



Implementation of The *Student Teams Achievement Division* (STAD) Cooperative Model to Practice Student Collaboration and Communication Skills on Electrolyte and Non-Electrolyte Solutions Materials

Lathifatul Hikmah¹, Rudiana Agustini^{2*}

^{1,2}Chemistry Education, Department of Chemistry, Faculty of Mathematics and Natural Sciences, State University of Surabaya, Ketintang Campus, Jalan Ketintang, Surabaya 60231, Jawa Timur, Indonesia.

*e-mail: rudianaagustini@yahoo.com

Received: March 19th, 2022 Accepted: April 12th, 2022 Online Published: April 14th, 2022

Abstract: Implementation of The Student Teams Achievement Division (STAD) Cooperative Model to Practice Student Collaboration and Communication Skills on Electrolyte and Non-Electrolyte Solutions Materials. This study aims to describe the implementation of learning through the application of the STAD type cooperative learning model on electrolyte and non-electrolyte solutions and to describe students' collaboration and communication skills during learning. This study uses a pre-experimental method with a research design that is a one-shot case study. The target of this research is the students of class X IPA 2 at SMAN 14 Surabaya with 36 students. The results of this study are 1) The implementation of the syntax of the STAD cooperative learning model at the first meeting got an average percentage score of 96.5% and at the second meeting it was 93.6%, both of which were in the very good category. 2) Students' collaboration skills at the first meeting had an average percentage score of 89.5% and at the second meeting it was 94.5%, both of which were in the very good category. 3) Students' communication skills include the quantity and quality of questioning and opinionating skills. The percentage of quantity scores asking and giving opinions at meetings 1 and 2, respectively, is 47% and 87%. The quality of questions and opinions of students who obtained good criteria at the first meeting were 13.89% and 22.22%, at the second meeting 16.67% and 41.67%, respectively. Based on the results of the study, it can be concluded that a cooperative learning model like STAD can train students' cooperation and communication skills, which is indicated by an increase in cooperation skills. and student communication during 2 academic meetings and were included in the good category.

Keywords: STAD, Collaboration Skills, Communication Skills, Electrolytes and non-electrolytes.

Abstrak: Penerapan Model Kooperatif Tipe Student Teams Achievement Division (STAD) untuk Melatihkan Keterampilan Berkolaborasi dan Berkomunikasi Siswa Pada Materi Larutan Elektrolit dan Non Elektrolit. Penelitian ini bertujuan untuk mendeskripsikan keterlaksanaan pembelajaran melalui penerapan model pembelajaran Kooperatif tipe STAD pada materi larutan elektrolit dan non elektrolit serta mendeskripsikan keterampilan berkolaborasi dan berkomunikasi siswa selama pembelajaran. Penelitian ini menggunakan metode pra-eksperimen dengan desain penelitian yaitu one-shot case study. Sasaran penelitian ini adalah siswa kelas X IPA 2 di SMAN 14 Surabaya dengan jumlah 36 siswa. Hasil dari penelitian ini yaitu 1) Keterlaksanaan sintaks model pembelajaran kooperatif tipe STAD pada pertemuan pertama mendapatkan skor persentase rata – rata sebesar 96,5% dan pada pertemuan kedua sebesar 93,6% yang keduanya termasuk dalam kategori sangat baik. 2) Keterampilan kolaborasi siswa pada pertemuan pertama memiliki skor persentase rata – rata sebesar 89,5% dan pada pertemuan kedua sebesar 94,5% yang keduanya termasuk dalam kategori sangat baik. 3) Keterampilan komunikasi siswa meliputi kuantitas serta kualitas keterampilan bertanya dan

berpendapat. Persentase skor kuantitas bertanya dan berpendapat pada pertemuan 1 dan 2 berturut – turut yaitu 47% dan 87%. Kualitas bertanya dan berpendapat siswa yang memperoleh kriteria baik pada pertemuan 1 yaitu 13,89% dan 22,22%, pada pertemuan 2 sebesar 16,67% dan 41,67%. Berdasarkan hasil penelitian dapat disimpulkan bahwa model pembelajaran kooperatif tipe STAD dapat melatih keterampilan kolaborasi dan komunikasi siswa yang ditunjukkan dengan keterampilan kolaborasi dan komunikasi siswa meningkat selama 2 pertemuan pembelajaran dan termasuk dalam kategori yang baik.

