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THE APPLICATION OF TEAMS GAMES TOURNAMENTS (TGT) MODEL WITH THE HELP OF *ULAR TANGGA* MEDIUM ON THE SUBJECT OF BUFFER SOLUTION TO 11th GRADERS OF A STATE SENIOR HIGH SCHOOL IN BANDA ACEH

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Abstract

The aim of this study was to determine the activities, attitudes, skills, learning outcomes and students' response to the application of Teams Games Tournaments (TGT) model with the help of ular tangga medium on the subject of buffer solution to 11th graders of State Senior High School (SMAN) Number 13 Banda Aceh. This study employed a qualitative research approach. The subjects were the students of class XI MIA totaling 13 students, consisting of 8 female and 5 male students. The data were collected through observation, test and questionnaires. The research instruments used were the observation sheets of students' activities, attitudes, and skills; cognitive test, the questionnaire sheet of students' response. The data were analyzed by using quantitative descriptive analysis technique. The results of the observation of the first and the second meeting were as follows: (1) the average percentage of students' activities were 86.75% and 95.25% respectively; (2) the average percentage of students' attitudes were 76.92% and 94.23% in a row; and (3) the average percentage of students' skills were 73.94% and 67.69% in a row. The percentage of students' learning completeness classically was 82.50%. The result of students' responses obtained an average percentage value of 92.20% with very good criteria. Based on the results, it can be concluded that the application of TGT model with the help of 'ular tangga' medium on the subject of buffer solution can improve the students' activities and learning outcomes.

Keywords: *TGT, learning outcomes, ular tangga, buffer solution.*

INTRODUCTION

Chemistry is the science of matter concerned with the composition of substances, structure, properties and interactions between them. Chemistry is perceived as a difficult subject for secondary school to learn (Demircioğlu, 2003). One reason of this is that chemistry concepts are abstract in nature and require students to construct mental images of things they cannot see (Taber & Coll, 2002). Another reason is that a chemical phenomenon requires a proof through laboratory works. One of the difficult chemistry concepts is buffer solution.

Buffer solution is one of the chemistry topics studied by 11th graders of senior high schools. Buffer solution is a study of chemistry related to other chemistry topics that are solubility, acid-based solution pH, stoichiometry, chemistry equilibrium, and math for chemistry. This topic has a range of subtopics taught that are buffer definition, buffer solution composition and characterizations, types of buffer solution, pH of buffer solution, and work principle of buffer solution in daily lives of creatures.

Based on the observation of and the interview with the chemistry teachers at SMAN 13 Banda Aceh, it was found that generally the teachers still used the traditional way of teaching chemistry topics. This was because they considered this method as simple, easy, and suitable to be applied in large classes. This led to little participation among students, especially students of class XI MIA 2. The class discussion was rarely done so the interaction and communication among students and the teachers had not been established optimally. The students only listened and wrote which made them rarely asked questions or expressed their opinions. As a result, the learning outcome of the students in the chemistry classes was not satisfactory (low). This was proven by the classical average value of the daily test on the lesson of buffer solution in the academic year of 2013-2014 which was 51.8. In addition, the National Test (UN) score of 2013/2014 for school and national level for this topic was also low (36.91 and 53.58 respectively).

One of the efforts to improve students' learning outcomes and performances in this topic is applying TGT model. TGT model is a cooperative learning model that puts the students in groups of 5 to 6 students with different abilities, genders and tribes (Fatoni, Sukardjo & Utami, 2013). This model uses game as a reinforcement technique. Games learning activities are applied in order to create more active and fun learning experiences, and they also develop students' sense of responsibility, cooperation and involvement (Khudori, Ashadi & Masykuri. 2012). Based on the research results conducted by Purnamawati, Ashadi, and Susilowati (2014), it was concluded that there was an effect of the use of TGT cooperative learning model with cards and snakes and ladder media towards students' cognitive and affective learning achievements on the topic of redox reaction.

