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The Development of Cooperative Learning Model of STAD Type Based Learning Materials to Improve Students Collaborative Thinking Skills

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ABSTRACT

This study aimed at developing STAD type-based cooperative learning materials to improve students' collaborative thinking skill. The study used Research and Development (R&D) method by Thiagarajan which consists of four stages: *define*, *design*, *develop*, and *disseminative*. The developed materials included RPP, LKPD and THPD. The validity result of the pre test and post test showed that the materials fulfilled *valid* criteria. The validity test was done using SPSS 14 program and the results showed that Sig. (2- tailed) value was lower than (\leq) 0,05 and thus considered valid, and the Alpha Cronbrach was higher than (\geq) 0,60 which made it considered reliable. The validity test for the results of practicality observation test showed a result of very practical and the effectivity results were gained from one-sample t-test that was by comparing the pre-test and post-test scores, which showed that the students and teacher's activity in the limited classroom fulfilled the criteria *practical* and *effective*. The STAD type cooperative learning materials developed in this study had significant effects on students' collaborative thinking skill in solving addition and subtraction problems. Based on the table of descriptive results for paired sample t-test, it can be concluded that there was differences on the average score of $85 > 71,67$ and **Sig.(2-tailed) = 0,000** which means **Sig. < 0,05**. Based on those results, it can be concluded that H_0 was rejected and H_a was accepted which means that the learning results between pre-test and post-test were different.

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INTRODUCTION

The fast development of Maths and technologies in 21st century have greatly influenced human lives mainly in the world of education, that developing new skills has been considered needed to keep up with the development. The skill achievement in 21st century were done through improving learning qualities, helping students in improving their participations, emphasizing on project or problem-based learning, and supporting students' communication and collaborative skills. According to Trilling dan Fadel (2009: 4), collaborative skill is a crucial result of education as 21st century learning includes 4K. They are collaborative, creativity, critical thinking, and communication. Grenstein (2012) in Ahmad Nasih (2021) stated that "collaboration is defined as a learning process to plan and work together, to consider different perspectives, and to participate in discussions by giving suggestions, listening to, and supporting others.

Based of the need to develop 21st century skills on students, an observation was done at SD Negeri Tanggul Wetan 01 and the results of 3rd grade students' competency test showed that many students scored below the KKM (Kriteria Ketuntasan Minimum) or minimum criteria. The low results of the students' maths competency test were influenced by several factors, including the learning materials used in the learning processes which still need improvement in terms of variations and they also need to be optimized as teachers can share information to the students easier, which can grow students' learning interests and make the learning environment fun. Based on above problems, a learning innovation is needed to optimize students' enthusiasm and active participation in order for their mathematic competency can be optimal. This can be done by developing learning materials based on Student Teams-Achievement Division (*STAD*) model. "Student Teams-Achievement Division (*STAD*) is a learning model which includes small groups of students with different academic skills who work together to reach the learning goals." (Huda, 2013:201).

In line with constructivism approach in learning, one of the learning models that have received responses is cooperative learning model. Slavin (dalam Isjoni : 2014) states that cooperative learning is a learning model in which learning and working are done collaboratively in small groups of 4 – 5 people and this can help stimulate students' motivation in learning. In this study, the researcher chose cooperative learning model based on the previous similar studies which found that *STAD* type cooperative learning had significant roles in helping teachers conduct better learning in their classrooms. Among those previous studies is the one done by Enny Veronita Libra Kusumawati (2012) which showed that (1) Completeness of study classically was 85,7% of students completed, (2) Students' activities were effective, (3) Teachers' skill in managing the learning was good, and (4) Students' responses towards the learning was positive.