Keywords: STAD, Keterampilan Kolaborasi, Keterampilan Komunikasi, Elektrolit dan non-elektrolit

▪ INTRODUCTION

Significant abilities in the 21st century are as yet pertinent to the four mainstays of life that embrace figuring out how to know, figuring out how to do, figuring out how to be and figuring out how to live respectively (Scott, 2015). Everything about four standards contains explicit abilities that expect to be sceptor in learning exercises, as significant reasoning abilities, disadvantage addressing, metacognition, relational abilities, joint effort, advancement and creation, information proficiency, and shifted various abilities.

Accomplishing these 21st century abilities is accomplished by working on the nature of getting the hang of, assisting understudies with creating cooperation, tweaking personalization of picking up, accentuating project/issue based picking up, empowering coordinated effort and correspondence, empowering understudy inclusion and inspiration Empowering understudies to learn, upgrade innovativeness and advancement, use instruments and assets. suitable picking up, planning learning exercises applicable to this present reality, enabling metacognition and creating understudy focused learning. Some 21st century abilities should be instructed expressly. So, 21st century learning has the fundamental rule that learning should be understudy focused, cooperative, relevant and coordinated into society. The job of educators in executing learning in the 21st century is basic to accomplishing a more promising time to come for the country's youngsters (Drake & Reid, 2018).

All teachers know the significance of having the option to speak with understudies, or at least, having understudies who can speak with one another and requesting that understudies comprehend what they are imparting (Siahaan & Napitupulu, 2018). The motivation behind correspondence is to share thoughts, materials, or assets with other gathering individuals, to talk about an issue or arrangement, to give material to other gathering individuals, and to give criticism to other people. This sort of collaboration advances the learning system and ties every person to different individuals from the gathering. what's more, to normal learning objectives (Yassin, Razak, & Maasum, 2018). Communication skills consist of speaking skills which are the skills to convey messages through spoken language as an activity to convey messages through spoken language to convey ideas that are collected and developed according to the needs of the listeners, where speaking skills include the ability to ask questions and express opinions (Subhayni, Sa'adiah, & Armia, 2017).

Collaboration skills are the ability to engage in any activity to create relationships with others, respect each other's relationships and work together as a team to achieve the same goal (Rahmawati, Fadiawati, & Diawati, 2019). Indicators showing collaboration skills are active contribution, productive work, flexibility and commitment, responsibility and respect (Rahmawati, Fadiawati, & Diawati, 2019).

Based on the results of pre-research questionnaires in class XI IPA 1 SMAN 14 Surabaya as many as 30 students, 73% of students stated that chemistry subjects were difficult to understand. In addition, as many as 57% of students also stated that the chemistry of electrolyte and non-electrolyte solutions was not easy to understand. Then, the highest result from several choices of learning methods that students expect when the teacher teaches is the discussion learning method with a percentage of 40%. During the learning process, students rarely and almost never ask questions or give opinions. This is supported by survey results that up to 40% of students rarely ask questions or give opinions, and up to 47% of students who never ask questions or give opinions. In addition, based on the opinion of students who stated that collaboration skills need to be trained with a percentage of results of 90%, and as many as 97% of students also stated that communication skills also needed to be trained. These results support that collaboration skills and communication skills really need to be trained in schools.

Model learning against a more general theoretical framework (Isjoni, 2012) is a strategy used by teachers to improve students' motivation and attitude to learn, think critically, develop social skills and achieve better learning outcomes. The learning model contains the teacher's choice of strategies for certain goals in the classroom. Meanwhile, the strategy according to Kemp (Rusman, 2012) may be a learning activity that has to be done by teachers and students in order that learning objectives are achieved effectively and efficiently.

Development methods and approaches that promote student-student interaction are an attempt to make students more active in the learning process and solve large class size problems. The development of various cooperative learning methods is the result of a joint effort to get students more involved in the learning process (Ibraheem, 2011).

Learning Cooperative expects to increment benefits for all understudies through understudy joint effort, where understudies whose level is higher than different understudies can help their cohorts by directing them to get the example or complete the task (Yassin, Razak, & Maasum, 2018).

STAD is a sort of agreeable learning created by Slavin at Johns Hopkins College and known as "understudy group learning". The STAD learning strategy trains understudies to work in little, heterogeneous gatherings (five to six individuals) and to help each other comprehend the material gave (Kriswintari, Yuanita, and Widodo, 2018).

