Kontinu: Jurnal Penelitian Didaktik Matematika
E-ISSN: 2656-5544
P-ISSN: 2715-7326
Vol. 8, No. 1: November 2024
Hal. 81-87

The Application of Cooperative Team Games Tournament (TGT) Method for Improving Quadratic Equation Learning Outcomes in Vocational High Schools

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Abstarct. *This study aims to improve the learning outcomes of vocational high school (SMK) students in quadratic equation material through the implementation of the Teams Games Tournament (TGT) learning model. The research method employed was Classroom Action Research (CAR), conducted in three cycles, each consisting of planning, implementation, observation, and reflection. The subjects of this study were 10th-grade students at SMKS Muhammadiyah 4 Sukorejo Kendal. Data were collected through learning outcome tests and classroom activity observations. The findings indicate that the TGT model effectively enhances students' understanding of quadratic equations, as evidenced by the increase in average test scores and active participation in group discussions and academic competitions. This research supports the use of game-based cooperative learning to boost student motivation and academic achievement in vocational education.*

Keywords: *Teams Games Tournament (TGT), learning outcomes, quadratic equations, classroom action research, vocational high school.*

INTRODUCTION

Mathematics education in vocational high schools (SMK) frequently encounters challenges due to students' low interest and learning achievement, particularly in algebraic topics such as quadratic equations (Hendriana et al., 2017). This limited conceptual mastery adversely affects students' ability to solve technical problems requiring mathematical foundations in fields like engineering and business (Widodo & Pusporini, 2019). One contributing factor is the conventional teacher-centered instruction that limits active student engagement (Kurniawan et al., 2021), necessitating more interactive and collaborative learning approaches to enhance participation and understanding.

The cooperative learning model Teams Games Tournament (TGT) offers a solution by integrating group work, competition, and educational games (Slavin, 2013). Previous studies demonstrate TGT's effectiveness in improving mathematics motivation and learning outcomes across educational levels (Purnamasari & Afriansyah, 2020; Febriana et al., 2022). In vocational education contexts, this model can facilitate more engaging learning while developing collaboration skills relevant to workplace demands (Suprihatin, 2015). However, research examining TGT implementation specifically for quadratic equations in SMKs remains limited.

Quadratic equations constitute fundamental mathematical knowledge prerequisite for advanced concepts like quadratic functions and optimization (NCTM, 2014). Students' difficulties often stem from weak conceptual understanding and inability to apply formulas across problem contexts (Zulkarnain et al., 2021). The TGT approach may help students master the material through group discussions, game-based practice, and immediate peer feedback (Isjoni, 2013).

This study employs Classroom Action Research (CAR) methodology to examine TGT's effectiveness in improving student outcomes. CAR was selected for its capacity to provide practical solutions while systematically reflecting on pedagogical improvements (Kemmis et al., 2014). The research was conducted through three cycles to ensure significant enhancement in both learning outcomes and student engagement, with data collected through tests and classroom observations for comprehensive TGT impact evaluation.

The findings are expected to contribute theoretically by strengthening empirical evidence for cooperative learning (Johnson & Johnson, 2018), and practically by providing teachers with guidelines for implementing TGT in algebra instruction, particularly in vocational schools with heterogeneous student populations.

RESERACH METHOD

This study utilized Classroom Action Research (CAR) with the Kemmis and McTaggart model, comprising four cyclical stages: planning, acting, observing, and reflecting (Arikunto et al., 2020). The research was conducted over three cycles to ensure gradual improvement in learning outcomes, with each cycle consisting of 2-3 sessions focused on implementing the TGT model through class presentations, group work, academic tournaments, and team rewards (Devi et al., 2021). The participants were 32 tenth-grade students at SMKS Muhammadiyah 4 Sukorejo Kendal. Data were collected through HOTS-based written tests (Higher Order Thinking Skills) to measure conceptual understanding and application of quadratic equations (Brookhart, 2014), as well as participatory observation sheets to assess student engagement during the learning process (Cohen et al., 2018). Instrument validity was verified through expert judgment by two mathematics education specialists, while reliability was measured using Cronbach's alpha.