The design of this study was development model 4P (four-P). This model includes 4 stages (*Defining, Designing, Developing, and Distributing* (Thiagarajan, 1974:5). The outcomes of this study were learning materials based on cooperative type *STAD* and their effects on students' collaborative skills. The learning materials included Rencana Pelaksanaan Pembelajaran (RPP) or lesson plan, Lembar Kerja Peserta Didik (LKPD) or worksheet dan Tes Hasil Belajar (THB) or final test. Indicators for collaborative skill, according to Trilling and Fadel (2009:48) are as follow:

Table 1. Indicators for collaborative skill according to Trilling and Fadel (2009:48)

No	Indicator	Sub Indicator
1	Collaboration	- Collaborating with group effectively - Collaborating with different groups respectively
2	Responsibility	- Being responsible for collaborative team work - Initiative and independent
3	Compromises	- Effectively communicate in teams - Having discussions for decision making
4	Communication	- Effectively communicate in teams
5	Flexibility	- Making self contribution as made by each team

No	Indicator	Sub Indicator
		member.
		- Adapting with other team members

METHODOLOGY

This study aimed at developing valid, practical, and effective learning materials, including lesson plan, worksheets, and tests based on cooperative type STAD to improve students' collaborative skill. The process followed stages in modified Thiagarajan Model that is a model for designing learning materials which consists of 4 stages (1) defining, (2) designing, (3) developing, and (4) disseminating.

RESULT AND DISCUSSION

The results of the development were cooperative type STAD learning materials and their effects on students' collaborative thinking skill in solving addition and subtraction problems. The development process was based on 4D developmental research model by Thiagarajan which consists of defining, designing, developing, and disseminating.

1. Defining

The actions conducted at this stage were to set and define the development conditions. Success or effectivity of a learning materials in the classroom can be identified from students' responses following the learning process. There were 4 analysis conducted at defining stage: *a. Front-end Analysis* which was done to define the big problem needed for developing the learning materials and this included identifying the curriculum, the learning administration, and the learning process, *b. Students' characteristics Analysis* which was conducted to identify the characteristics of students who would participate in the tests in accordance with the plan and development of the learning materials, *c. Concept Analysis* where analyzing materials was done to systematically choose and set, elaborate and design the learning materials which were relevant to teach to students, and *d. Task Analysis* which was done by analyzing students' final task on addition and subtraction following the learning of the topics and the results of this analysis showed that they were able to develop *associating operation technique*.

2. Designing

This stage was conducted to design learning cooperative type STAD-based materials to improve students' collaborative skill on addition and subtraction. The results of the design at each phase are explained further as follow: *a. Test construction*, *b. Learning model choice*, *c. Lesson plan design*, and *d. Initial Design*. At *Test construction* phase, the test consisted of 4 essay questions. The answer keys were oriented towards the students' collaborative skill for the tested topics, thus the gained scores reflected their collaborative skill. *Learning model choice* phase was conducted to decide the appropriate media to deliver the learning materials. In accordance with this study which was to develop learning materials, the media used in designing the lesson plan, worksheets, and tests were based on cooperative type STAD learning models and followed the collaborative skill indicators. *Lesson plan, worksheet, and test* was designed in two formats: form and content. *Initial design* was the ready-to-test materials which consisted of lesson plans, worksheets, and tests. This design was called *the first draft*.

3. Developing

Some actions conducted at this stage included expert validation and followed with revision and field test at SDN Tanggul Wetan 01. The results of this *Developing* stage are explained as follow:

a. Validator

Validator was featured as the basis to conduct the revision and improvement of the developed learning materials. Validation was conducted on the lesson plans, worksheets, and tests. The validity tests on the learning materials and research instrument were done by three validators and the results were described as follow:

1) Validation and Revision on the learning materials.

