Unnes.J.Biol.Educ. 14 (2) (2025)

Journal of Biology Education

http://journal.unnes.ac.id/sju/index.php/ujbe

The Effect of STAD-based QuizWhizzer on Students' Cognitive Learning Outcomes and Anthusiasm on Circulatory System

Aura Titis Fania, Lutfia Nur Hadiyanti[1]✉

[1]Biology Department, FMIPA, Universitas Negeri Semarang, Indonesia

Article Info

Article History:

Received : April 2025

Accepted : April 2025

Published : August 2025

Keywords:

Circulation system, cognitive learning outcome, QuizWhizzer, STAD, students' anthusiasm

Abstract

Learning activities are activities carried out by students and require them to play an active role during the activity. Based on the results of interviews and observations, it is known that student participation in discussions at SMAN 1 Ungaran is still low, this has a negative impact on understanding the material of the human blood circulation system. The integration of QuizWhizzer in the STAD model can be a solution to the problem by supporting student interactivity in learning. This study aims to analyze the effect of QuizWhizzer in the Student Teams-Achievement Division (STAD) model on students' cognitive learning outcomes on the material of the blood circulation system. The research method used Quasy Experiment Non-Equivalent Control Group Design. The results of posttest analysis with Independent sample T-test and Paired Sample T-test showed Sig. (2-*tailed*) 0.017 and 0.000 which means there was a significant increase in the cognitive learning outcomes of experimental class students compared to the control class, with an average posttest score of 83.8 experimental class and 79 control class. Thus, QuizWhizzer in the STAD model has an effect on improving students' cognitive learning outcomes on the material of the human blood circulation system. This combination is able to create an interesting and fun learning atmosphere, and is recommended to be applied to various other subjects.

✉ Correspondence Address:
D6 Building 1st Floor Jl Raya Sekaran Gunungpati Semarang
E-mail: lutfiahadiyanti@mail.unnes.ac.id

p-ISSN 2252-6579

e-ISSN 2540-833X

INTRODUCTION

Learning activities are essential processes that require students to actively engage throughout, enabling them to develop self-efficacy and construct their own understanding of concepts (Pongkendek et al., 2019; Rompegading et al., 2021). In student-centered learning approaches, teachers act as facilitators, providing support and opportunities for students to enhance their abilities. Effective learning occurs when the majority of students actively participate, exhibit enthusiasm, and demonstrate high self-esteem (Panggabean et al., 2021; Sopian, 2016). Professional educators play a crucial role in selecting the most suitable instructional models tailored to students' characteristics and needs, ensuring optimal comprehension of the material. The chosen learning model should be engaging and capable of fostering proactive student involvement.

Cooperative learning is an instructional model that enhances self-efficacy development, increases motivation for learning, fosters active learning attitudes, and leads to improved academic outcomes (Qureshi et al., 2023). This approach allows students the freedom to engage actively and fosters trust among classmates, thereby creating an enjoyable learning atmosphere. Furthermore, cooperative learning enhances students' social, cognitive, and attitudinal skills, facilitating optimal learning processes (Kurniani & Nikmah, 2023; Sugiata, 2018). It necessitates that students work collaboratively in groups to discuss and solve problems presented by the teacher (Kusuma & Khoirunnisa, 2018). Various types of cooperative learning models exist, including Student Teams Achievement Division (STAD), Jigsaw, Team Game Tournament (TGT), Group Investigation, among others (Kurniani & Nikmah, 2023).

The STAD model specifically emphasizes enhancing interaction among students (Suparmini, 2021). It is designed to enable students to articulate both abstract ideas and their understanding of the material during group discussions (Nasution & Hafizah, 2020). In this model, students are divided into small heterogeneous learning groups based on differing abilities to comprehend the material, gender, ethnicity, and backgrounds (Ghufron et al., 2023; Karo et al., 2020; Nainggolan et al., 2021; Supratiningsih et al., 2021). The application of STAD has been shown to improve collaboration skills, responsibility, engagement, achievement, motivation, and overall student learning outcomes (Motwani et al., 2022; Nugroho & Shodikin, 2018; Suparmini, 2021). The STAD model creates an active, effective, collaborative, and enjoyable learning environment where students can assist and motivate one another in mastering the material (Adnyana, 2020; Piliang, 2020). Students who have a better grasp of the material take responsibility for teaching their peers who may struggle with understanding it, ensuring that all team members achieve a comprehensive understanding. Discussions within the STAD model occur in small groups, allowing students to focus more intently on the material presented by their peers (Fiteriani & Baharudin, 2017; Hutabarat & Ferawati, 2020; Islami et al., 2021; Nainggolan et al., 2021; Supratiningsih et al., 2021).

In addition to the model itself, the tools utilized during the learning process play a crucial role in enhancing student outcomes. QuizWhizzer is an interactive web-based educational game featuring narrative and flexible elements (Wahyuningsih et al., 2021). This multifunctional quiz-based learning tool allows teachers to select various quiz types for students, including multiple-choice questions, short answers, true/false questions, and fill-in-the-blank exercises (Audina et al., 2022; Wahyuningsih et al., 2021). Interviews with biology teachers at SMAN 1 Ungaran revealed that during discussions and collaborations, students often lack proactivity. This deficiency contributes to inadequate comprehension of the material as evidenced by low cognitive learning outcomes related to human circulatory system content. Data from the academic year 2023/2024 indicated a mean score of only 66.67 with a student mastery percentage of merely 30.5%. To address these challenges, the researcher proposes implementing QuizWhizzer within the STAD cooperative learning model for teaching the human circulatory system. The STAD model was selected for its potential to enhance student participation during discussions and group collaborations by providing a platform for problem-solving dialogue. The integration of QuizWhizzer serves as an alternative assessment tool that can foster positive competition among students and motivate them to improve their learning outcomes.