Sharan and Sharan (1987) uncovered that through the utilization of STAD, not just dominance of learning ideas can be improved, yet additionally thinking abilities in data handling and independent direction. STAD is tied in with instructing strategies that can rouse understudies to learn. This is predictable with Aliyah's (2016) research discoveries that understudies answer decidedly to the use of STAD learning procedures (Kriswintari, Yuanita, & Widodo, 2018).

In light of past exploration by Rusman (2013), it is shown that the use of the STAD cooperative learning model applied in learning arithmetic has demonstrated that when it is executed, the understudies' coordinated effort abilities can be upgraded through the cooperation between understudies (Junita & Wardani, 2020). Besides, in light of examination, (Noor & Husna, 2016) observed that STAD type cooperative learning can further develop understudy movement in all parts of the study hall. Understudies' relational abilities in learning worked on in every marker in the wake of utilizing STAD type cooperative learning model.

Based on this description, the STAD Type of Cooperative Learning Model is applied to Practice Collaboration and Communication Skills for Students on Electrolyte and Non-Electrolyte Solutions at SMA Negeri 14 Surabaya. The purpose of this study is

to describe the implementation of learning through the application of the cooperative model type STAD, which serves as important data to determine the improvement in students' collaboration and communication skills as a result of this research. The benefit of this research is that it motivates students to continue to improve their collaboration and communication skills, and can be input and add insight into the use of the STAD type Cooperative learning model in Chemistry lessons so that it can help teachers improve students' collaboration and communication skills .

▪ METHOD

The type of research used in this research is quantitative research with experimental methods through a pre-experimental approach (*Pre-Experimental Design*). According to Sugiyono (2013), the pre-experimental approach is said to be a type of research that has not been conducted seriously. So it can be said that there are external variables that influence the formation of the dependent variable.

The research design used in this study is a *one-shot case study*, that is an experiment conducted without a comparison group and also without a pre-test. Group the research subjects were treated, then the variables to be observed were measured. The design is as follows:

X	O
----------	----------

Information :

X : Treatment in the learning process of electrolyte and non-electrolyte solutions using the STAD type cooperative learning model

O : Collaboration and communication skills that will be observed after the treatment is the application of the STAD type cooperative learning model

This research was conducted at SMAN 14 Surabaya, which is located at Perum YKP IV Blok KK Tenggilis Mejoyo Rungkut Surabaya. This research was directed in January of the even semester of the 2021/2022 scholarly year. The targets used in this study were students of class X IPA SMAN 14 Surabaya, namely class X IPA 2 with a total of 36 students.

This study obtained data through the use of observation and questionnaire methods. The perception strategy was utilized to notice the implementation of the STAD type cooperative learning model, student activities and observe students' collaboration and communication skills during the learning process. The questionnaire method was used to obtain data on student opinions regarding the implementation of the STAD type cooperative learning model to class X IPA 2 students on electrolyte and non-electrolyte solutions. The instruments used were observation sheets on the implementation of the learning model syntax, student activity observation sheets, collaboration skills observation sheets, communication skills observation sheets, and student response questionnaire sheets.

The implementation of the STAD type cooperative learning model involves observing the learning process, which is then given a score by the observer on the observation sheet for the implementation of the model learning syntax. The scoring is then analyzed using the following formula:

$$\% \text{ Implementation} = \frac{\text{Total score obtained}}{\text{Maximum total score}} \times 100\%$$

The scores obtained are then converted according to categories such as Table 1.

Table 1. Reading Score Based on Likert Scale

Percentage	Category
0% - 20%	Very Bad
21% - 40%	Bad
41% - 60%	Fairly
61% - 80%	Good
81% - 100%	Very Good

(Riduwan, 2011)

The percentage of implementation of the learning model is considered good if $\geq 61\%$ (Riduwan, 2011).