a) Validation and Revision on the lesson plan

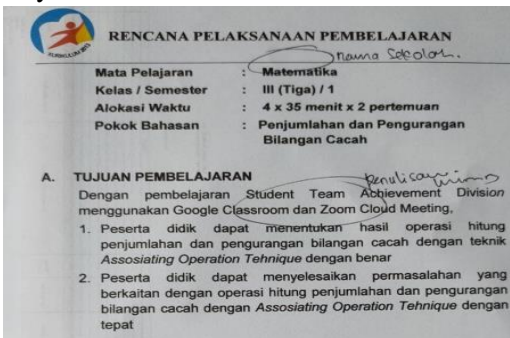
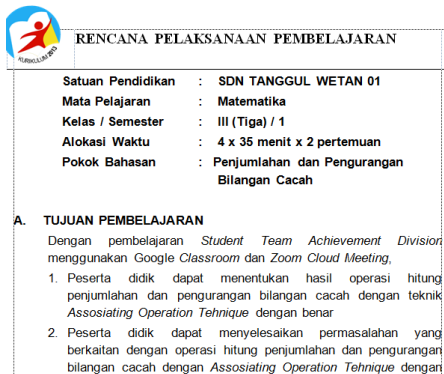
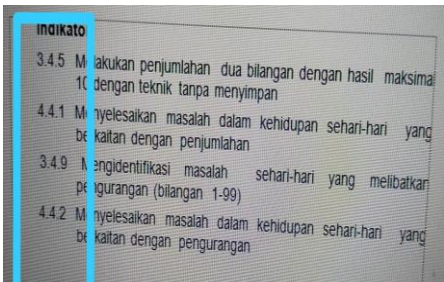
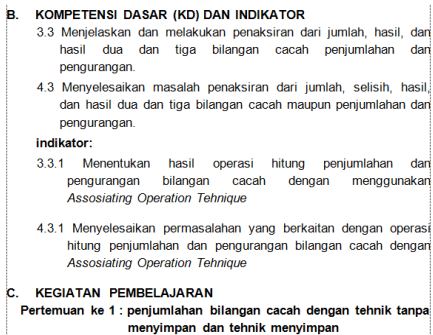
The lesson plan was validated by three validators which then be recaptured and analyzed. The validation results are shown in the following table:

Table 2. Expert Validation result on the Lesson Plan

No	Aspect to be examined	score			Average age (Ii)	Average aspect (Ai) per
		V1	V2	V3		
I	Learning Objectives Formulation					
	1. Clarity of Core Competences and Basic Competences	4	4	4	4.00	
	2. Suitability of Core Competences and Basic Competences	4	4	4	4.00	
	3. Accuracy of Core Competence Description into Indicators	3	4	4	3.67	3.8
	4. Suitability of Indicators with Learning Objectives	4	4	4	4.00	
	5. Suitability of Indicators with Students' Development	4	4	3	3.67	3.67
II	Lesson Plan Content					
	1. Lesson Plan Design Systematics	4	4	4	4	
	2. Suitability of Learning Activities Sequences with cooperative type STAD	3	3	3	3	
	3. Clarity of Learning Scenarios (steps), Learning Activities (Introduction, Core, and Closing)	4	4	4	4	
III	Language and Text					
	1. Using a language that represent the standard language (EYD)	4	4	3	3.67	3.89
	2. The language used was communicative and comprehensive	3	4	4	3.67	
IV	Time					
	1. Suitability of Allocated Time	3	4	3	3.33	3.83
	2. Details of Time for Each Learning Stage	3	4	4	3.67	
	Total Score	43	43	44	40.68	11.03
	Va average	3.82	3.36	3.91	3.70	3.68
	Validation result percentage (%)	95.45	84.09	97.73	92.45	91.92

Based on the recapitulation result of table 2, it is obtained that the average total of the Lesson Plan (RPP)'s validation score is 3.74 and the percentage of total average of the Lesson Plan's validation results is 93.5%. Based on validity criteria, the prototype of Lesson Plan meets the valid criteria. In addition to assessing the validation sheet of Lesson Plan, the validator also gives notes, comments and suggestions for improvements to Lesson Plan. The suggestions and comments are used as an improvement of the Lesson Plan. The results of Lesson Plan before and after revision are described as follows:

