Research Article

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Effectiveness of Teams Games Tournament Technique in Basic Drug Education among Grade 5 and 6 Students in a Primary School in Chiang Mai, Thailand

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Abstract: This study evaluated the feasibility and student satisfaction of the Teams Games Tournament (TGT) cooperative learning technique for delivering medicines and illicit drugs education to primary school students. A one-group pretest–posttest study was conducted with 33 Grade 5 and 30 Grade 6 students at Banthakwian School, Chiang Mai, Thailand. The 90-minute intervention included an educational video followed by a structured competitive tournament with oral quizzes and immediate feedback. Knowledge was assessed using an 8-item quiz, and satisfaction was measured using a 9-item Likert-scale questionnaire. Immediate post-lesson knowledge gains were not statistically significant: Grade 5 scores increased slightly from 5.94 ± 1.80 to 6.18 ± 2.24 (p = 0.309), whereas Grade 6 scores decreased marginally from 6.93 ± 1.17 to 6.73 ± 1.17 (p = 0.264). Grade 6 students demonstrated high baseline knowledge (86.6%), suggesting a potential ceiling effect. Despite modest and statistically non-significant short-term cognitive gains, satisfaction was high in both grades (overall mean ± SD 3.99 ± 0.60), with students reporting high interest, enjoyment, and perceived engagement/participation. Although statistically significant improvements in knowledge were not observed, the TGT activity demonstrated feasibility and high student satisfaction in primary school medicines and illicit drugs education. Future implementations may benefit from multi-session delivery and differentiated content complexity tailored to students' prior knowledge to support knowledge retention.

Keywords: Teams Games Tournament, Drug education, Primary school, Health-promoting schools

INTRODUCTION

Academic service to communities is a core mission of higher education institutions, reflecting the systematic application of knowledge and professional expertise to improve quality of life and address local needs (1). In school settings, the World Health Organization (WHO) and the United Nations Educational, Scientific and Cultural Organization (UNESCO) have advanced the health-promoting schools agenda through the Making Every School a Health-Promoting School initiative, which proposes eight global standards spanning school–community partnerships, health education within the curriculum, and access to school health services (2). Evidence indicates that comprehensive, school-wide health-promoting approaches can improve multiple dimensions of student well-being and may support selected educational outcomes, although effects on academic achievement vary across studies (3). Within this framework, structured university–school partnerships provide a practical mechanism to strengthen school health education and to evaluate measurable learning outcomes relevant to both health and educational systems. Student health is multidimensional, encompassing physical, social–emotional, and psychological well-being that is

intrinsically linked to learning capacity and achievement (4). WHO emphasizes that schools are critical settings for shaping these outcomes because children spend a substantial portion of their developmental years in these environments (2). Favorable health conditions are associated with better attendance, higher engagement, improved social–emotional competencies, and stronger cognitive performance. Conversely, health challenges such as anemia, anxiety, and malnutrition or exposure to interpersonal violence can disrupt learning and compromise longer-term development (5-8). Consequently, health-promoting schools play a vital role in fostering supportive and protective environments that reduce health risks and enable sustained educational success (2, 9). Nation University (Chiang Mai Campus), through interprofessional collaboration among the Faculties of Dentistry, Nursing, and Pharmacy, initiated a community outreach partnership with Banthakwian School (San Sai District, Chiang Mai) to support sustainable, locally tailored health education. A baseline needs survey conducted in June 2024 identified priority concerns among primary students (Kindergarten to Grade 6; approximately 290 students), including dental caries, exposure to e-cigarettes, and overnutrition linked to frequent consumption of sweets and limited parental supervision after school. These findings underscored the need for engaging school-based health education activities that strengthen health-risk literacy. Furthermore, national assessments have indicated room for improvement in Thai students' health education achievement, reinforcing the importance of evaluating feasible and effective instructional strategies in real-world school settings. In response, the Faculty of Pharmacy implemented a targeted medicines and illicit drugs education activity for upper primary students (Grades 5 and 6) as part of this interprofessional outreach. Strengthening age-appropriate knowledge related to medicines and substances is particularly timely for late primary students. The Grade 5 curriculum already introduces foundational concepts regarding medicine and illicit drugs, providing a relevant baseline for skill- and knowledge-building. Grade 6 students, who would have been exposed to related content in the preceding year or through life experiences, were included to reinforce learning and to provide an indirect perspective on retention of key messages. However, evidence remains limited regarding the effectiveness and acceptability of cooperative, game-based active learning strategies—particularly Teams Games Tournament (TGT)—for medicines and illicit drugs literacy among Thai primary students, including potential differences by grade level and learner satisfaction. TGT is a cooperative learning technique that organizes students into heterogeneous teams that collaborate on learning tasks and then participate in structured academic games or tournaments. Team-based performance can motivate participation through peer interaction and gamified competition. Prior studies suggest that TGT can enhance engagement and retention by making learning interactive and enjoyable (10). Such features may be especially valuable for safety-relevant topics such as medicines and illicit drugs education, which can otherwise feel abstract or overly didactic when delivered through conventional lectures. Accordingly, this study aimed to: 1) compare Grade 5 and Grade 6 students' knowledge of medicines and illicit drugs before and after the TGT-based educational activity; 2) assess student satisfaction with the TGT approach across both grade levels.