The steps of TGT learning model according to Istarani (2012) are as follows: (1) providing material (2) studying in groups (3) doing games (4) doing tournaments and (5) giving reward. In this model, the teacher presents the lesson and then the students work in teams. In order to make sure that all the team members have already mastered the concepts, the teacher carries out a tournament in which the students can contribute the points for their team (Tukiran, Faridli & Harmianto, 2012). The rules of the tournament are that there should be a group of three players in which one person acts as a question reader, another one as an answer holder, and the last one as an answer replier. In addition, the group score is obtained from the sum of the members' scores. The group gaining the highest score will get a reward. By doing so, it is hoped that when the students answer the questions given at the tournament, the students' creativity can be developed so that they have motivation to learn chemistry.

Besides the right choice of learning model, the teacher should be able to choose an appropriate and an innovative learning medium that support the achievement of instructional process. One of the media that can be used in teaching buffer solution is *ular tangga*. *Ular tangga* is a daily game which is familiar to the students. This game is easy to be applied because of its simple rules. However, in designing the medium, the teachers should consider creating an educative game so that the chemistry instruction becomes meaningful and interesting for the student as they can learn as well as play together.

METHODS

This study employed a qualitative research approach. The research's subjects were students of class XI MIA 2 at SMAN 12 Banda Aceh totaling 13 students, consisting of 5 male and 8 female students.

The data were collected through observation, test, student's worksheet (LKS), and questionnaire. The observation on the students' activities, attitudes, and skills was done by 4 observers consisting of 2 chemistry teachers in this school and 2 students of Chemistry Education Department at FKIP Unsyiah.

The research instrument used was the observation sheets of students' activities, attitudes and skills; the cognitive test which consisted of 12 multiple choice questions, *ular tangga* game medium and the questionnaire sheet of students' response. Before these instruments were used, they were tested for their validation by 2 validators. The instruments tested were test items (also done reliability test), the observation sheets of students' activities, attitudes, and skills; and questionnaire sheet of students' response. After the data were obtained, they were analyzed by using quantitative descriptive analysis technique.

RESULTS AND DISCUSSION

The students' activities were observed throughout the first and the second meetings. The main activities involved in both meetings were group discussion (which consisted of 4 to 5 students with different learning abilities), asking questions, working on student worksheet, doing lab work, doing a presentation, and doing tournament (consisted of 36 questions) and *ular tangga* game (see Figure 1). *Ular tangga* game was designed according to the functions of game medium mentioned by Yusuf and Aulia (2011) that it should be able to: (1) motivate the students' willingness to learn, (2) present information, and (3) give the instruction.

Figure 1. The *ular tangga* game medium.

In the first meeting, the students who asked questions were only 2 persons. In addition, the students tended to be demotivated when they were asked to sit or join in the group discussion or in the group tournament session divided as they wanted to make their own group. Regarding lab work activities, there were only a few students who were seen active in doing the experiments. When the researcher asked the group to present their lab work results/discussion, only one out of three groups that did a presentation while others only gave comments. In regards to the tournament, the students were divided into 4 groups of 3 or 4 students with the same level of learning abilities. Thus, the average score of the students' activities in this meeting was 86.75%. However, in the second meeting the score increased to 95.25%. This was because they were already accustomed to the learning activities, the group discussion, the rules of the tournament and the *ular tangga* game.

The students' learning outcomes are divided into three categories that are affective/attitude, cognitive and psychomotoric/skills (Bloom, 1956, in Sudjana, 2009). These three domains have the same weight. Students' attitudes evaluation comprises seven aspects including honesty, discipline, responsibility, caring, working together, diligence, and respect to teacher. In the first meeting, there were 3 students who obtained attitudes score higher than others. In general, there were 4 aspects which had lower scores as they did not reach the completeness score that were discipline, responsibility, caring and honesty. For example, there were some students who were late coming to class. Therefore, they could not participate in some learning activities maximally as there was an activity that they missed out on. However, in the second meeting, the four aspects which had lower score in the first meeting had an increase in their scores. The average scores of the students' attitudes in both meetings were 76.92% and 94.23% respectively.

The learning outcome of skills domain was evaluated through tournament activities in both meetings and also in the laboratory work on the first meeting.