Student activities were analyzed by observing every 3 minutes for 75 minutes in 2 meetings. Then the data obtained from the observers were analyzed using the following formula:

$$\% \text{ student activity time} = \frac{\sum \text{student activity time}}{\sum \text{overall activity time}} \times 100\%$$

(Sugiyono, 2014)

Data on student collaboration skills were obtained from the observations of observers during the learning process. At each meeting an overall analysis was carried out using the following formula:

$$\% \text{ student collaboration skills} = \frac{\sum \text{score of each indicator}}{\sum \text{overall score}} \times 100\%$$

The observations obtained were then converted according to the criteria described in Table 2 below:

Table 2. Collaboration Skills Assessment Criteria

Percentage	Criteria
0% - 20 %	Very bad
21 % - 40 %	Bad
41 % - 60 %	Fairly
61% - 80%	Good
81% - 100%	Very good

(Sudjana, 2002)

Data on students' communication skills include questioning skills and opinionating skills obtained from the observations of observers during the learning process. At each meeting an overall analysis was carried out using the following formula:

$$\% \text{ quantity of student question} = \frac{\text{quantity of students asking}}{\text{total number of students}} \times 100\%$$

$$\% \text{ quantity of student opinion} = \frac{\text{quantity of students opine}}{\text{total number of students}} \times 100\%$$

The quality score of asking questions is obtained based on observation indicators, that is students ask questions according to the level of asking Bloom's Taxonomy. Meanwhile, the opinion quality score is obtained based on observation indicators, namely students convey information logically and communicatively. The resulting score is then processed by the formula:

$$\% \text{ quality of questioning skills} = \frac{\text{Total score obtained}}{\text{Maximum total score}} \times 100\%$$

$$\% \text{ quality of opinion skills} = \frac{\text{Total score obtained}}{\text{Maximum total score}} \times 100\%$$

The observations obtained were converted according to the following Table 3 criteria:

Table 3. Criteria for Assessment of Communication Skills

Score interval	Criteria
0% - 33.2 %	Not Good
33.3 % - 66.5 %	Fairly
66.6 % - 100 %	Good

(Sudjana, 2002)

▪ RESULTS AND AN DISCUSSION

Implementation of the STAD Type Cooperative Learning Model

This study utilizes the Cooperative learning model sentence structure as per Wijaya and Arismunandar (2018) which comprises of 6 phases. The implementation of the STAD learning model syntax was seen by observers utilizing the Implementation Observation Sheet instrument during 2 gatherings. All learning exercises are carried out offline or face to face with electrolyte and non-electrolyte solutions material. Observation the Implementation of this learning model is utilized to decide the appropriateness of the educator led getting the hang of utilizing the STAD type cooperative learning model syntax. The percentage of implementation of the STAD type Cooperative learning model for 2 meetings is presented in table 4 below:

Table 4 . Percentage Implementation of STAD Type Cooperative Learning Model

Rated syntax	Execution	
	Meeting 1 (%)	Meeting 2 (%)
Phase 1: convey the goals and motivation of students	95	96.7
Phase 2: presenting information	95	75
Phase 3 : organize students in study groups	97.5	100
Phase 4: guiding the group to work and study	93.3	98.3
Phase 5: evaluation	98.3	96.7
Phase 6: reward	100	95
Average	96.5	93.6

In light of table 4, it very well may be seen that each stage in the learning linguistic structure has a rate above 61% in each gathering. At the first meeting an average of 96.5% was obtained and at the second meeting an average of 93.6% was obtained. The large percentage obtained at each meeting shows that the implementation of the learning model can be carried out well and is included in the very good category.

Each meeting consists of 6 phases of learning activities. In the first phase, the teacher conveys all the learning objectives to be achieved at the meeting and motivates students to study electrolyte and non-electrolyte solutions well . The second phase, the teacher conveys information to students by explaining the outline of the material that will be discussed at the meeting. In the third phase, the teacher divides heterogeneous groups of 6 students with different ability levels to practice their collaboration skills.

The fourth phase, The teacher guides the study groups in working on the student worksheet or LKPD given to them. The fifth phase, the teacher evaluates learning outcomes and gives quizzes to find out the learning outcomes of each student. The sixth phase, The teacher gives awards to appreciate individual and group effort or learning outcomes (Wijaya & Arismunandar, 2018).