Table 3. The result of Lesson Plan Before and After being revised

No	Before Revision	After Revision
1	Giving the school a name on the Lesson Plan identity	 
2	describing the indicators according to the existing basic competence (KD)	 

b) The Result of Validation and Revision of Students' Worksheets (LKPD)

Students' Worksheets (LKPD) are validated by three validators which are then recapitulated and analyzed. The results of the students' worksheets that have been recapitulated are shown in table 4



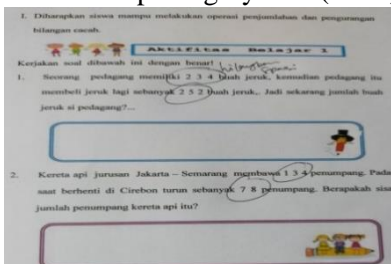
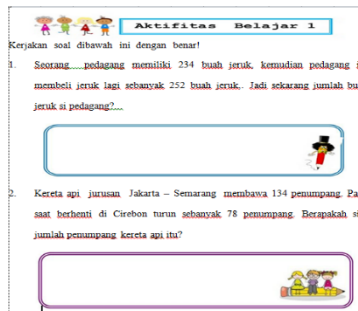
Table 4. Students' Worksheets (LKPD) Validation Results

No	Aspect to be examined	score			average (Ii)	Average per aspect (Ai)
		V1	V2	V3		
I	Format					
	1. LKPD has clear instructions	4	4	3	3.67	3.67
II	Content of LKPD					
	1. The LKPD is presented systematically	4	4	4	4	
	2. The correctness of concept/ material	3	3	3	3	
	3. The question raised is according to the cognition of learners	4	4	4	4	
	4. Each activity has a clear goal	4	4	4	4	3.78
	5. The presented activities can improve the collaborative skills of learners	4	4	4	4	
	6. The presentation of LKPD is interesting	3	4	4	3.67	
III	Language and Writing					

No	Aspect to be examined	score			average (Ii)	Average per aspect (Ai)
	1. The question is formulated in simple language and does not cause an ambiguity	4	3	4	3.67	
	2. Using communicative terms	4	4	3	3.67	
	3. Being formulated by following the the Indonesian Spelling System (EYD)	3	4	4	3.67	
	4. Using commutative language	4	3	3	3.33	
	Total Score	42	37	43	40.68	11.03
	Va Average	3.82	3.36	3.91	3.70	3.68
	Presentation of validation result (%)	95.4 5	84.09	97.73	92.45	91.92

Based on the recapitulation results of table 4, it is obtained that the total Va averagelidation score of The Students' Worksheets is 3.68 and the presentation of the total Va averagelidation results of the Students' Worksheets is 91.92%. Based on the validity criteria, the Students' Worksheets meet the valid criteria. In addition to assessing the validation sheet of the Students' Worksheets, the validator also provides notes, comments and suggestions for improvement on the Students' Worksheets. The comments and suggestions are used as an improvement of the Students' Worksheets. the Students' Worksheets results before and after revision are described as follows:

Table 5. LKPD results before and after being revised

No	Before Revision	After Revision
1	Less attractive cover	
		
2	Nominal values is adjusted to The Indonesian Spelling System (EYD)	
		

c) Validation and Revision Results of Learning Achievement Test (THB)

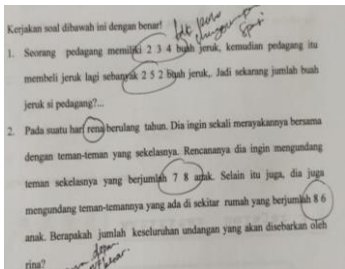
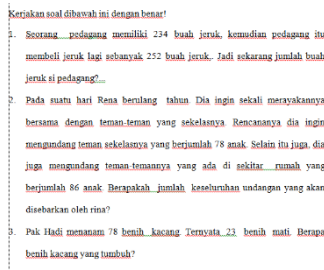
The Learning Achievement Test (THB) is validated by three validators who are then recapitulated and analyzed. The validation results of THB recapitulation are shown in table 6