MATERIALS AND METHODS

Study Design and Participants

A one-group pretest–posttest intervention study was conducted on May 22, 2025, at Banthakwian School (San Sai District, Chiang Mai, Thailand). The study population comprised all Grade 5 (N = 34) and Grade 6 (N = 31) students enrolled in Semester 1/2025. Because this activity was conducted as part of a school outreach program, all eligible students were invited to participate. Therefore, no formal sample size calculation was performed, and the final sample size was determined by class enrollment and attendance on the study day. Students enrolled in Semester 1/2025. Eligibility required parental/guardian consent and participation on the study day. A total of 33 Grade 5 and 30 Grade 6 students took part (97.1% and 96.8% of each class, respectively); one student from each grade was absent or withdrew and was not included in the paired pre–post analysis. Students were pre-assigned (non-randomly) to five teams per class in coordination with class teachers, with each team composed of 4–7 members of mixed academic

abilities (approximate ratio 1 high:2 medium:1 low achiever) to promote heterogeneous grouping. All participants and their guardians provided informed consent prior to the activity. This study was reviewed and approved by the Human Research Ethics Committee of Nation University (Approval No. AF11-02-008/2568).

Intervention (TGT Activity)

The TGT educational activity on basic medicines and illicit drugs knowledge lasted 90 minutes per class. Sessions were conducted in two rounds on the same day: Grade 6 from 8:45–10:15 and Grade 5 from 10:30–12:00. At the start, researchers explained the rules and format of the TGT game. Students sat with their teams, and each team received a set of answer cards. An individual pre-test quiz on basic medicines and illicit drugs knowledge (eight multiple-choice questions) was administered. A short educational video about fundamental medicines and illicit drugs knowledge was then shown to the whole class to provide baseline information.

After the video, the TGT tournament took place. The research team posed 10 quiz questions orally, one by one, related to the educational content. For each question, teams were given 2 minutes to discuss and collectively select the answer card they believed was correct. After time elapsed, the correct answer was revealed and explained to reinforce key concepts. Teams were awarded points for correct answers. This friendly competition format encouraged participation and discussion within groups.

Upon completing all questions, the team with the highest total score received a small prize as recognition and to enhance engagement. Finally, an immediate post-test using the same eight-item quiz was administered, followed by a satisfaction questionnaire. The entire process was supervised by the research team and class teachers.

Educational Content

The learning content covered basic pharmacological knowledge, including principles of proper medicines and illicit drugs use, common dosage forms, categories of medications, tools for measuring liquid medicine, and fundamental facts about medicines and illicit drugs. This content was designed in line with the Grade 5 health curriculum and supplemented by information from a national drug prevention handbook for youth, using age-appropriate language and examples. The quiz questions were reviewed for accuracy and relevance by three faculty experts prior to use.

Measurement Instruments

Three instruments were utilized: 1) a knowledge quiz on basic medicines and illicit drugs knowledge, 2) a satisfaction survey, and 3) a demographic record (grade level and gender).