Student activities

Observation of student activities means to decide the suitability of all student activities during the learning process with the syntax of the STAD type cooperative learning model and to observe the collaboration skills and communication skills of students have been trained. The results of this observation were obtained from the student activity observation sheet instrument. Observers observed student activities every 3 minutes for 75 minutes in 2 meetings. The results of the recapitulation of observations of student activities during 2 meetings are presented in Table 5 below:

Table 5 . Recapitulation of Student Activity Observations		
Student Activities	Percentage (%)	
	P1	P2
Students listen or pay attention to the teacher's explanation	16	19
Students read the material on the LKPD	19	4
Students focus on doing assignments on LKPD	6	11
Students discuss the answers to the questions in the LKPD in groups	6	11
Each group ensures that each member in the group understands the answers to the questions on the LKPD	3	7
Each group ensures that each member in the group has the responsibility to be ready to answer questions from the teacher	3	4
Students present their group learning results	16	11
Students ask questions to the teacher or the group who are presenting	3	4
Students refute or give opinions to the group that is presenting	6	11
Students take quizzes given by the teacher individually	3	11
Students conclude the material being studied	9	4
Number of relevant activities	91	96
Irrelevant student activities	9	4
Total activity count	100	100

Based on Table 5 it can be seen that the students performed relevant activities according to the syntax of the STAD type cooperative learning model in 2 meetings with percentages of 91% and 96% respectively. This shows that student activities can be said to support the effectiveness of implementing the STAD type cooperative learning model to train students' collaboration and communication skills, because the percentage

of relevant activities is higher than the percentage of irrelevant activities carried out by students. The research conducted by Noor & Husna (2016) is in line with these results, namely STAD cooperative learning can increase student activity in every aspect, namely student involvement in learning, the quantity of students who ask and answer questions, and quantity of students who interact with each other to discuss the subject matter.

Collaboration Skills

In this study, there are four indicators of collaboration skills used, namely working productively, showing respect for the opinions and contributions of each group member, being able to show flexibility and compromise, and being able to show responsibility in collaborative work (Rahmawati, Fadiawati, & Diawati, 2019). The results of this observation were obtained from the observation sheet instrument of students' collaboration skills with observers in each group. The observer observed the collaboration skills of each student during 2 meetings. The results of the recapitulation of observations of student collaboration skills during 2 meetings are presented in Table 6 below:

Table 6. Recapitulation of Student Collaboration Skills Observation

Indicator	Percentage (%)			
	M1	Criteria	M2	Criteria
Work productively	90	Very good	99	Very good
Appreciate your opinion	88	Very good	95	Very good
Compromise	88	Very good	89	Very good
Responsibility	92	Very good	95	Very good
Average	89.5	Very good	94.5	Very good

Table 6 shows that every collaboration indicator has very good criteria with the average percentage at the first meeting being 89.5% and at the second meeting 94.5%. This shows that the collaboration skills that are trained can be carried out very well. The research conducted by Rusman (2013) is in line with these results that in the implementation of the STAD learning model can increase students' collaboration skills by working together among students.

Communication Skills

The communication skills trained in this study include questioning skills and opinionating skills. Observations were made by observers using the communication skills observation sheet during 2 meetings. The results of the percentage of the quantity of students' questions and opinions at the 1st and 2nd meetings are presented in table 7 below:

Table 7. Percentage of Quantity Questions and Opinions

Skills	Meeting 1 (%)	Meeting 2 (%)
Ask	14	31
Opine	33	56
Amount	47	87

Based on the results of the percentage of the quantity of questions and opinions during 2 meetings in table 7, it can be seen that the quantity of questions and opinions has expanded from the main gathering to the subsequent gathering as evidenced by the percentage of quantity asked at the first meeting only 14% of the total number of students and at the second meeting of 31%. While the quantity of opinion at the first

meeting was 33% of the complete number of understudies and at the second meeting it was 56%. This proves that there is an enhancement in the quantity of students' communication skills during learning process of the STAD learning model.

The quality of students' questioning was observed by analyzing every question posed by students classified within the Bloom's Taxonomy level who were trained. Observing the quality of students' questioning skills was observed using the instrument of the quality of students' questioning skills. The results of the recapitulation of the student 's questioning skill quality data at the 1st and 2nd meetings are presented in table 8 below:

Table 8. Percentage of Quality Questioning Skills

Meeting	Percentage of Students who got Predicate in Questioning Skills (%)		
	Not Good	Fairly	Good
Meeting 1	86.11	0	13.89
Meeting 2	69.44	13.89	16.67

In light of table 8, it very well may be seen that at the main gathering up to 13.89% of the complete number of understudies who posed inquiries in the Good category. The second meeting, as many as 16.67% of the total number of students who asked questions in the good category, as many as 13.89% who asked questions in the fairly good category. Results the percentage of the quality of asking questions during the 2 meetings above, proves that there is an enhancement in the quality of students' questions during the learning process of the STAD Type Cooperative model.

