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Implementation of a Team Game Tournament a Collaborative Learning Method and Study of its Impact on Learners' Development

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***Abstract*— The paper showcases the encouraging results of the cooperative learning (CL) method Team Game Tournament (TGT). TGT helps students to improve and accelerate their learning. In TGT success of the team is dependent on the success of the individual [5]. A tournament is played between small academically balanced teams. Facilitators form such teams and note the performance of each team by visual monitoring, data from student questionnaires, and exam results. Exam results of Third Year Automobile course Machine Design (AE301) with and without TGT are compared. Students' performance in exams is improved, they show to be focused and participative, to develop their critical thinking. Because of TGT, deep discussions happened on topics by students in a group. They enjoy the new learning format. Social skills like teamwork and managing conflict are developed in students. Students' feedback and improvement of their performance in exams confirm the above perceptions.**

***Keywords*— Cooperative learning, Team Game, Tournament (TGT), Student attitude.**

***JEET Category*—Practice paper**

I. INTRODUCTION

In Cooperative learning (CL) students work in small groups to help each other learn. CL helps a student to learn the material better due to the facility to share their knowledge and discuss it with the team. It also improves the social and cooperative behavior of learners. The subject AE301 is a traditionally difficult subject. Students suffer to understand, remember and apply the number of design processes discussed in the subject. Many work on selective topics to earn a passing percentage. Slow learners find it difficult to pass the course on the first attempt. Few advanced learners only achieve excellence in it. Therefore, the new learning method needs to provide the student with an ability to efficiently work as part of a team in addition to facilitating an early and thorough grasp of concepts. In Cooperative Learning (CL) students attain their learning outcomes through team activities. The success of CL depends upon the following elements [1, 2].

i *Accountability of individual in group success*: the success of a group is dependent on the performance of each member of the group.
ii *Group Accountability*: The contribution of each member is accountable so members help each other.
iii *Encouragement to each other*: Group members encourage each other to achieve goals.
iv *Social Skills*: Skills like leadership, communication, managing conflict, and building trust are getting developed in students.
v *Group Processing*: Group members prepare a plan to study material and to find out all possible questions and answers.
vi *Group structure*: Heterogeneous mix of students in a group conforms to fair competition.
vii *Equal Opportunities for Success*: Every group and student gets an equal opportunity to score because of the TGT structure.

The students participate in TGT more actively because:

i they get an award when the group wins,
ii they get recognition in school/class,
iii interaction with peer help them to understand the concepts.
iv by explaining to others they understand better.
v even after an initial loss, they get a chance to excel.

Here TGT is chosen to be implemented in AE301.

II. TGT PROCESS

In the early ’70s, DeVries & Edwards developed TGT [6-8]. In TGT teams are formed as per the ranking of the students. Competition between similar ranking students of different teams takes place [9]. The facilitator prepares questions and answers in card format. He puts cards on each table. In each table, one of the students reads the question, and the other students can “pass” or “challenge” the question. If the challenger gives the correct answer, then he/she and his/her team get a score. For every question role of the student changes. The current nature of TGT is not suitable for AE301 because of its nature. In AE301 calculations are required so some modifications are made to a traditional method.

Course Outcomes (COs) of AE301 are

1. Design joints for different loading conditions.
2. Design shafts, keys, and couplings to transmit the required amount of torque.
3. Design gears to transmit the required torque.

There is a total of four credits to the course. Content of the course is expected to be delivered through 36 lectures and 12 tutorial hours that are used to practice numericals.

In the traditional method of tutorial, students had to solve questions given by faculty and submit the solutions. The questions were common to all and based on material that was delivered and shared with the students. During tutorials, students work in a group and help each other. They also get support from facilitators whenever required. Students solve maximum problems correctly and one week after submission they get a corrected solution from an instructor. Overall student feedback about tutorials is positive but the level of student engagement and participation were very diverse. So to enhance student participation and to enhance student learning TGT is used for the conduction of tutorials.

Steps in implementation of TGT to AE301:

1. The facilitator discusses the topic in the lecture.
2. A facilitator provides material to students covered during lectures.
3. Students work in teams to form questions and their answers related to the topic. Every group has to follow the guidelines provided by the facilitator to meet course outcomes.
4. Students answer questions proposed by another team.
5. The scores are assigned to students as per their performance (quality of proposed question and accuracy of answers) and their team performance (comparison is done between answers given by teams).

III. IMPLEMENTATION OF TGT

1) Team formation:

After completion of a topic in lecture announcement about the TGT activity is done in a classroom. A total of 64 students are in class so 16 teams of 4 students are formed. Here teams are small and academically balanced based on performance in the previous year. The CPI of a student is considered while making a team. Each group becomes heterogeneous as it is a mixture of high-grade and low-grade students. A captain nominated by each team is responsible for question answer collection and submitting it to a facilitator. In case of conflict, the captain discusses with a facilitator.