RESEARCH METHOD

This study is classified as quantitative research characterized by its systematic and structured implementation. The research employs a Quasi-Experimental Design, specifically the Non-Equivalent Control Group Design. This design was selected due to the inability to fulfill the criteria of true experimental research, which requires random sampling. In educational research, samples naturally form intact groups, such as classes of students. Moreover, in Quasi-Experimental Designs, the research variables cannot be entirely controlled; the researcher can only focus on the specific variables under investigation (Creswell & Creswell, 2022). A schematic representation of this research is presented in Figure 1.

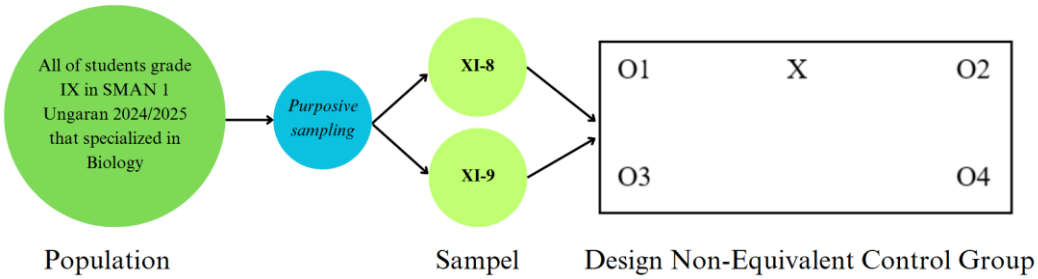


Figure 1. Research Methode Scheme

The implementation of the research consists of three main stages: preparation, implementation, and drawing conclusions.

Preparation

In this stage, the researcher conducted data collection and needs analysis through observations during the learning activities. Additionally, the researcher interviewed biology subject teachers and investigated literature related to the application of the STAD learning model and the interactive quiz website QuizWhizzer. Subsequently, the researcher determined the population and sample for the study. The population for this study comprises eleventh-grade students at SMAN 1 Ungaran during the 2024/2025 academic year who have opted for Biology as their specialization. At SMAN 1 Ungaran, there are five classes with a total of 180 students enrolled in Biology. The sample for this study involves two classes: XI-8 as the control group and XI-9 as the experimental group, totaling 72 students from both classes. Sample selection was conducted using purposive sampling techniques based on specific considerations, including recommendations from the biology teacher and the similarity of student characteristics across cognitive, affective, and psychomotor domains. The population and sample determination scheme are illustrated in Figure 1.

After identifying the population and sample, the researcher then developed the learning instruments to be used, including teaching modules for both the control class and the experimental class, a design for the QuizWhizzer platform, student response questionnaires, and pretest and posttest instruments. The development of teaching modules was aligned with the learning outcomes in the curriculum currently used by the research school, namely the Merdeka Curriculum. Before being administered to students, the pretest and posttest questions underwent quality testing to determine validity, reliability, difficulty level, and item discrimination. Quality testing was conducted using ANATESV4 software, and content validation was also performed by providing material validation sheets to experts in biology content. This research encompasses three types of variables: independent variables, dependent variables, and control variables. The independent variable is the implementation of the STAD learning model integrated with QuizWhizzer, while the dependent variables are cognitive learning outcomes and student enthusiasm. The variable control pertains to students' study hours in receiving instruction on the human circulatory system at school.

Implementation

In this phase, the learning process was conducted using the STAD model divided into four meetings. In the first meeting, the researcher provided an introduction related to the material on the human

circulatory system and administered a pretest to assess students' initial understanding of this material. In meetings two and three, the researcher implemented learning activities using the STAD model integrated with QuizWhizzer. The implementation of the STAD learning model in weeks two and three followed Slavin's (1980) learning syntax, which had been modified to meet research needs. The integration of QuizWhizzer with the STAD model was achieved by incorporating its use in phase five of STAD's learning syntax, which is evaluation. In this phase, there were differences in treatment between the experimental class and the control class; in the experimental class, quizzes were conducted using QuizWhizzer, while in the control class, quizzes were administered using paper quizzes. In the final meeting, an assessment of students' final understanding was conducted by administering a posttest to students. The researcher then asked students to fill out a questionnaire to gather their responses during the learning activities. A response questionnaire was also given to teachers to evaluate how well the learning activities integrating QuizWhizzer within the STAD model were executed.

Drawing Conclusions

Data for this study includes cognitive learning outcomes and student enthusiasm. Sources of cognitive learning data are pretest and posttest scores administered to students before and after instruction, whereas data on student enthusiasm were collected through a Likert scale questionnaire distributed via Google Forms as a feedback mechanism. Data analysis techniques employed include homogeneity and normality tests to ensure that data are normally distributed and homogeneous as prerequisite tests; independent sample t-tests to assess differences in cognitive learning outcomes between control and experimental classes; paired sample t-tests to determine mean score differences in cognitive outcomes for experimental class students before and after treatment; and classical completeness tests to evaluate the percentage of mastery achieved by students in both experimental and control classes. Data, data collection techniques, instruments, and data analysis techniques utilized in this study are summarized in Table 2. The analysis of student feedback questionnaires involves calculating total scores and categorizing responses based on predefined criteria. The scoring criteria for student feedback are presented in Table 1. The results of data analysis will be descriptively presented to draw conclusions regarding whether the integration of QuizWhizzer within the STAD model can serve as an effective solution for enhancing cognitive learning outcomes and student enthusiasm in studying the human circulatory system topic.