Knowledge Quiz

The knowledge quiz was developed by the researchers to evaluate students' understanding of the content related to medicines and illicit drugs. It consisted of eight multiple-choice questions (each with one correct answer) covering key content areas (e.g., appropriate medication use, identifying medication types, and understanding harms of narcotics). The same quiz was administered before and after the activity to assess changes in knowledge. Content validity was examined by three content experts using the Item–Objective Congruence (IOC) index. Items with IOC values between 0.67 and 1.00 were considered acceptable; all items met this criterion, indicating adequate content validity. Reliability was not assessed in the present sample; however, administration and scoring procedures were standardized.

Satisfaction Survey

Student satisfaction with the TGT learning activity was measured using a nine-item Likert-scale questionnaire developed for this study. Items addressed interest in learning, enjoyment, ease of understanding, participation, perceived value of game-based learning, appropriateness of time, clarity of instructions, stress level, and confidence to apply knowledge. Each item was rated from 1 (strongly disagree/very low satisfaction) to 5 (strongly agree/very high satisfaction). Mean scores were interpreted using predefined criteria: 4.51–5.00 = very high; 3.51–4.50 = high; 2.51–3.50 = moderate; 1.51–2.50 = low; and 1.00–1.50 = very low. The draft questionnaire was reviewed by experts for clarity and relevance, and minor wording adjustments were made to ensure age appropriateness. On the intervention day, researchers and teachers administered the pre-test, facilitated the TGT activity, and then administered the post-test and satisfaction survey. All responses were collected anonymously; students were identified only by code numbers to match pre- and post-test scores.

Data Collection

On the intervention day, researchers administered the pre-test, facilitated the TGT activity, and then administered the post-test and satisfaction survey. All responses were collected anonymously; students were identified only by code numbers to match pre- and post-test scores.

Data Analysis

Data were analyzed using SPSS. Descriptive statistics were used to summarize participant characteristics. The normality assumption for paired t-tests was assessed using the Shapiro–Wilk test. Although the data showed deviations from normal distribution, paired t-tests were retained because the sample sizes exceeded 30 and the test is robust to moderate violations of normality according to the Central Limit Theorem. Statistical significance was set at $p < 0.05$. Knowledge quiz scores before and after the activity were compared using paired t-tests separately for Grade 5 and Grade 6 (within-subject comparisons). A two-sided $p < 0.05$ was considered statistically significant. Satisfaction survey results were analyzed descriptively: for each item and overall, the mean and standard deviation were calculated and interpreted according to the predefined satisfaction criteria.

RESULTS

Participant Characteristics

A total of 63 students participated in this study, including 33 Grade 5 students and 30 Grade 6 students. The gender distribution was similar across the two classes, with a slight majority of females. In Grade 5, there were 14 male students (42.4%) and 19 female students (57.6%), whereas in Grade 6 there were 14 male students (46.7%) and 16 female students (53.3%). Nearly all enrolled students participated in the activity (33/34 in Grade 5 and 30/31 in Grade 6, corresponding to over 96% participation in each grade).

Pre-test and Post-test Knowledge Scores

The mean scores on the 8-point drug knowledge quiz before and after the TGT activity are shown in Table 1.

Table 1. Pre- and post-test knowledge scores (out of 8) for Grade 5 and Grade 6 students (paired t-test within each grade).

Grade (n)	Pre-test (mean ± SD)	Post-test (mean ± SD)	*t* (df)	*p*-value
Grade 5 (33)	5.94 ± 1.80	6.18 ± 2.24	1.034 (32)	0.309
Grade 6 (30)	6.93 ± 1.17	6.73 ± 1.17	−1.140 (29)	0.264

For Grade 5, students' average score increased slightly after the activity (from 5.94 to 6.18), but this improvement was not statistically significant (p = 0.309). For Grade 6, the average score unexpectedly decreased marginally (from 6.93 pre to 6.73 post), but this change was also not significant (p = 0.264). Thus, in neither grade did the single-session TGT intervention produce a significant difference in immediate test scores. We note that Grade 6 students had a relatively high pre-test mean (approximately 87% of the items correct on average)

To further explore the relationship between prior knowledge and outcomes, we examined the correlation between pre- and post-test scores. In Grade 5, the Pearson correlation r was 0.80, $p < 0.001$, indicating a strong positive correlation: students who scored higher on the pre-test tended to also score higher on the post-test. In Grade 6, the correlation was $r = 0.66$, $p < 0.001$ also a moderately high positive relationship. These correlations suggest that individual differences in baseline knowledge carried through to the post-test performance, which is expected in educational interventions without strict control groups.

