers should adopt buzz group strategy in classrooms to enable students participate actively and interact to arouse their interest and improve their performance and retention.
2. Government should provide enabling environment for lecturers and making the school conducive for participatory studentship.
3. The curriculum planners should introduce some collaborative packages into the methodologies of teaching sciences to update lecturers' knowledge on the application of the buzz strategy.

REFERENCES

1. Ahmad, S. Z. (2020). Buzz groups to develop EFL students' critical listening and reduce their oral communication apprehension. *Journal of Faculty of Education Menioufia University*, 2(35), 56-91. Doi. 10.21608/MUJA.2020.106684
2. Hidayah, C., & Rahmawan, S. (2023). The Effect of Buzz Group Based Blended Learning to Improve Students Cognitive Learning Outcomes on Thermochemical Materials. *EduChemia: Jurnal Kimia dan Pendidikan*, 8(2), 145-160. DOI: <http://dx.doi.org/10.30870/educhemia.v8i2.19430>
3. Kenney, M., & Zysman, J. (2016). The rise of the platform economy. *Issues in science and technology*, 32(3), 61.

4. Lubis, F. F. M., Wardani, A. R., & Harahap, Y. M. (2023). Buzz group method to enhance cooperation among students in classroom. *EXCELLENCE: Journal of English and English Education*, 3(1), 23-27. <https://doi.org/10.47662/ejee.v3i1.583>
5. Ningsih, B., & Suryani, E. (2021). The effectiveness of the buzz group discussion methods on improving the collaboration of basic school students. *International Journal of Global Accounting, Management, Education, and Entrepreneurship*, 2(1), 1-6. <https://doi.org/10.48024/ijgame2.v2i1.35>
6. Prastyawan, P., & Jamilah, J. (2024). Can the Buzz group strategy unlock potential? Exploring its impact on enhancing students' writing skills through a quasi-experimental study. *Voices of English Language Education Society*, 8(1), 163-172. <https://doi.org/10.29408/veles.v8i1.24502>
7. Prayoga, F. (2018). The impact of topic based group discussion on EFL learners' speaking performance. *Journal of Research & Method in Education*, 8(2), 40-45. DOI: 10.9790/7388-0802064045
8. Qureshi, M. A., Khaskheli, A., Qureshi, J. A., Raza, S. A., & Yousufi, S. Q. (2023). Factors affecting students' learning performance through collaborative learning and engagement. *Interactive Learning Environments*, 31(4), 2371-2391. <https://doi.org/10.1080/10494820.2021.1884886>
9. Raja, R., & Nagasubramani, P. C. (2018). Impact of modern technology in education. *Journal of applied and advanced research*, 3(1), 33-35. <https://dx.doi.org/10.21839/jaar.2018.v3S1.165>
10. Romeike, B. F., & Fischer, M. (2019). Buzz groups facilitate collaborative learning and improve histopathological competencies of students. *Clinical Neuropathology*, 38(6), 285.
11. Senko, C., & Dawson, B. (2017). Performance-approach goal effects depend on how they are defined: Meta-analytic evidence from multiple educational outcomes. *Journal of Educational Psychology*, 109(4), 574. <https://doi.org/10.1037/edu0000160>
12. Wickelgren, W. A. (1972). Trace resistance and the decay of long-term memory. *Journal of mathematical psychology*, 9(4), 418-455. [https://doi.org/10.1016/0022-2496\(72\)90015-6](https://doi.org/10.1016/0022-2496(72)90015-6)
13. Wong, C. L., Chu, H. E., & Yap, K. C. (2020). A framework for defining scientific concepts in science education. *Asia-Pacific science education*, 6(2), 615-644.
14. York, T. T., Gibson, C., & Rankin, S. (2015). Defining and measuring academic success. *Practical assessment, research & evaluation*, 20(5), n5.