Table 1. Students Questionnaries Criteria

Persentation (%)	Criteria
0 – 25	Poor
26 – 50	Fair
51 – 75	Good
76 – 100	Very Good

Table 2. Data, Data Collection Technique, Instruments, Data Analysis Technique

No	Data	Data Collection Techniques	Instruments	Data Analysis Techniques
1.	Pretest and posttest scores	Test	Pretest and posttest Quiestions	Test of normality, test of homogeneity, independent sample t-test, paired sample t-test, classical completeness testing
2.	Students Anthusiasm	Quiestionnaire	Questionnaire Sheet	Calculation of Likert Scale Questionnaire

RESULTS AND DISCUSSION

This study was conducted between October 22, 2024, and November 22, 2024, with a pause for P5 activities from November 4 to November 12, 2024. The research aimed to analyze the impact of integrating

QuizWhizzer into the Student Teams-Achievement Division (STAD) model on students' cognitive learning outcomes regarding the circulatory system at SMA Negeri 1 Ungaran during the 2024/2025 academic year. Two classes were selected as samples: XI-8 as the control group and XI-9 as the experimental group. The control group received instruction on the circulatory system using the STAD model without technological integration, while the experimental group utilized QuizWhizzer as an interactive tool within the STAD framework. Data collection encompassed pretest and posttest scores, student response questionnaires, and teacher feedback surveys. Pretest and posttest scores served as indicators of students' cognitive learning outcomes, while questionnaires captured qualitative insights into student and teacher responses to QuizWhizzer's integration within STAD. Both groups employed STAD's cooperative learning model, which consists of six key stages: (1) setting goals and motivating students; (2) forming study groups; (3) teacher presentations; (4) team-based learning; (5) evaluation; and (6) recognition or rewards (Nurdyansyah & Fahyuni, 2016; Wulandari & Kunci, 2022). However, in the experimental class, evaluations were conducted using QuizWhizzer, whereas written quizzes were used in the control class. The study will be deemed successful in enhancing cognitive learning outcomes if: (1) there is a significant difference in learning outcomes between the experimental and control classes; (2) there is a significant increase in average posttest scores compared to pretest scores in the experimental class; and (3) the percentage of classical test results in the experimental class exceeds that of the control class. Conversely, the study will be considered successful in increasing student enthusiasm if the overall average percentage from student feedback reaches between 76% - 100%.

Students' Cognitive Learning Outcome

The data of students' interest were obtained by distributing an interest-level instrument sheet (ISM) of study. Interest in learning was measured after students were given treatment. Based on the results of the normality test on the pretest data, it was found that the data were normally distributed. This is indicated by the significance values of 0.087 for the experimental class and 0.200 for the control class (Table 3). According to the decision-making criteria for the Kolmogorov-Smirnov normality test, if the significance value is greater than 0.05, it can be concluded that the pretest data for both the experimental and control classes are normally distributed. The results of the homogeneity test on the pretest data indicate that both classes are in a homogeneous condition or have the same level of initial understanding, allowing both classes to be used as research samples. The results of the homogeneity test for the pretest data using Levene's test showed a significance value of 0.536 (Table 3). Based on the decision-making criteria for Levene's homogeneity test, if the significance value is greater than 0.05, it can be concluded that the pretest data for both the experimental and control classes are homogeneous. With normally distributed and homogeneous pretest data, an independent sample t-test was then conducted. The results of this test indicated that there was no significant difference in initial understanding between students in the experimental and control classes. The significance value from the independent sample t-test for the pretest data was 0.073 (Table 3). According to the decision-making criteria for the independent sample t-test, if the Sig. (2-tailed) value is greater than 0.05, it can be concluded that there is no significant difference in prior knowledge between the experimental and control classes.

Table 3. Analysis Results on Pretest Score

Category	Control Class	Experiment Class
Pretest score means	36.7	40.6
	Significance (Sig.)	
Test of Normality	0.200	0.087
Test of Homogeneity	0.536	
Independent sample T-test	0.073	

In the final session, the researcher administered a posttest to assess students' final understanding levels and distributed a questionnaire to gauge student responses and reactions during the learning process. According to the results obtained from testing posttest scores in both classes (Table 4), independent sample t-test analysis yielded a significance value (Sig. 2-tailed) of 0.017. This finding indicates a substantial

difference in learning outcomes between the experimental and control classes. Additionally, paired sample t-test analysis conducted on pretest and posttest scores for the experimental class revealed a significance value (Sig. 2-tailed) of 0.000. Based on these results, it can be concluded that there is a significant difference in cognitive learning outcome improvements for students subjected to QuizWhizzer integrated within the STAD learning model concerning the human circulatory system content. The results of the classical completeness calculation for the control and experimental classes indicate that the classical completeness score for the experimental class is higher than that of the control class. The classical completeness score for the experimental class is 86%, while that of the control class is 72%. In the control class, there are 10 students who did not achieve mastery, whereas in the experimental class, only 5 students did not. Students are considered to have mastered the material on the circulatory system if they achieve a score of ≥75. This criterion is established by the school. Based on the comparison of classical completeness, where the classical completeness score in the experimental class is higher than that in the control class, it can be concluded that the use of QuizWhizzer in the STAD learning model positively influences cognitive learning outcomes for students regarding the circulatory system material.