Table 1. The students' learning outcome score for skills domain in the first and the second meeting.

Student Initial	*Skills Score*				*Optimum Score*	*4 Scale Conversion*	*Predicate*
	First Meeting			*Second Meeting*			
	Lab Work (LW)	*Tournament (T)*	*Average (LW+T/2)*	*Tournament*			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CA	100.00	100.00	100.00	100.00	100.00	4.00	A
CB	100.00	20.00	60.00	30.00	60.00	2.40	C^+
CS	75.00	30.00	52.50	60.00	60.00	2.40	C^+
DA	100.00	60.00	80.00	60.00	80.00	3.20	B^+
DC	100.00	75.00	87.50	100.00	100.00	4.00	A
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DP	100.00	30.00	65.00	80.00	80.00	3.20	B^+
HN	100.00	70.00	85.00	50.00	85.00	3.40	B^+
PY	100.00	62.50	81.25	80.00	81.25	3.25	B^+
RR	75.00	75.00	75.00	90.00	90.00	3.60	A^-
SA	100.00	50.00	75.00	80.00	80.00	3.20	B^+
SN	100.00	20.00	60.00	50.00	60.00	2.40	C^+
YA	100.00	40.00	70.00	70.00	70.00	2.80	B^-
YL	10000	40.00	70.00	30.00	70.00	2.80	B^-
Total	1250.00	672.50	961.25	880.00	1016.25	40.65	B^+
Average		51.73	73.94	67.69	78.17	3.12	

Based on Table 1, the average score of students' skills in the second meeting (67.69) was lower than the first meeting (73.94%). This was due to the fact that in the first meeting the score of skills domain was combined with that of laboratory work, whereas in the second meeting, there was no laboratory work score. However, judging from the tournament's average score, the score in the second meeting increased from 51.73 to 67.69. This result is in line with the study results done by Rosyana, Mulyani and Saputro (2014) who concluded that there was an effect of students' skills towards the students learning performances on the colloid topic.

The students' learning outcomes of cognitive domain were obtained from the student groups' worksheet score in both meetings and the test which was carried out in the second meeting. The average of students' learning completeness percentage in this test was 78.76%. This means that there were 11 out of 13 students who achieved the optimum score required. From 11 students there were 2 students who achieved the score of 100, while the lowest score achieved was 48. The average percentage score above is higher than the average score of academic year of 2013/2014 test that was 51.80%. Thus, it can be said that there is an increase of 26.96% in students' learning outcomes. This result was in accordance with the statement of Djamarah and Zain (2010) that if 75% of the number of students who take part in the learning process reached the level of minimal, optimal, or even maximal success, then the subsequent subject can be discussed.

The total average of the three domains (affective/attitude, skills, and cognitive/test) were considered as the learning outcome of 11th graders of SMAN 13 Banda Aceh in the topic of buffer solution. The recapitulation of the result can be seen in Table 2 below.

Table 2. The students' learning outcome recapitulation (attitudes, skills, and cognitive).

No	*Student Initial*	*Competency Score*					*Learning Outcome Average [{(5)+(6)+(7)}:3]*	*Predicate*	*Completeness*
		Cognitive Domain			*Skills*	*Attitudes*			
		LKPD	*Post-test*	*Average*					
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	CA	4.00	4.00	4.00	4.00	4.00	4.00	A	Complete
2	CB	4.00	1.92	2.96	2.40	2.50	2.46	C^+	Incomplete
3	CS	3.85	3.20	3.51	2.40	2.50	2.80	B^-	Complete
4	DA	4.00	3.04	3.52	3.20	4.00	3.57	A^-	Complete
5	DC	3.85	4.00	3.92	4.00	3.00	3.64	A^-	Complete
6	DP	3.85	3.36	3.60	3.20	4.00	3.60	A^-	Complete
7	HN	3.85	3.04	3.44	3.40	4.00	3.61	A^-	Complete