Table 6. The Validation Results of Learning Achievement Test (THB)

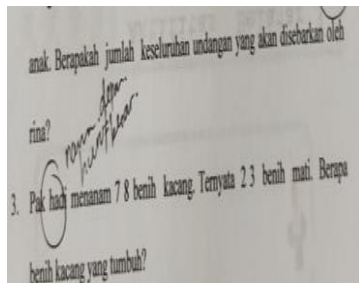
No	Aspect to be examined		Score		Average (Ii)	Average per aspect (Ai)
		V1	V2	V3		
I	Format					
	1. The clarity of instructions on THB	4	4	3	3.67	3.67
II	THB Contents					
	1. The question in THB is according to the materials taught	4	4	4	4	
	2. The THB's question level is according to students' cognitive abilities	3	3	3	3	
	3. The THB's question can improve students' collaborative skills	4	4	4	4	
III	Language and Writing					
	1. The question is formulated in simple language and does not cause an ambiguity	3	4	4	3.67	
	2. Formulated by following the The Indonesian Spelling System (EYD)	4	4	3	3.67	
	Total Score	42	37	43	40.68	11.03
	Va Average	3.82	3.36	3.91	3.70	3.68
	Presentation of validation result(%)	95.45	84.09	97.73	92.45	91.92

Based on the recapitulation results of table 6, it is obtained that the total average of validation score of The Learning Achievement Test is 3.69 and the percentage of total average of validation result of The Learning Achievement Test is 92.13%. Based on validity, the prototype of The Students' Worksheets meets the valid criteria. In addition to assessing The Learning Achievement Test's sheet, validator also provides notes, comments and suggestions for improvements to The Learning Achievement Test. Comments and suggestions are used as a THB correction. The Learning Achievement Test results before and after revisions are described as follows:

Table 7. THB Results Before and After being Revised

No	Before revision	After revision
1	Rupiah nominal value is adjusted to EYD (The Indonesian Spelling System)	
		

2 the writing system must be appropriate



bersama dengan teman-teman yang sekelasnya. Rencananya dia ingin mengundang teman sekelasnya yang berjumlah 78 anak. Selain itu juga dia juga mengundang teman-temannya yang ada di sekitar rumah yang berjumlah 86 anak. Berapakah jumlah keseluruhan undangan yang akan disebarkan oleh rina?

3. Pak Hadi menanam 78 benih kacang. Ternyata 23 benih mati. Berapa benih kacang yang tumbuh?

The assessment results of RPP (Lesson Plan), LKPD (Students' Worksheets), THB (Learning Achievement Test) by each validator can be seen in table 7:

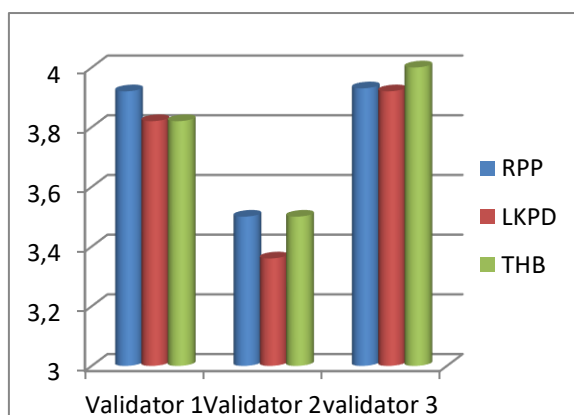


Figure 1. The Bar Chart of Assessment Result of RPP, LKPD, THB

From figure 1, it is obtained the average coefficient of validity and interpretation which can be seen in the following table.

