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The Comparison of Effectiveness of Cooperative Learning Model STAD and TGT toward Motivation and Achievement of Chemistry Learning on The Material of Rate Reaction in Grade XI SMAN 4 Yogyakarta on Academic Year of 2013/2014

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Abstract

Cooperative learning model allows for each student's knowledge of the subject to be an important aspect of project completion. There are many types of cooperative learning model, such as Students Teams Achievement Divisions (STAD) and Teams Games Tournament (TGT). Those cooperative learning model can be applied in both social and science class. This experimental research aimed to determine the effectiveness of learning models application of STAD and TGT toward motivation and achievement of students' chemistry learning. The research population was grade XI students in SMA N 4 Yogyakarta in the academic year of 2013/2014 with a total population of 145 students. The taken research samples were students from class XI IPA 5 by using STAD as first experiment class and students from class XI IPA 4 using TGT as second experiment class, y purposive sampling. The taken data was the data of prior knowledge of chemistry, chemistry-learning achievement analyzed by using Analysis of Covariance, and chemistry-learning motivation before and after learning analyzed by using t-test for paired samples and t-test for independent samples.
The result of t-test for paired samples showed significant difference toward chemistry-learning at both experimental classes. The result of t-test for independent samples showed no significant difference toward chemistry-learning between those. The Analysis of Covariance showed significant difference toward chemistry-learning between those if prior knowledge was statically controlled.

Keywords: achievement, motivation, STAD, TGT

Introduction

Because of the subject material and learning model, chemistry becomes a boring and difficult subject which results in students' low motivation. Kean and Middlecamp (Rumansyah, 2002) declare that difficulty to study chemistry is related to the abstract characteristic of chemistry. For example, when learning about atom, students cannot see what atom looks like. They can just imagine or see from learning media without seeing the real ones. This problem can cause difficulty for some students. According to a research conducted by Sunyono (2006), during the learning process of chemistry, the students tend to be passive and are not interested due to the traditional teaching method applied by the teacher who only gives lecture and exercises.

Those problems can results in students' low motivation. Teachers have a lot to do with their students' motivational level. The students may arrive in class with a certain motivation, but the teaching style, the characteristic of the subject, and the interactions among students and

teacher may have an impact on their motivation, which affects their achievement. Because its reason, many students have a low cognitive skill in chemistry.

Such paradigm can be changed if teachers can apply an interesting learning model to improve the students' motivation. As stated in the Regulation of Ministry of Education and Culture, the learning process should be student-centered. The teacher must be able to manage the class effectively and innovatively so that students can interact with other students. It can be applied using cooperative learning model which is oriented to student's achievement. Because learning model can influence students' learning motivations, the teacher must pay a lot of attention to the lesson to be applied in learning model. The students must take part in the academic activities – in other words the approach of learning process is student-centered. Brecke & Jensen (2007) said that this method can help students achieve and maintain interest that can be connected to their critical thinking abilities. Student-centered approach can be implemented in a cooperative learning model.

In a cooperative learning model, the students are given a chance to work in groups in which they share the materials, ideas, and opinions. This is similar to what is conveyed by Johnson & Johnson (2009) that main purpose of cooperative learning is to actively involve students in the learning process. In this case, the students have an obligation to interact with the environment including the teacher and other students. This paper is aimed to determine the effectiveness of Student Teams Achievement Divisions (STAD) and Teams Games Tournament (TGT) toward motivation and achievement of chemistry learning.

Material and Method

The study was conducted in SMAN 4 Yogyakarta at the middle of the first semester for 5 weeks of academic year 2013/2014 is using experiment method. The experimental research involved 56 students at grade XI with total population of 145 students. The taken research samples were students from class XI IPA 5 by using STAD learning as first experiment class and students from class XI IPA 4 using TGT learning as second experiment class by purposive sampling. The taken data was the data of prior knowledge of chemistry, chemistry-learning achievement analyzed by using Analysis of Covariance, and chemistry-learning motivation before and after learning analyzed by using t-test for paired samples and t-test for independent samples.

Result and Discussion

Learning in groups can affect students' motivation, cognitive, affective, and social processes. Students realize that they cannot succeed in achieving their goals unless other group members can also achieve theirs. When working cooperatively as a group, all the group members have the same goal which is earn the same reward (Slavin, 2008). They cannot achieve the group's goals if they do not achieve their own. The student' contribution to group efforts can be identified by giving an individual test to each student. Students' final course grade is taken as an indicator of academic achievement (Peklaj & Levpušček, 2006).

Sample in this research, in which STAD and TGT was applied to a chemistry lesson on rate reaction, has never been taught with any implementation of STAD and TGT, so when STAD and TGT was applied in their class, they were attracted. In STAD and TGT learning model, if some students do not understand a material or a lesson, the other students who have understood it can explain it to them. This condition made the learning process more advanced, and as a result the students can get their best results. Motivational questionnaire is using Likert scale that has five alternative answers: always, often, sometimes, seldom, and never. Score of the motivational questionnaire was processing by t-test for paired samples that used to find out whether beginning and ending student's motivation has significant difference.

The STAD positively affects students' motivation as noted in t-test for paired samples. It is important in interpreting the results to estimate the power of the STAD effect. The null hypothesis (Ho) in this research is no significant difference between beginning and ending students' motivations. As table 1 indicates, the t_{result} is higher than the t_{table} and p-value is less than the standard significance that means Ho is rejected. The result of t-test for paired samples showed significant difference toward chemistry learning motivation.