Student Satisfaction

All participants completed the satisfaction questionnaire after the activity. Table 2 summarizes the satisfaction results by item for each grade.

All individual items in both grades received mean ratings between 3.8 and 4.3, which fall in the "Good/High" satisfaction range (3.51–4.50). The overall satisfaction score was 4.01 ± 0.66 for Grade 5 and 3.99 ± 0.60 for Grade 6.

For Grade 5, the item with the lowest mean was "the class time was used appropriately" (Mean = 3.83), suggesting a few students might have felt the session was slightly rushed or lengthy, though it was still rated as good. The highest-rated items for Grade 5 were related to making learning fun (4.20) and clarity of instructions (4.07). For Grade 6, the lowest mean (3.80) was for "the activity encouraged me to participate more," Nonetheless, this rating remains in the high satisfaction range. Notably, Grade 6 gave a very high score for confidence in applying knowledge (4.27), perhaps reflecting their maturity in recognizing the value of what they learned. No student indicated strong dissatisfaction on any aspect.

DISCUSSION

The TGT-based learning session produced differentiated learning outcomes between the two grade levels. Grade 5 students demonstrated a slight increase in their post-test scores, while Grade 6 students showed a marginal decrease, though neither changes reached statistical significance. This indicates that the single-session TGT intervention had limited immediate cognitive effects, particularly among older students. Nevertheless, several important insights emerge from the comparative patterns observed.

Table 2. Summary of student satisfaction ratings for the TGT learning activity (Mean ± SD on a 5-point scale).

Satisfaction Item (summarized)	Grade 5 (n=33)	Grade 6 (n=30)
1. "The learning activity increased my interest in learning."	4.10 ± 0.94	4.13 ± 0.86
2. "The activity made the lesson more fun and engaging."	4.20 ± 0.85	3.97 ± 0.67
3. "The activity helped me understand the lesson more easily."	3.97 ± 0.81	3.97 ± 0.72
4. "The activity encouraged me to participate more."	4.03 ± 0.96	3.80 ± 0.81
5. "Learning through games was a valuable experience."	4.00 ± 1.11	4.00 ± 0.79
6. "The class time was used appropriately."	3.83 ± 0.87	3.90 ± 0.84
7. "Instructions and rules were clear and easy to understand."	4.07 ± 0.87	3.93 ± 0.83
8. "I felt relaxed and not stressed during learning."	4.00 ± 1.08	3.97 ± 0.89
9. "I am confident I can apply the knowledge I gained."	3.97 ± 0.96	4.27 ± 0.83
Overall Satisfaction (all items)	**4.01 ± 0.66**	**3.99 ± 0.60**

Comparison with Previous Studies

The modest improvement observed in Grade 5 students aligns with previous evidence demonstrating that TGT can enhance academic performance across different subjects. For example, Surit reported significantly higher post-lesson drug knowledge scores among Grade 5 students who participated in TGT-based learning activities, indicating that structured peer interaction and competitive reinforcement can strengthen conceptual understanding (11).

Further studies support the effectiveness of TGT in primary school settings. Banani and Aman found that the TGT cooperative learning model, when supported by multimedia learning, improved both cooperation skills and learning outcomes among Grade 5 students in social science classes (10). Safira similarly demonstrated that TGT enhanced motivation and comprehension in elementary learners by promoting active engagement and repeated content exposure within a cooperative-competitive format (12). In addition, Astri and colleagues reported that integrating TGT with the Numbered-Board Quiz technique significantly improved science achievement among Grade 4 students, highlighting that TGT not only enhances cognitive outcomes but also fosters collaborative problem-solving skills (13).

Taken together, these studies consistently show that TGT supports improved learning outcomes, engagement, and peer collaboration among primary school students. These mechanisms likely contributed to the upward trend observed in our Grade 5 group, even though the magnitude of improvement remained modest within the limited instructional timeframe.