Table 8. Coefficient of Validity and Its Interpretation

No	Instructional Tool	Coefficient of validity	interpretation
1	Lesson Plan (RPP)	3.78	Very valid
2	Students' Worksheets (LKPD)	3.70	Very valid
3	Learning Achievement Test (THB)	3.78	Very valid

According to the validity coefficient, three learning instruments developed were very valid.

b) The Validation results of Learning Instruments

These results consisted of the validation results obtained from the teacher's activity observation sheet, the students' activity observation sheets, the Learning Outcome Test (THB) and the students' response questionnaires. Each validator gave suggestions and input as well as the revised validation sheet.

c) The Validation Results of Teacher's activity observation sheet

This result was validated by three validators by recapitulating and analyzing. The recapitulated validation results of the teacher's activity observation sheet are shown in table 9.

Table 9. The Recapitulation of Validation Results of Teacher's Activity Observation Sheet

No	Aspect to be examined	score	Average (Ii)	Average per aspect (Ai)
----	-----------------------	-------	--------------	-------------------------

		V1	V2	V3		
I	Format					
	1. Clear format makes the observer easier to fill in	4	4	4	4	4
II	Content					
	1. The suitability with the teacher's activities in lesson plan (RPP)	4	4	4	4	
	2. The observation order is in line with the activities sequence in lesson plan (RPP)	4	4	4	4	3.75
	3. The specific and operational formula is easy to measure	3	3	3	3	
	4. Every teacher's activity is able to be observed	4	4	4	4	
III	Language					
	1. The language used is based on the rules of standard Indonesian language (EYD)	4	4	4	4	4
	2. The language used has no difficulty to understand	4	4	4	4	4
	Total average	27	27	27	27	11.75
	Va average	3.86	3.86	3.86	3.86	3.92
	The Presentation of validation results (%)	96.43	96.43	96.43	96.43	97.92

Based on the recapitulation results shown in table 9, the total average score for the validation of teacher's activity observation sheet was 3.92 and the average percentage of the total validation result of the teacher's activity observation sheet is 97.92% as it met the valid criteria on the validity of the teacher's activity observation sheet.

a) The Validation Results of the students' activities Observation Sheet

Three validators validated then recapitulated and analyzed the validation Sheet of the students' activities observation sheet. The validation results of the teacher's activity observation sheet which were recapitulated are described in table 10.

Table 10. Th Recapitulation of Validation Sheets of the Students' Activities Observation Sheet

No	Aspect to be examined	score			Average (Ii)	Average per aspect (Ai)
		V1	V2	V3		
I	Format					
	1. Clear format makes the observer easier to fill in	4	4	4	4	4
II	Content					
	1. The suitability with the teacher's activities in lesson plan (RPP)	4	4	4	4	
	2. The specific and operational formula is easy to measure	4	3	4	3.67	
	3. Every student's activity is able to be observed	4	4	3	3.67	
	4. Every student's activity goes hand in hand with learning objectives	4	4	4	4	
III	Language					
	1. The language used is based on the	4	4	4	4	3.67

No	Aspect to be examined	score			Average (Ii)	Average per aspect (Ai)
	rules of standard Indonesian language (EYD)					
2.	The language used has no difficulty to understand	3	3	4	3.33	
	Total Score	27	26	27	26.67	11.5
	Va Average	3.86	3.71	3.8	3.81	3.83
				6		
	The presentation of validation result (%)	96.5	92.7	96.5	95.25	95.75

Based on the recapitulation results seen in table 10, the total average validation score of the students' activity observation sheet was 3.83 and the average percentage of the total validation results of the students' activity observation sheet was 95.75% as it was based on the validity criteria of the students' activity observation sheet fulfilled the valid criteria.

d). The Validation Results of Students' Responses to LKPD

The students' response questionnaire sheet was done in second meeting after finishing the field trial learning process. The students' response questionnaire sheet was filled in by as many as 56 students of 3rd grade. Their response scores were then recapitulated and analyzed. The recapitulation results of students' responses are shown in table 11.