Table 4. Analysis Result on Posttest Score

Category	Control Class	Experiment Class
Posttest score means	79	83.8
	Significance (Sig.)	
Test of Normality	0.200	0.197
Test of Homogeneity	0.915	
Independent sample T-test	0.017	
Paired sample t-test	-	0.000

The outcomes are primarily influenced by the chosen instructional model and media selection, specifically the integration of QuizWhizzer as an interactive quiz alternative within the STAD learning framework in the experimental class. This integration aims to facilitate teachers' tasks while providing an enjoyable experience for students during evaluation phases (Susanto & Ismaya, 2022; Yanuarto & Susanti, 2023). The experimental group's cognitive learning outcomes improved significantly due to gamification elements introduced through QuizWhizzer. Real-time ranking features fostered healthy competition among students, motivating them to excel during quizzes (Anunpattana et al., 2021; Faijah & Marhaeni, 2021; Sitompul et al., 2023). The diverse question formats added challenges that prevented monotony and increased student engagement and enjoyment during evaluations. Consequently, students demonstrated heightened enthusiasm and focus, contributing to improved cognitive outcomes (Kumala et al., 2024; Susanti, 2022; Susanto & Ismaya, 2022; White & McCoy, 2019; Yanuarto & Susanti, 2023). Additionally, QuizWhizzer facilitated students' adaptation to technology in educational settings (Novita & Herman, 2021; Wulansari & Dwiyanti, 2021). The inclusion of challenges within gamified learning environments encouraged students to exert maximum effort during evaluations. QuizWhizzer's leaderboard feature provided real-time rankings that fostered positive emotions and created enjoyable learning experiences for students (Amany & Desire, 2020; Anunpattana et al., 2021; Sitompul et al., 2023). This competitive element inspired active participation while simultaneously enhancing comprehension of complex topics.

The live race feature in QuizWhizzer (showed in Figure 2) fosters a healthy competitive atmosphere among students, motivating them to strive for excellence while completing quizzes (Anunpattana et al., 2021; Faijah & Marhaeni, 2021; Sitompul et al., 2023) . As illustrated in Figure 4, students concentrate on answering questions while monitoring their standings via the game board projected by the researcher. The variety of question types such as ordering (Figure 3a), true or false (Figure 3b), multiple choice (Figure 3c), drag and down (Figure 3d), and short answer presented adds an additional layer of challenge, preventing monotony and instead enhancing student enthusiasm and enjoyment during quiz activities, which positively impacts cognitive learning outcomes (Kumala et al., 2024). Furthermore, the integration of QuizWhizzer assists students in adapting to technological applications within their learning activities (Yanuarto & Susanti, 2023).

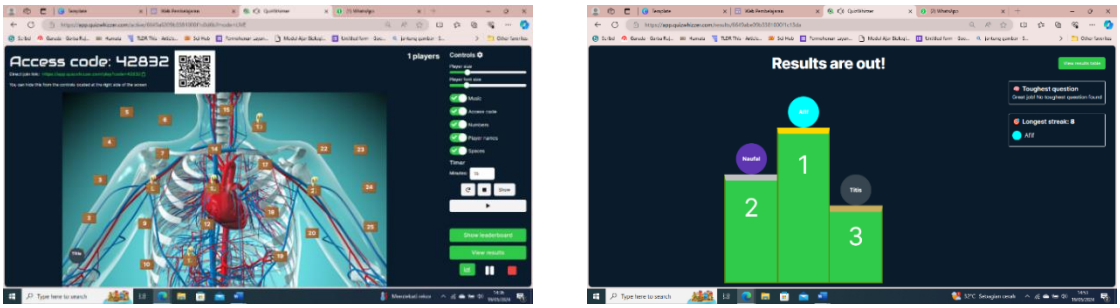
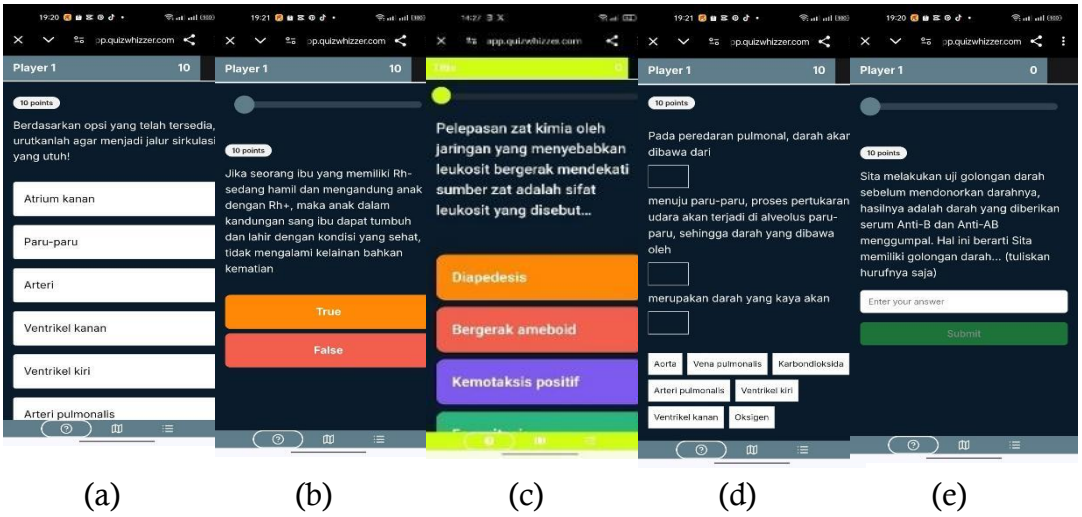