2) The Tournament:

The TGT consists of two matches (14th March and 11th April) The schedule of the match is shown in Table 1.

Table 1. Schedule of TGT tournament

Sr. No.	Activity	Duration
1.	Formulation of question and solution by individual student in a group and submission of the same to the facilitator.	1 Hr.
2.	Short break for students during which facilitator separates out questions and answers of the first hour.	10 min
3.	Tournament between teams (First round) as per the lots shown in ***Table 2.***	30 min
4.	The winner of each group (Group A to H fig.1) plays the next match with the winner of the next group and the loser of each group plays a match with the loser of each group(Second round). In this way, each group will get the same chance to win and score.	30 min

Rules for formation of questions:

i The question should be well defined and with a proper solution.
ii Give the required data in question.
iii Write the group number and roll number at the top of the sheet.
iv Box the important answers so that they will be identified quickly.
v Write proper units wherever required.
vi Use of class notebooks and handouts provided by the instructor is allowed.
vii Do not use the internet or books for the formation of questions.
viii The question and answer should be on two separate pages.

Table 2:- Team match details for the first round

Team-1 →	Team-2	A
Team-3 →	Team-4	B
Team-5 →	Team-6	C
Team-7 →	Team-8	D
Team-9 →	Team-10	E
Team-11 →	Team-12	F
Team-13 →	Team-14	G
Team-15 →	Team-16	H

Evaluation of match between two teams

For a game between two teams with 4 members each, there will be a total of 8 questions and 16 answers.

Rule of draw

If the answer given by the opponent team is equally good or poor to the original answer submitted by another team then it will be considered a draw and no student or team gets a mark.

Rule of goal

If one student submits a better answer than the opponent then it is considered a goal for his/her team.

Outcome of match

As per the above rules, the preparation of the score sheet for every match will be done. By adding the scores of all questions, the outcome of a match (a win, a draw or a loss) is established.

Rewards to individual and team

A reward is a kind of motivation for students. It is necessary to define it clearly at an early stage of the tournament. The assessment of AE301 is distributed among 50% of End Semester Examination (ESE) and 50% of In semester Evaluation (ISE). ISE again has three components two unit tests of 30% weightage and 20% of weightage are given for a continuous assessment. TGT has taken over the 20 % continuous assessment component of AE301 which has been weighted as shown in ***Table 3.***

Table 3 Evaluation details

Sr. No.	Criterion of evaluation	Weightage in %
1	Participation.	20
2	Formulation of question.	20
3	Accuracy and understanding of an answer to the proposed question.	20
4	Accuracy and understanding of an answer to the opponents' question.	20
5	Team performance	20 (20 for win 10 for draw 0 for loss)
6	Champion of tournament additional reward.	5
7	Runner up in tournament additional reward	2

Each member of the winning team is awarded a trophy and certificate sponsored by the department.

IV. OBSERVATIONS OF INSTRUCTORS

Following are the observation recorded by instructors during the implementation of TGT.

i When the activity started students were busy formulating questions and solving them, at the initial level there was less interaction in a group. Before submission of problems interaction in the group increased as the performance of each group member is accountable to get a prize.

ii Every group member checked other members' numerals so a lot of interactions happen between group members. They cross-check the process used to solve numerically.

iii The level of participation was excellent. A variety of questions were created and solved by students. It created a problem and solution database for reference.

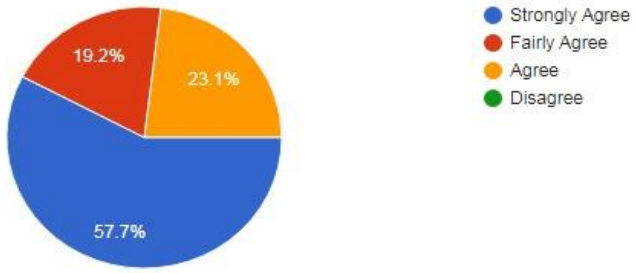
iv Classroom dynamics were changed. Students were thinking about each other's performance to get a prize.

v There was a lot of excitement among students as every group was having an equal chance to win a prize even though they lose the first match.

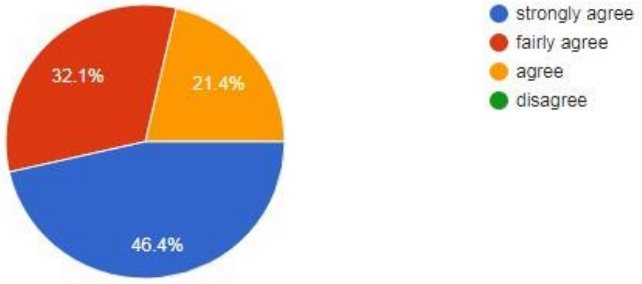
V. STUDENT'S FEEDBACK

Student feedback is collected using Google Forms with the help of five questions. The responses given by students are as shown below

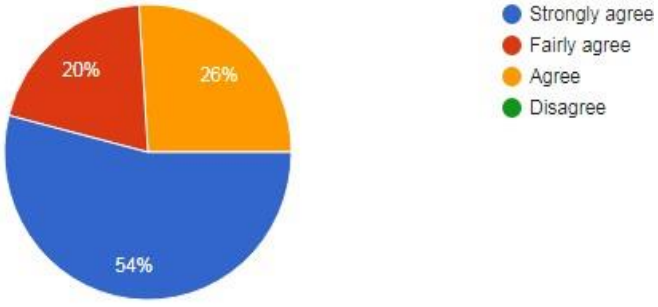
Q1. TGT helped me to explore my learning about a topic and makes me aware of what I must revisit.