Quantitative and qualitative data analyses were performed. Quantitative data were analyzed using descriptive statistics to calculate the average score improvement and classical learning completeness, while qualitative data from observations were analyzed using Miles and Huberman's (2014) technique, which included data reduction, data display, and verification. The success criteria were set at ≥75% of students achieving the Minimum Completeness Criteria (KKM) score of 70 and a minimum 20% increase in learning activity per cycle (Hattie, 2017).

RESULT AND DISCUSSION

The study demonstrated significant improvement in quadratic equation learning outcomes through the implementation of the Teams Games Tournament (TGT) model. The data analysis revealed progressive enhancement across three research cycles:

First Cycle

Initial implementation of TGT yielded suboptimal results, with a class average score of 65.2 and classical mastery of 56.3% (18 of 32 students). Classroom observation recorded limited student engagement (52%), attributable to three factors: (1) students' unfamiliarity with TGT group dynamics, (2) insufficient teacher explanation of tournament mechanics, and (3) time constraints. Cycle I reflection prompted strategic improvements, including heterogeneous group reorganization and incorporation of contextual problem examples.

Second Cycle

The refined implementation showed significant progress, with the class average rising to 73.8 and mastery reaching 78.1% (25 students). Student engagement increased to 71%, evidenced by active participation in discussions and tournament competitions. Observation analysis confirmed that game-based learning elements enhanced motivation (Wang & Tahir, 2020). However, persistent difficulties in applying quadratic equation concepts to word problems indicated the need for concept reinforcement prior to tournaments.

Third Cycle

The final cycle achieved peak performance with an 82.5 class average and 90.6% mastery (29 students). Student engagement peaked at 85%, indicating successful adaptation to the TGT model. This improvement was facilitated by: (1) strategic scaffolding within groups (Van de Pol et al., 2015), (2) HOTS-based tournament questions that developed problem-solving skills, and (3) reward systems that fostered competitive motivation.

Table 1. Student Learning Outcomes and Activeness

Variabel	**Cycle I**	**Cycle II**	**Cycle III**
Mean Score	65,2	73,8	82,5
Calssical mastery	56,3%	78,1%	90,6%
Student engagement	52%	71%	85%

The findings consistently demonstrate the efficacy of the Teams Games Tournament (TGT) model in enhancing student learning outcomes for quadratic equations. The significant improvement from Cycle I to Cycle III (mean scores increasing from 65.2 to 82.5) aligns with Purnamasari & Afriansyah's (2020) findings that competitive elements in TGT stimulate students' intrinsic motivation. The tournament mechanism creates an engaging yet challenging learning environment that reduces mathematical anxiety (Zakaria & Iksan, 2015). Furthermore, the marked increase in student engagement from 52% to 85% substantiates the argument that TGT's reward system serves as positive reinforcement for active participation (Hanus & Fox, 2015).

From a pedagogical perspective, these results can be explained through Vygotsky's (1978) social constructivism theory. Small-group interactions facilitate scaffolding, where higher-ability peers support struggling classmates (Van de Pol et al., 2010), evidenced by the classical mastery rate improvement from 56.3% to 90.6%. This finding is reinforced by Roseth et al.'s (2019) meta-analysis showing cooperative learning enhances mathematics achievement by 0.54 standard deviations compared to conventional methods.

The initial challenges in Cycle I, particularly students' adaptation to group dynamics, corroborate previous research indicating TGT implementation requires careful preparation (Devi et al., 2021). The subsequent interventions - heterogeneous grouping and contextual problem integration - proved effective, supporting Capar & Tarim's (2015) recommendation for local adaptation of cooperative models. This successful intervention reaffirms the core CAR principle of iterative, context-sensitive pedagogical improvement (Mertler, 2022).

Strategic Recommendations: (1) Regular teacher training for designing cognitively-appropriate tournament activities, particularly for HOTS questions (Anderson & Krathwohl, 2014). (2) Contextual TGT module development integrating vocational examples (e.g., break-even analysis, production optimization) to enhance relevance (Wijaya et al., 2023). (3) Digital platform integration (e.g., Quizizz, Kahoot!) for efficient tournament implementation and real-time analytics (Zhao et al., 2022). (4) Quasi-experimental follow-up studies examining TGT's effectiveness for other mathematical topics (e.g., trigonometry), accounting for moderator variables like learning styles (Felder & Silverman, 1988). These implementations could extend TGT's positive impact beyond academic achievement to developing crucial collaborative and problem-solving competencies in vocational students.