Figure 2. Live Race Features in QuizWhizzer



(a) (b) (c) (d) (e)

Figure 3. The variety of question in QuizWhizzer

Students' determination to achieve top rankings during quiz sessions enhances their engagement throughout the learning process, a phenomenon supported by the STAD learning model implemented during these activities. The cooperative STAD model enables students to maintain focus, actively participate, enhance critical thinking skills, and enjoy discussions throughout the learning sessions (Ewut et al., 2024; Ramadhani et al., 2024). The active involvement of students during learning activities aids in their personal development and comprehension of the material. This model promotes interactivity among students by encouraging them to exchange ideas and engage in discussions, thereby fostering interactions that motivate and assist peers in grasping the material and ensuring that all group members understand what is being studied (Farid, 2024; Wulandari & Kunci, 2022). The freedom provided to the audience group to ask questions stimulates curiosity among students, while the presenter group, in answering these questions, is required to engage in discussions and utilize additional resources to provide accurate responses. This process facilitates an exchange of information among students, thereby enhancing their knowledge (Salo & Tulak, 2019; Wulandari & Kunci, 2022).

The integration of technology into learning models opens opportunities for students to develop critical 21st-century skills such as critical thinking, collaboration, and creativity—skills essential for addressing future challenges. The use of QuizWhizzer within the Student Teams-Achievement Division (STAD) model exemplifies the application of Science, Technology, and Innovation (STI) to support the Sustainable Development Goals (SDGs). Specifically, it aligns with SDG 9 (Industry, Innovation, and Infrastructure) and SDG 17 (Partnerships for the Goals) by fostering technological innovation and collaborative learning environments. Additionally, QuizWhizzer helps students adapt to technology use in educational settings while promoting inclusivity and interactivity in the learning process. This platform also enables data collection that can be utilized to enhance educational effectiveness sustainably (Anzai, 2022; Klemun et al.,

2023; Morozova & Rozhnenko, 2021; Seibert et al., 2020).

In the control class, cognitive learning outcomes showed improvement; however, this increase was not as significant as that observed in the experimental class. The control class employed the STAD model without technological support, relying solely on written quizzes. Traditional paper-based quizzes lacked interactive features like leaderboards, which are instrumental in fostering a competitive spirit among students. The competitive element inherent in QuizWhizzer motivates students to achieve better results by creating an engaging and dynamic learning environment (Zainuddin et al., 2020). Furthermore, QuizWhizzer reduces student boredom during lengthy learning sessions by creating a livelier and more enjoyable atmosphere (Qomariyah et al., 2025). Thus, integrating QuizWhizzer into cooperative learning models like STAD offers a promising approach to improving both cognitive outcomes and student engagement.

Figure 4. Students Focused on Quiz

Student Learning Anthusiasm

Analysis revealed a correlation between active participation in discussions and cognitive learning outcomes. Students with lower engagement during discussions tended to achieve lower cognitive scores. The average activity score for the experimental class was significantly higher at 93 compared to 85 in the control class. In the experimental group, students actively collaborated by explaining topics confidently within their teams. Conversely, control group students demonstrated less mastery over the material during group presentations due to limited engagement. The absence of gamified elements in traditional STAD diminished student enthusiasm and comprehension levels. The student feedback questionnaire was administered to the experimental class to assess their responses during the learning activities that integrated QuizWhizzer within the STAD learning model. The questionnaire comprised seven indicators, and the analysis of student responses for each indicator is presented in Figure 5. Based on the questionnaire results, it can be concluded that during the learning process utilizing the QuizWhizzer integration within STAD, 93.4% of students reported feeling pleased, while 94.5% expressed enthusiasm throughout the lessons. Additionally, 97.2% of students noted an increase in their interest in learning, accompanied by 94.4% experiencing heightened curiosity regarding the material covered. The use of QuizWhizzer enabled 94.4% of students to maintain greater focus while completing quizzes. Furthermore, 97.2% of students found it easier to understand the material related to the human circulatory system when taught through the STAD model enhanced by QuizWhizzer.

Student interactivity during the learning process is prominently observed in group discussion activities. Each group, consisting of four students, is formed by the teacher with careful consideration of gender and pretest results to ensure balanced abilities among groups. This diversity allows students to gain different perspectives and experiences during discussions, thereby enriching their learning experiences (Ewut et al., 2024; Salo & Tulak, 2019). Each group is assigned a unique subtopic to discuss collaboratively, enabling students to acquire new information related to material not yet covered in class. During each session, several groups present their discussion outcomes. While presentations are ongoing, non-presenting groups

are required to engage in discussions and formulate questions for the presenting group. If the audience group has no questions, the presenting group is given the opportunity to check the audience's understanding.

This interactive approach fosters a dynamic learning environment where students actively participate and exchange ideas, enhancing their comprehension of the subject matter. Group discussions not only promote critical thinking but also encourage collaboration among peers, which is essential for developing communication skills and fostering a sense of community within the classroom. The role of the teacher as a facilitator becomes crucial in guiding these discussions and ensuring that all voices are heard, thus creating an inclusive atmosphere conducive to learning.