Table 1. Result of t-test for paired samples in TGT

N	p	t_{result}	t_{table}
28	0.006	2.986	2.479

Because STAD can influence extrinsic motivation, it can keep students attending the class and finishing the tasks. Besides, extrinsic motivation enables them to start enjoying working with other students and develop intrinsic motivation. Furthermore, Shih & Gamon (2001) say that motivation influences how and why students learn as well as how they perform. There is no denying that social interaction plays a major role in how children learn, yet, in many classrooms students are often the passive recipients of knowledge rather than being active in

its creation (Gillies & Boyle, 2010). Working in a group allows for each student's knowledge of the subject to be an important aspect of project completion. It can be proved from the mean of final test's grade, which increases from 51,286 to 80,595.

The similar result was shown in second experiment class that applied TGT. The Ho in this research is no significant difference between beginning and ending students' motivations. As table 2 indicates, the t_{result} is higher than the t_{table} and p-value is less than the standard significance that means Ho is rejected. The result of t-test for paired samples showed significant difference toward chemistry learning motivation.

Table 2. Result of t-test for paired samples in TGT

N	p	t_{result}	t_{table}
28	0.006	2.976	2.479

Sardiman (2011) declare that strong motivation of students will be shown on their achievement. It can be proved from increasing of the mean of final test's grade.

We used t-test for independent sample to determine the effectiveness between STAD and TGT toward gain score motivation. The result of analysis showed that there is no significant difference on the beginning and ending students' motivation in STAD and TGT. The difference between students' prior knowledge and achievement is shown in Figure 1 and to know the significant difference of achievement in STAD and TGT class, we used Analysis of Covariance. The value of F_{result} is 29,019 with p = 0.000 and standard significance 5%.

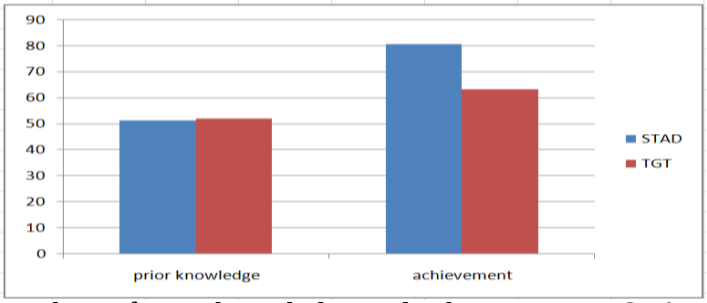

Figure 1. Bar chart of prior knowledge and achievement in STAD and TGT

The F_{result} is higher than the F_{table} and p-value is less than the standard significance means Ho is rejected. The result of Analysis of Covariance showed significant difference toward students' achievement. Correlation between achievement (Y) and prior knowledge (X) can be determined by linear regression analysis. The value of r_{table} on standard significance 5% is 0,266 and r_{xy}=0,274 with p=0,041, therefore $r_{xy}>r_{table}$. According to the result, there is significant correlation between achievement and students' prior knowledge.

The difference of students' achievement in STAD and TGT class can be caused by any factors, one of them is learning model. In STAD we used individual quiz that can make students more focus on doing exercise. Meanwhile, in TGT we played a tournament that can make students more active, but less focus than in STAD. This research proved that STAD and TGT can improve students' motivation and enable them to achieve their best results in learning chemistry, but STAD is more effective than TGT because motivational and post-test score in STAD is higher than in TGT. Basically, cooperative learning model is learning activities of a group in which each student must responsible for doing assignment, help each other to achieve the goal and must be held accountable for his or her own contributions (Slavin, 2008; Herreid, 2006).

Conclusion

In conclusion, the STAD and TGT can improve students' motivation and enable them to achieve their best results in learning chemistry because those cooperative learning models can influence extrinsic motivation and actively involve students in the learning process. Through interaction, students learn to share ideas, clarify differences, and construct new understandings. Learning in groups not only affects students' motivation, but also cognitive, affective, and social processes.

References

Brecke, R. & Jensen, J. (2007). Cooperative learning, responsibility, ambiguity, controversy and support in motivating students. *InSight*, 2(6), 57-63.

Gillies, R.M. & Boyle, M. (2010). Teachers' reflection on cooperative learning: Issues of implementation. *Teaching and Teacher Education*, 26, 933-940.

Herreid, C.F. (2006). *Start with a story: The case study method of teaching college science*. Malaysia: UTM.

Johnson, D.W. & Johnson, R.T. (2009). An educational psychology success story: Social interdependence theory and cooperative learning. *Educational Researcher*. 38(5), 365-379.

Peklaj, C. & Levpušček, M.P. (2006). *Students' motivation and academic success in relation to the quality of individual and collaborative work during a course in educational psychology*. Slovenia: National School for Leadership in Education

Rumansyah, Y.I. (2002). Penerapan metode latihan berstruktur dalam meningkatkan pemahaman siswa terhadap konsep persamaan kimia. *Jurnal Pendidikan dan Kebudayaan*. No. 35 Tahun ke 8.

Sardiman, A.M. (2011). *Interaksi dan motivasi belajar mengajar*. Jakarta: Raja Grafindo

Shih, C.C. & Gamon, J. (2001). Web-based learning: Relationships among student motivation, attitude, learning styles, and achievement. *Journal of Agricultural Education*, 42(4), 12-19.

Slavin, R.E. (2008). *Cooperative learning: Teori, Riset, dan Praktik*. (Alih bahasa Narulita Yusron). Bandung: Nusa Media

Sunyono, I. W.W.; Suyanto, E.; Suyadi, G. (2009). Identifikasi masalah kesulitan dalam pembelajaran kimia SMA kelas X di propinsi Lampung. *Jurnal Pendidikan MIPA - FKIP Lampung*. 2, 1-12.