The quality of student opinions is observed from two aspects, namely students' logical and communicative opinion expressions. Logical that is convey information based on facts and opinions that can support the material presented, and Communicative namely conveying information with a clear choice of words with good wording so that the information conveyed can be understood by the recipient of the message. The observation of the quality of students' opinions was observed by the instrument Quality of the students' opinions. The results of the recapitulation of the Students ' Opinion Skills Quality data at the 1st and 2nd meetings are presented in table 9 below:

Table 9. Percentage of Quality of Opinion

Meeting	Percentage of Students who get Predicate in Opinion Skills (%)		
	Not good	Fairly	Good
Meeting 1	66.67	11.11	22.22
Meeting 2	44.44	13.89	41.67

In light of table 9, it very well may be seen that at the first meeting there were as many as 22.22% of the total number of students who submitted opinions in a good category, and 11.11% who submitted opinions in a fairly good category. At the second meeting, as many as 41.67% of the total number of students who submitted opinions in the good category, and as many as 13.89% who submitted opinions in the fairly good category. Results the percentage of quality opinions during the 2 meetings above, proves that there is an increase in the quality of students' opinions during the learning process of the STAD learning model.

The outcomes of communication skills in this study are in accordance with the consequences of examination directed by Noor and Husna (2016) that students' communication skills increased after utilizing the STAD learning model.

Learning Results as Supporting Data

The learning outcomes are determined from the results of the tests carried out by the students at the end of each lesson during 2 meetings. The purpose of this quiz is to observe and assess students' cognitive abilities after the implementation of the STAD learning model on electrolyte and non-electrolyte solutions. This quiz contains 10 multiple choice questions and students are given time to work on them. The following results from the quiz scores that have been obtained are presented in table 10:

Table 10. Student Quiz Score

No.	Student Name	Quiz 1	Quiz 2
1.	ADWT	80	90
2.	ASS	60	70
3.	APA	70	80
4.	AFF	70	70
5.	AAL	70	90
6.	AMR	80	80
7.	DTMI	20	90
8.	DA	60	60
9.	DCR	80	90
10.	DDMM	80	70
11.	DAR	60	70
12.	DNAR	90	90
13.	DJI	70	60
14.	ERP	60	70
15.	HP	90	90
16.	JPR	80	90
17.	LNS	0	80
18.	MAP	80	90
19.	MFRM	50	90
20.	MRA	0	60
21.	NAS	70	90
22.	NFS	90	90
23.	ONS	70	70
24.	PTDASW	70	70
25.	RS	80	70
26.	RRP	50	90
27.	RHA	70	80
28.	RFD	80	80
29.	RDC	40	70
30.	RNV	60	90
31.	RM	70	90
32.	SPB	60	70
33.	STE	80	90
34.	SKA	80	90
35.	SIP	70	100
36.	TVR	70	70

Results of the *One Sample t*- test from the data values in table 10 are presented in table 11 below:

Table 11. Test Results *One Sample t-test*

One-Sample Test						
Test Value = 75						
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Learning outcomes	2.858	35	,007	5,278	1.53	9.03

Based on table 10 above, it can be seen that the value of Sig. (2-tailed) of $0.007 < 0.05$; then H_0 is rejected and H_a is accepted. This means that there is a significant difference between the results of the implementation of the STAD learning model and the KKM value of 75. This shows an expansion in understudy learning results after the implementation of the STAD learning model, in line with the results of research conducted by Danggus (2020) that the application of the STAD type of cooperative learning model module-assisted can improve student learning outcomes on chemical equilibrium material.

▪ CONCLUSION

Based on the results of the analysis and discussion of this study, it can be concluded that the implementation of the STAD learning model can be implemented very well. Students' collaboration skills on electrolyte and non-electrolyte solutions overall have increased as evidenced by the average percentage of each indicator, from 89.5% to 94.5% for 2 meetings. The overall communication skills of students on electrolyte and non-electrolyte solutions also experienced an increase both in terms of quantity of asking and opinion skills or in terms of quality of questioning and opinion skills. This shows the percentage of the number of questions and opinions at the first meeting, which is 47% of the total number of students, and at the second meeting 87% of the total number of students. As for the quality of asking questions and opinions as evidenced by the percentage of the quality of asking questions at the first meeting there were as many as 13.89% of the total number of students in the good category, at the second meeting 16.67% in the good category and 13.89% in the fairly good category. Then, the percentage of opinion quality at the first meeting was 22.22% in the good category, and 11.11% in the fairly good category, at the second meeting, 41.67% in the good category, and as many as 13.89% who submitted opinions quite good category. The results obtained from this study indicate that the STAD learning model can be used as a method to train students' collaboration and communication skills.