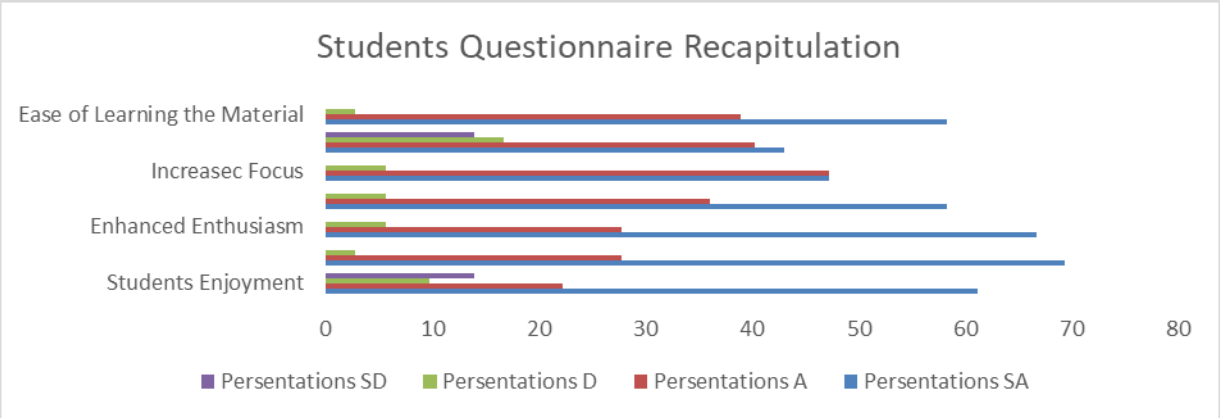


Figure 5. Students Questionnaire Recapitulation

CONCLUSION

The integration of QuizWhizzer within the STAD model significantly improved cognitive learning outcomes for circulatory system material at SMA Negeri 1 Ungaran while fostering greater student enthusiasm. By incorporating gamification principles such as real-time rankings and diverse question formats into cooperative learning frameworks, educators can create engaging environments that motivate students to actively participate and achieve better academic results. These findings align with the principles of educational transformation, which emphasize the importance of student activity, collaboration, and communication in the learning process. Educational transformation encourages students to adopt proactive and responsible attitudes towards their learning, thereby facilitating more meaningful learning experiences. Moreover, the integration of QuizWhizzer within the STAD model successfully established a pleasant and effective learning environment for students, positioning it as a viable alternative for educators seeking to implement technology in the context of educational transformation in the digital era.

ACKNOWLEDGEMENT

Deepest gratitude to Ungararan 1 High School for providing the necessary support and resources that enabled the completion of this journal. Our heartfelt thanks go to the students who actively participated in the research process; your enthusiasm, cooperation, and valuable insights have been integral to the success of this work. We are also profoundly grateful to the dedicated teachers whose expertise, guidance, and encouragement were instrumental in shaping the direction of this study

REFERENCES

Adnyana, M. E. (2020). Implementasi Model Pembelajaran STAD Untuk Meningkatkan Motivasi dan Prestasi Belajar. *Indonesian Journal of Educational Development*, *1*(3), 496–505.

Amany, D., & Desire, A. (2020). Pembelajaran Interaktif berbasis Gamifikasi guna Mendukung Program WFH pada saat Pandemic Covid-19. *ADI Bisnis Digital Interdisiplin Jurnal*, *1*(1), 48–55. https://doi.org/10.34306/ABDI.V1I1.116

Anunpattana, P., Khalid, M. N. A., Iida, H., & Inchamnan, W. (2021). Capturing potential impact of challenge-based gamification on gamified quizzing in the classroom. *Heliyon*, *7*(12). https://doi.org/10.1016/j.heliyon.2021.e08637

Anzai, E. (2022). APPLICATION OF STAD COOPERATIVE LEARNING MODEL TO INCREASE STUDENTS' LEARNING OUTCOMES IN SOCIAL SCIENCE SUBJECT. *PROGRES PENDIDIKAN*, *3*(1), 24–32. https://doi.org/10.29303/prospek.v3i1.197

Audina, L., Rostikawati, T., & Gani, R. A. (2022). Pengembangan Media Game Interaktif Elektronik Berbasis Quizwhizzer Pada Subtema Usaha Pelestarian Lingkungan. *Primary: Jurnal Pendidikan Guru Sekolah Dasar*, *11*(6), 1996–2006. https://doi.org/10.33578/jpfkip.v11i6.9212

Creswell, J. W., & Creswell, J. D. (2022). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (Sixth Edition). SAGE Publications.

Ewut, E. P., Makaborang, Y., & Ndjoeroemana, Y. (2024). Penerapan Model Pembelajaran Tipe Student Teams Achievement Divisions Dengan Media LKS Teka-Teki Silang Untuk Meningkatkan Hasil Belajar Siswa SMP Negeri 1 Kanatang (Application of the Student Teams Achievement Divisions Type Learning Model Using Crossword Puzzle LKS Media to Improve Student Learning Outcomes at SMP Negeri 1 Kanatang). *Biodik: Jurnal Ilmiah Pendidikan Biologi* , *10*(3), 358–364. https://doi.org/10.22437/biodik.v10i3.35157

Faijah, N., & Marhaeni, H. N. (2021). QuizWhizzer-Assisted Educational Game Design to Improve Students' Conceptual Understanding Skills. *MULTIDISCIPLINE - International Conference 2021*, 455–461.

Farid, M. (2024). Upaya Meningkatkan Aktivitas dan Hasil Belajar Fisika Menggunakan Model Pembelajaran Student Teams Achievement Division (STAD). *Lontar Physics Today*, *2*(3), 117–126. https://doi.org/10.26877/lpt.v2i3.18115

Fiteriani, I., & Baharudin. (2017). Analisis Perbedaan Hasil Belajar Kognitif Menggunakan Metode Pembelajaran Kooperatif yang Berkombinasi Pada Materi IPA di MIN Bandar Lampung. *Jurnal Pendidikan Dan Pembelajaran Dasar*, *4*(2).