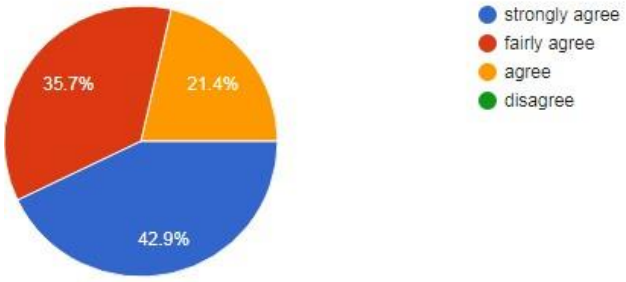
Q2. I help my teammates during a game



Q3. Teammates help me to learn concepts that I missed during class.



Q4. I work hard to improve the score of my team.



Q5. I enjoy participating in the tournament.

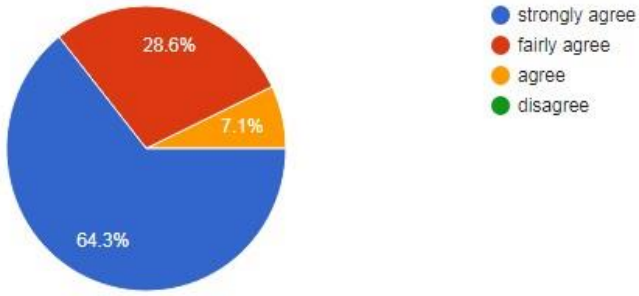


Table 4. The score of each question as per responses (Weightage; Strongly agree-5; fairly agree-4; agree-3; disagree-1)

Q. No.	Score (Out of 5)
1	4.346
2	4.246
3	4.28
4	4.215
5	4.572

From ***Table 4*** the score of Q.5. is the highest. It indicates students are enjoying working in TGT. The score of Q.1. is the second highest, it talks about students' learning. Q.2,3 and 4 are about collaborative learning, a score of questions indicates students are learning better in CL.

VI. STUDENT'S PERFORMANCE IN AN AE301

The performance of students in subject AE301 of batch 2020-21 is compared with batch 2018-19 fig.1. Both examination patterns are the same. For batch 2020-21 TGT is implemented. A comparison shows significant improvement in students' performance. The numbers of students in BC, BB, AB and AA grades are increased. The average score of students has increased from 36.7 (in 2018-19) to 62.3 (in 2020-21)

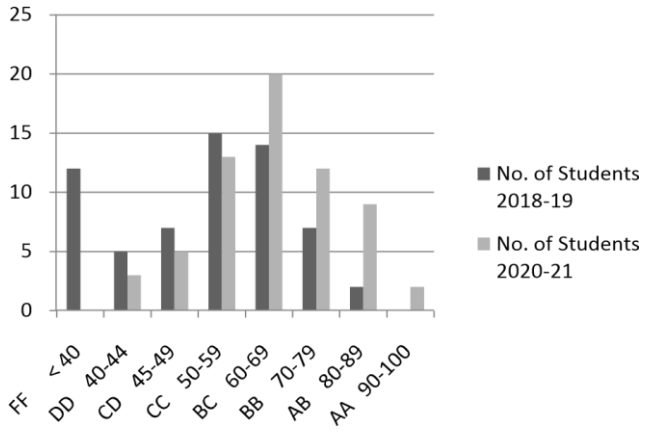


Fig.1.Score distribution in exam

VII. OUTCOMES OF TGT

Following are the outcomes of TGT

- Student feedback about TGT is positive and it also helps them to interact with a peer. It creates social awareness and the knowledge exchange process continues even after the activity is over.
- Student participation in problem-solving increased.
- Quiz results after TGT are excellent and it indicates improvement in student learning.
- Students' performance in exams is improved.

VIII. CONCLUSION

A TGT has been implemented within the tutorials of AE301 subject. Students enjoyed competing with other and at the same time working with the team to excel. The TGT created bonding between students. Significant improvement in results indicates students have studied topics carefully. TGT help them to understand the subject from peers. Overall TGT is a good approach to engaging students in CL but it needs proper planning and implementation. However, these results may vary with a subject so more testing of it is required. An individual researcher may carry out a study to develop a universal model of TGT.

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