▪ REFERENCES

- Danggus, G. (2020). Penerapan Pembelajaran Tipe STAD untuk Meningkatkan Hasil Belajar Materi Keseimbangan Kimia Kelas XI MIPA SMAN 2 Pontianak. *Jurnal Pendidikan Informatika dan Sains*, 9(1), 28-36.
- Drake, S. M., & Reid, J. L. (2018). Integrated curriculum as an Effective Way to Teach 21st Century Capabilities. *Asia Pacific Journal of Educational Research*, 1(1), 31-50.

- Ibraheem, T. L. (2011). Effects of two modes of student teams – achievement division strategies on senior secondary school students' learning outcomes in chemical kinetics. *Asia-Pacific Forum on Science Learning and Teaching*, 12(2).
- Isjoni. (2012). *Pembelajaran Kooperatif: Meningkatkan Kecerdasan Komunikasi antar Peserta Didik*. Yogyakarta: Pustaka Pelajar.
- Junita, & Wardani, K. W. (2020). Efektivitas Model Pembelajaran STAD dan CIRC terhadap Peningkatan Keterampilan Kolaborasi Siswa Kelas V SD Gugus Joko Tingkir pada Mata Pelajaran Tematik. *Jurnal Pendidikan Dasar Indonesia*, 5(1), 11-17.
- Kriswintari, D., Yuanita, L., & Widodo, W. (2018). Fostering students' thinking skill and social attitude through STAD cooperative learning technique on tenth grade students of chemistry class. *Journal of Physics*.
- Noor, A. J., & Husna, R. (2016). Meningkatkan Kemampuan Komunikasi Matematis Siswa Menggunakan Model Pembelajaran Kooperatif Tipe Student Teams Achievement Division (STAD). *Jurnal Pendidikan Matematika*, 4(2).
- Rahmawati, A., Fadiawati, N., & Diawati, C. (2019). Analisis Keterampilan Berkolaborasi Siswa SMA pada Pembelajaran Berbasis Proyek Daur Ulang Minyak Jelantah. *Jurnal Pendidikan dan Pembelajaran Kimia*, 8(2).
- Riduwan. (2011). *Skala Pengukuran Variabel - Variabel Penelitian*. Bandung: Alfabeta.
- Rusman. (2012). *Model-model Pembelajaran: Mengembangkan Profesionalisme Guru*. Jakarta: RajaGrafindo Persada.
- Rusman. (2013). *Belajar dan Pembelajaran Berbasis Komputer*. Bandung: Alfabeta.
- Scott, C. (2015). *The Futures of Learning 2: What kind of learning for the 21st century?*. Paris: UNESCO Education Research and Foresight.
- Sharan, Y., & Sharan, S. (1987). Training Teachers for Cooperative Learning. *Educational Leadership*, 45(3), 20-25.
- Siahaan, M. M., & Napitupulu, E. E. (2018). The Difference of Students' Mathematical Communication Ability Taught by Cooperative Learning Model Think Talk Write Type and Numbered Head Together Type. *Jurnal Pendidikan dan Kebudayaan*, 8(3).
- Subhayni, Sa'adiah, & Armia. (2017). *Keterampilan Berbicara*. Banda Aceh: Syiah Kuala University Press.
- Sudjana, N. (2002). *Dasar-dasar proses Belajar Mengajar*. Bandung: Sinar Baru Algensindo.
- Sugiyono. (2013). *Statistika untuk Penelitian*. Bandung: Alfabeta.
- Sugiyono. (2014). *Metode Penelitian Kuantitatif, Kualitatif, dan R & D*. Bandung: Alfabeta.
- Wijaya, H., & Arismunandar. (2018). Pengembangan Model Pembelajaran Kooperatif Tipe STAD Berbasis Media Sosial. *Jurnal Jaffray*, 16(2), 175-196.
- Yassin, A. A., Razak, N. A., & Maasum, N. R. (2018). Cooperative Learning: General and Theoretical Background. *Advances in Social Sciences Research Journal*, 5(8).