Ghufron, S., Nafiah, Syahruddin, Kaswadi, & Mustofa. (2023). The Effect of STAD-Type Cooperative Learning Based on a Learning Tool on Critical Thinking Ability in Writing Materials. *International Journal of Instruction*, *16*(1), 61–84. https://doi.org/10.29333/iji.2023.1614a

Hutabarat, H. D., & Ferawati, A. H. (2020). Improvement of Understanding Physics Concept Using Cooperative Model of STAD Type and Mapping Concept Model. *Journal of Physics: Conference Series*, *1428*(1), 1–8. https://doi.org/10.1088/1742-6596/1428/1/012059

Islami, A. I., Budiasih, E., Sukarianingsih, D., & Sulistina, O. (2021). STAD-NHT vs STAD Learning Models; The Difference in Students' Achievement on Redox Reaction. *AIP Conference Proceedings*, *2330*, 1–6. https://doi.org/10.1063/5.0043353

Karo, R. K., Perangin-Angin, R. B. B., & Murad, A. (2020). The Effect of STAD Cooperative Learning Model and Critical Thinking Ability on Learning Outcomes PPKn Grade V Students of SD Negeri 060934 Medan Johor. *Budapest International Research and Critics in Linguistics and Education (BirLE) Journal*, *3*(2), 871–878. https://doi.org/10.33258/birle.v3i2.959

Klemun, M. M., Ojanperä, S., & Schweikert, A. (2023). Toward evaluating the effect of technology choices

on linkages between sustainable development goals. *IScience*, *26*(2). https://doi.org/10.1016/j.isci.2022.105727

Kumala, F. N., Safitri, I., Triwahyudianto, T., Yasa, A. D., & Salimi, M. (2024). HOTS-Based e-evaluation Quizwhizzer in science learning in elementary schools. *Inovasi Kurikulum*, *21*(3), 1345–1358. https://doi.org/10.17509/jik.v21i3.71147

Kurniani, K. H., & Nikmah, A. R. (2023). Enhancing Quadratic Function Learning Outcomes with TGT Cooperative Learning. *Eduma : Mathematics Education Learning and Teaching*, *12*(2), 188–201. https://doi.org/10.24235/eduma.v12i2.14

Kusuma, A. P., & Khoirunnisa, A. (2018). Penerapan Model Pembelajaran Kooperatif Tipe Make a Match dan Team Games Tournament terhadap Hasil Belajar. *NUMERICAL: Jurnal Matematika Dan Pendidikan Matematika*, 1. https://doi.org/10.25217/numerical.v2i1.186

Morozova, Y., & Rozhnenko, O. (2021). The use of innovative technologies to enhance the cognitive activity of students. *E3S Web of Conferences*, *273*, 12110. https://doi.org/10.1051/e3sconf/202127312110

Motwani, R., Kaliappan, A., & Chandrupatla, M. (2022). Student Team Achievement Division as A Tool for Peer Assisted Co-Operative Learning in Neuroanatomy. *Anatomy and Cell Biology*, *55*(4), 452–458. https://doi.org/10.5115/acb.22.122

Nainggolan, A. D., Sipayung, R. R., Barus, D. P., Sihombing, R. A., & Siahaan, K. W. A. (2021). Implementasi Model Pembelajaran Tipe STAD dalam Meningkatkan Hasil Belajar Siswa Pada Materi Pokok Bunyi. *QUANTUM: Jurnal Inovasi Pendidikan Sains*, *12*(1), 63–70.

Nasution, M. L., & Hafizah, N. (2020). Development of Students' Understanding of Mathematical Concept with STAD Type Cooperative Learning Through Student Worksheets. *Journal of Physics: Conference Series*, *1554*(1). https://doi.org/10.1088/1742-6596/1554/1/012035

Novita, R., & Herman, T. (2021). Digital technology in learning mathematical literacy, can it helpful? *Journal of Physics: Conference Series*, *1776*(1). https://doi.org/10.1088/1742-6596/1776/1/012027

Nugroho, S., & Shodikin, A. (2018). Keefektifan Pembelajaran Student Teams Achievement Division (STAD) Berbantuan Komik Pada Siswa SD. *Jurnal Matematika Dan Pendidikan Matematika*, *3*(1), 22–32.

Nurdyansyah, & Fahyuni, E. F. (2016). *Inovasi Model Pembelajaran Inovatif* (Vol. 1). Nizamia Learning Center.

Panggabean, J. H., Defi Siregar, M. S., & Rajagukguk, J. (2021). The Effect of Teams Games Tournament (TGT) Method on Outcomes Learning and Conceptual Knowledge in Physics Science. *Journal of Physics: Conference Series*, *1819*(1). https://doi.org/10.1088/1742-6596/1819/1/012047

Piliang, F. M. (2020). Peranan Model Pembelajaran Kooperatif Tipe STAD dalam Meningkatkan Prestasi Belajar Siswa di SMP Negeri 1 Barus Tapanuli Tengah. *Jurnal Wahana Inovasi*, *9*(1), 112–117.