Table 2 continued…

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
8	PY	4.00	3.68	3.84	3.25	3.50	3.53	A^-	Complete
9	RR	3.25	3.68	3.46	3.60	3.50	3.52	A^-	Complete
10	SA	4.00	3.04	3.52	3.20	3.50	3.40	B^+	Complete
11	SN	3.25	1.92	1.30	2.40	3.50	2.40	C^+	Incomplete
12	YA	3.25	3.04	3.14	2.80	3.50	3.14	B	Complete
13	YL	3.25	3.04	3.14	2.80	4.00	3.31	B^+	Complete
Total							42.98		
Average							3.30	B	Complete
Completeness Percentage Classically							82.50		

Based on the table above, it can be concluded that as a whole the students' learning outcome got the average score of 3.30 out of the scale of 4 (82.50%) which is categorized as good. There were two students who were considered incomplete due to their decreased score during the tournament of *ular tangga*. Therefore, it can be said that they reach the requirements to continue the instructional learning activities for the new chemistry topic. These results are consistent with the research conducted by Nuzul, Yamtimah and Utomo (2013) who argued that the implementation of TGT learning model with the help of *Teka-teki Silang* (TTS) and *ular tangga* media can improve students' learning activities on the subject of colloid.

The questionnaire sheet was given after the students had done the cognitive test at the end of the second meeting. This questionnaire was used to determine the students' interest and opinion towards the application of TGT model with the help of *ular tangga* medium in class XI MIA 2 (Table 3). This questionnaire consisted of 8 queries with Yes and No answer as well as the students' reasons.

Table 3. The students' response towards the implementation of TGT model with the help of *ular tangga* medium on the topic of buffer solution.

No	*Student Initial*	*Question Number in the Questionnaire*								*Respond Total*	
		1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*Positive (score= 1)*	*Negative (score= 0)*
1	CB	1	1	1	1	1	1	1	1	7	1
2	CA	1	1	1	1	1	1	1	1	8	0
3	CS	1	1	1	1	1	1	1	1	8	0
4	DC	1	1	1	1	1	1	1	1	7	1
5	DA	1	1	1	1	1	1	1	1	8	0
6	DP	1	1	1	1	1	1	1	1	8	0
7	HN	1	0	1	0	1	1	1	1	7	1
8	PY	1	1	1	1	1	1	1	1	8	0
9	RR	1	0	1	0	1	1	1	1	7	1
10	SH	1	1	1	1	1	1	1	1	8	0
11	SN	1	1	1	1	1	1	1	1	7	1
12	YL	1	1	1	0	1	1	1	1	8	0
13	YA	1	1	1	1	1	1	1	1	8	0
Total										99	5
The Average Percentage										99/104x100%= 95,19%	4,81%

The findings from the questionnaire distributed to the students on the application of TGT model with the help of *ular tangga* medium showed that the average value of the negative response was 4.18% and the positive response was 95.19% which was in very good criteria. Take the students' response for the second question as an example. There was one student who answered that the application of TGT model did not stimulate him to learn as he could not hear the teacher's voice clearly and the pace of teaching was quite fast. This happened because he sat at the back and seemed not motivated to study. However, the positive response indicated that the application of TGT model on the topic of buffer solution encouraged the students to be more excited and motivated to learn chemistry. This result was in accordance with the study carried out by Tyasning, Haryono and Nurhayati (2012) that in the light of the students' satisfaction towards the

implementation of TGT learning model on crude oil lesson, there was an increase on students' satisfaction from 78.04% in the first cycle to 79.22% in the second cycle.

CONCLUSION

Based on the research result, it can be concluded that the application of TGT model with the help of *ular tangga* medium on the subject of buffer solution can improve the students' activities and learning outcomes. It can be proven by the following: (1) the average percentage of students' activities in the first and the second meetings were 86.75% and 95.25% respectively; (2) the average percentage of students' attitudes were 76.92% and 94.23% in a row; and (3) the average percentage of students' skills were 73.94% and 67.69% in a row. The percentage of students' learning completeness classically was 84.62%. The result of students' responses obtained an average percentage value of 92.20% with very good criteria. Therefore, it can be assumed that there were improvements on the students' performance classically.

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