Student Satisfaction

The high satisfaction scores in the present study align with these findings. Many students reported that the TGT activity was enjoyable, collaborative, and motivating. This is consistent with previous evidence demonstrating that TGT fosters positive attitudes toward learning through its game-based and cooperative format (10-13). These affective benefits are noteworthy, as positive attitudes can enhance long-term learning engagement even when immediate knowledge gains are modest.

Limitations

Several limitations should be considered when interpreting the findings of this study. First, the study employed a one-group pretest–posttest design without a control group, which limits the ability to attribute observed outcomes solely to the TGT intervention. Second, the relatively small sample size may have limited the statistical power to detect small effect sizes. Third, the intervention consisted of a single session and knowledge was assessed immediately afterward, which may not reflect longer-term knowledge retention. In addition, the activity was conducted by the research team, while teachers observed from outside the classroom; although this helped maintain consistency of the intervention, the presence of researchers may still have influenced students' responses. Finally, satisfaction outcomes were self-reported and may be subject to social desirability bias; therefore, high satisfaction does not necessarily indicate cognitive improvement.

Contrasting Grade 6 Outcomes

The slight decline in Grade 6 scores contrast with the majority of previous studies, which typically report gains following cooperative learning interventions. Several factors may explain this discrepancy.

First, Grade 6 students entered the activity with a high baseline score (approximately 86.6%), leaving limited room for measurable improvement. Staus and colleagues explained that such a ceiling effect constrained observable learning gain because students with already high pre-test scores have little remaining score range to demonstrate improvement (14). This phenomenon can result in an apparent decline or a non-significant change even when learning has occurred.

Second, expectations for instructional rigor may differ across age groups. Prior research suggested that when instructional tasks were perceived as under-challenging or monotonous learning activities, students may experience academic boredom, which can undermine learning engagement (15). Given that

some Grade 6 students were likely familiar with the medicines and illicit drugs education content, the single-session review format may not have provided sufficient challenge to sustain engagement.

Third, certain medicines and illicit drugs-related concepts may remain cognitively demanding for primary school students, particularly when delivered within a short, information-dense session. Cooperative learning theory suggests that peer-to-peer interaction can support comprehension, as explanations from classmates may align more closely with learners' current levels of understanding. Consistent with this rationale, Ramadhani's Grade 4 study reported that a TGT approach using crossword-puzzle media improved students' memory performance in vocabulary learning, underscoring TGT's potential as a game-based, peer-supported structure to reinforce newly learned content (16). In the present study, the brief and content-dense delivery may have limited opportunities for consolidation, such that Grade 6 students gained little new information beyond their baseline knowledge.

Fourth, although TGT often promotes positive attitudes and engagement, its tournament-based competition may introduce evaluative pressure for some learners. Evidence from primary school settings indicates that a competitive classroom climate may increase learning anxiety for some students, which may constrain observable learning gains even when students remain actively engaged (17). Experimental evidence further suggests that competition-induced anxiety can disrupt attention and increase cognitive load, contributing to lower test performance in some contexts (18). This dynamic may help explain the variability observed in Grade 6 post-test scores. Older students may be more sensitive to performance evaluation and peer comparison in competitive learning environments. In addition, Grade 6 students had higher baseline knowledge, leaving less room for measurable improvement, which may partly explain why this pattern appeared more clearly in this group.

CONCLUSION

This study evaluated the use of the TGT cooperative learning technique for delivering basic medicines and illicit drugs education to Grade 5 and Grade 6 students in a primary school setting. Although immediate post-lesson knowledge scores did not improve significantly—and Grade 6 students showed a slight decline—both grades reported high satisfaction with the learning experience. Overall, the findings indicate that TGT is a feasible and well-accepted approach that can promote engagement, motivation, and positive attitudes toward learning about medicines, even when short-term cognitive gains are modest.

The limited measurable improvement, particularly among Grade 6 students, may be attributable to high baseline knowledge, the need for more age-appropriate challenge, and individual differences in responses to competitive activities. Given the brief, single-session format and immediate post-test assessment, knowledge consolidation may also have been constrained.

Future implementations should consider 1) differentiating content complexity for older learners, 2) using multiple sessions or spaced reinforcement to support retention, and 3) incorporating team-design features that strengthen equitable participation and individual accountability. Strengthening university–school partnerships may further enhance learning experiences and support sustainable, community-oriented health education initiatives.

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