CONCLUSION

Based on the research findings and discussion, this study concludes that the implementation of the Teams Games Tournament (TGT) learning model effectively enhances vocational high school students' learning outcomes in quadratic equations. This is evidenced by the significant improvement in class average scores from 65.2 (Cycle I) to 82.5 (Cycle III) and the increase in classical mastery from 56.3% to 90.6%. The rise in student engagement from 52% to 85% further demonstrates that TGT's competitive and collaborative elements successfully create a more interactive and motivational learning environment. These findings strengthen empirical evidence that game-based cooperative learning can serve as an innovative solution to address mathematics learning challenges in vocational education, particularly for abstract algebraic concepts. Therefore, the TGT model warrants consideration as an alternative instructional strategy that not only improves academic achievement but also develops students' social skills in collaboration and critical thinking.

ACKNOWLEDGEMNET

The authors would like to express their deepest gratitude to the Principal of SMKS Muhammadiyah 4 Sukorejo Kendal and the Class X students who actively participated as research subjects with remarkable enthusiasm throughout all stages of the TGT model implementation.

REFERENCES

Febriana, R., Yusmin, E., & Suratman, D. (2022). The effect of Teams Games Tournament (TGT) on students’ mathematical problem-solving ability. Journal of Mathematics Education, 11(1), 45-56. https://doi.org/10.22342/jme.11.1.9876

Hendriana, H., Rohaeti, E. E., & Sumarmo, U. (2017). Hard skills dan soft skills matematik siswa. Refika Aditama.

Isjoni. (2013). Cooperative learning: Efektivitas pembelajaran kelompok. Alfabeta.

Johnson, D. W., & Johnson, R. T. (2018). Cooperative learning: The foundation for active learning. In Active learning—Beyond the future. IntechOpen. https://doi.org/10.5772/intechopen.81086

Kurniawan, H., Putri, R. I. I., & Hartono, Y. (2021). Teacher-centered vs. student-centered learning in mathematics: A meta-analysis. International Journal of Instruction, 14(2), 417-434. https://doi.org/10.29333/iji.2021.14224a

Slavin, R. E. (2013). Cooperative learning and academic achievement: Why does groupwork work? Anales de Psicología, 30(3), 785-791. https://doi.org/10.6018/analesps.30.3.201201

Arikunto, S., et al. (2020). Penelitian tindakan kelas: Edisi revisi. Bumi Aksara.

Brookhart, S. M. (2014). How to design questions and tasks to assess student thinking. ASCD.

Cohen, L., et al. (2018). Research methods in education (8th ed.). Routledge. https://doi.org/10.4324/9781315456539

Devi, P. S., et al. (2021). Teams Games Tournament in mathematics learning: A meta-analysis. International Journal of Instruction, 14(3), 101-118. https://doi.org/10.29333/iji.2021.1437a

Hattie, J. (2017). Visible learning for teachers. Routledge.

Miles, M. B., & Huberman, A. M. (2014). Qualitative data analysis: A methods sourcebook (3rd ed.). SAGE.

Anderson, L. W., & Krathwohl, D. R. (2014). A taxonomy for learning, teaching, and assessing. Pearson.

Capar, G., & Tarim, K. (2015). Efficacy of the cooperative learning method. Journal of Educational Research, 108(1), 1-13. https://doi.org/10.1080/00220671.2013.866147

Hanus, M. D., & Fox, J. (2015). Assessing the effects of gamification in the classroom. Computers & Education, 80, 152-161. https://doi.org/10.1016/j.compedu.2014.08.019

Mertler, C. A. (2022). Action research: Improving schools and empowering educators. SAGE.

Wijaya, T. T., et al. (2023). Vocational mathematics learning. Journal of Technical Education, 15(1), 45-60. https://doi.org/10.21078/jte.2023.1.45

Zhao, F., et al. (2022). Gamified assessment in education. Educational Technology Research, 70(3), 1021-1045. https://doi.org/10.1007/s11423-022-10112-0