Pongkendek, J. J., Parlindungan, J. Y., & Marpaung, D. N. (2019). Effectiveness of the application of team games tournament cooperative learning model (TGT) to improve learning outcomes of students of class xi science 1 SMA Frater Makassar in the principal material of salt hydrolysis. *IOP Conference Series: Earth and Environmental Science*, *343*(1). https://doi.org/10.1088/1755-1315/343/1/012228

Qomariyah, R. S., Anjarwati, A., Ardiansari, L., & Nisa, A. K. (2025). Building Global Perspective with Interactive Media: A Case Study on Using Quizwhizzer and 3D Media at SDN Krejengan. *Journal of Education Method and Learning Strategy*, *3*(01), 50–63. https://doi.org/10.59653/jemls.v3i01.1305

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

Ramadhani, C. M., Munawar, D. L., Kinasih, E. A. S., Handayani, F. A., Makbul, M., & Farida, N. A. (2024). Penerapan Metode Student on (STAD) dalam Meningkatkan Konsentrasi Belajar Pada Mata Pelajaran PAI Siswa Kelas 3 di SDN Telukjambe II. *JIPI: Jurnal Ilmu Pendidikan Islam*, *23*(2), 300–3016. https://doi.org/10.36835/jipi.v23i02.4179

Rompegading, A. B., Safitri, M., & Irfandi, R. (2021). Perbandingan Hasil Belajar Siswa antara Model

Pembelajaran Kooperatif Tipe Team Games Tournament dengan Student Teams Achievement Division. *BIOEDUSAINS:Jurnal Pendidikan Biologi Dan Sains*, *4*(2), 205–211. https://doi.org/10.31539/bioedusains.v4i2.2245

Salo, S. E., & Tulak, T. (2019). Penerapan Model Pembelajaran Kooperatif Tipe STAD Untuk Meningkatkan Keaktifan Belajar Matematika Siswa Kelas IV SDN 5 Tikala Kabupaten Toraja Utara. *ELEMENTARY JOURNAL*, *2*(1), 1–14.

Seibert, J., Schmoll, I., Kay, C. W. M., & Huwer, J. (2020). Promoting Education for Sustainable Development with an Interactive Digital Learning Companion Students Use to Perform Collaborative Phosphorus Recovery Experiments and Reporting. *Journal of Chemical Education*, *97*(11), 3992–4000. https://doi.org/10.1021/acs.jchemed.0c00408

Sitompul, H., Sayekti, R., Saragih, S. R. D., & Salminawati. (2023). Exploring Students' Perception of Quizizz as a Learning Media in Higher Education. *CJLT: Canadian Journal of Learning and Technology*, *49*(3), 1–24.

Sopian, A. (2016). Tugas, Peran dan Fungsi Guru dalam Pendidikan. *Jurnal Tarbiyah Islamiyah*, *1*(1), 88–97.

Sugiata, I. W. (2018). Penerapan Model Pembelajaran Team Games Tournament (TGT) Untuk Meningkatkan Hasil Belajar. *Jurnal Pendidikan Kimia Indonesia*, *2*(2), 78–87.

Suparmini, M. (2021). Penerapan Model Pembelajaran Kooperatif Tipe STAD untuk Meningkatkan Aktivitas dan Hasil Belajar. *Journal of Education Action Research*, *5*(1), 67–73. https://ejournal.undiksha.ac.id/index.php/JEAR/index

Supratiningsih, Dafik, & Farisi, M. I. (2021). An Analysis of STAD Cooperative Learning Implementation and Its Effect on The Collaborative Skill in Solving the Problems of Addition and Subtraction. *Journal of Physics: Conference Series*, *1839*(1). https://doi.org/10.1088/1742-6596/1839/1/012037

Susanti, N. (2022). Pengaruh Model Pembelajaran Student Team Achievement Division (STAD) dan Fleming terhadap Prestasi Belajar Peserta Didik pada Materi Trigonometri. *NUCLEUS*, *3*(2), 191–196. https://doi.org/10.37010/nuc.v3i2.1009

Susanto, D. A., & Ismaya, E. A. (2022). Pemanfaatan Aplikasi Quizwhizzer Pada PTM Terbatas Muatan Pelajaran IPS Bagi Siswa Kelas VI SDN 2 Tuko. *CJPE: Cokroaminoto Juornal of Primary Education* , *5*(1), 104–110. https://e-journal.my.id/cjpe

Wahyuningsih, F., Woroharsi, R. D. P., Saksono, L., & Samsul, S. I. (2021). Utilization of QuizWhizzer Educational Game Applications as Learning Evaluation Media. *International Joint Conference on Science and Engineering 2021 (IJCSE 2021)*, *209*, 148–152. www.quizwhizzer.com,

White, K., & McCoy, L. P. (2019). Effects of Game-Based Learning on Attitude and Achievement in Elementary Mathematics. *Networks: An Online Journal for Teacher Research*, *21*(1), 1–17. https://doi.org/10.4148/2470-6353.1259

Wulandari, I., & Kunci, K. (2022). Model Pembelajaran Kooperatif Tipe STAD (Student Teams Achievement Division) dalam Pembelajaran MI. In *Jurnal Papeda* (Vol. 4, Issue 1).

Wulansari, W., & Dwiyanti, L. (2021). Building Mathematical Concepts Through Traditional Games to Develop Counting Skills for Early Childhood. *International Journal of Elementary Education* , *5*(4), 574–583. https://ejournal.undiksha.ac.id/index.php/IJEE

Yanuarto, W. N., & Susanti, L. M. (2023). Utilizing QuizWhizzer Apps to enhance students' mathematical ability in game-based learning model. *Math Didactic: Jurnal Pendidikan Matematika*, *9*(2), 199–212. https://doi.org/10.33654/math.v9i2.1949

Zainuddin, Z., Shujahat, M., Haruna, H., & Chu, S. K. W. (2020). The role of gamified e-quizzes on student learning and engagement: An interactive gamification solution for a formative assessment system. *Computers and Education*, *145*. https://doi.org/10.1016/j.compedu.2019.103729