Table 11. The Validation Results of Students' Responses to LKPD

No	Aspect to be examined	score			Average (Ii)	Average per aspect (Ai)
		V1	V2	V3		
I	Format					
	1. Clear format makes the observer easier to fill in	4	4	3	3.67	3.33
II	Content					
	1. The questions on the questionnaire are in accordance with what LKPD is.	4	4	4	4	3.78
	2. The questionnaire is able to provide the information regarding LKPD effectiveness	4	4	4	4	
III	Language and Writing					
	1. The language used is based on the rules of standard Indonesian language (EYD)	3	4	3	3.33	3.78
	2. The language used has no difficulty to understand	4	3	3	3.33	
	Total average	19	17	19	18.33	19
	Va average	3.8	3.4	3.8	3.67	3.8
	The presentation validation result (%)	95	85	95	91.67	95

Based on the recapitulation results in the table 11 above, the total average of validation score of the students' response questionnaire sheet was 3.8 and the average percentage of the total validation results of the students' response questionnaire sheet was 95% since the the students' response questionnaire sheet reached the valid criteria.

b) The Validation Results of Interview Guidelines

The validation sheet of interview guidelines were done by two validators, the next steps they did were doing the recapitulation and analysis. The recapitulated validation results of the interview guidelines are shown in table 12.

Table 12. The Recapitulation Results of Interview Guidelines Validation

No	Aspect to be examined	score			Average (Ii)	Average per aspect(Ai)
		V1	V2	V3		
I	Content					
	1. The questions on the interview guidelines ease the educators, housewife, the origin school and the students themselves	4	4	4	4	4
	2. The interview results bring up the information, it can give your information regarding to the effectiveness of teaching and learning activities.	4	4	4	4	
II	Language and writing					
	1. The language used is based on the rules of standard Indonesian language (EYD)	3	4	3	3.33	3.5
	2. The language used has no difficulty to understand	4	3	4	3.67	
	Total Score	15	15	15	15	7.5
	Va Average	3.75	3.75	3.75	3.75	3.75
	The presentation validation result (%)	93.75	93.7	93.7	93.75	93.75

Based on the recapitulation results in table 12, the average of total score in the interview guidelines validation was 3.75 and the total of average percentage in the validation results of interview guidelines was 93.75%. Concerning the validity criteria, the interview guidelines sheet met the valid criteria.

The Validity Test of Pre-Test Questions

After carrying out the validity test by using SPSS, the obtained results are as follows:

Table 13. The Validity Test Results of Pre-test Questions

		Correlations				
		QUESTION 1	QUESTION 2	QUESTION 3	QUESTION 4	AVERAGE SCORE
QUESTION 1	Pearson Correlation	1	.905**	.072	.588**	.831**
	Sig. (2-tailed)		.000	.764	.006	.000
	N	20	20	20	20	20
QUESTION 2	Pearson Correlation	.905**	1	.180	.355	.803**
	Sig. (2-tailed)	.000		.448	.125	.000
	N	20	20	20	20	20
QUESTION 3	Pearson Correlation	.072	.180	1	.140	.572**
	Sig. (2-tailed)	.764	.448		.555	.008
	N	20	20	20	20	20
QUESTION 4	Pearson Correlation	.588**	.355	.140	1	.689**
	Sig. (2-tailed)	.006	.125	.555		.001

	N	20	20	20	20	20
AVERAGE	Pearson Correlation	.831**	.803**	.572**	.689**	1
SCORE	Sig. (2-tailed)	.000	.000	.008	.001	
	N	20	20	20	20	20

**. The correlation is significant at the 0.01 level (2-tailed).

The column of Total Score column showed the validity of pre-test questions. The number of respondents was 20 persons so that $DF=N-2=20-2=18$ with 0.05 as a confidence level. According to table R (Sugiyono), the r-table obtained was = 0.468. The above table revealed that the Total Score of Question 1 was 0.831; it means that Question 1 was valid as its r-results > r-table. The total score of Question 2 was 0.803 so that Question 2 was since its r-results > r-table. The total score of Question 3 was 0.572 so that Question 3 was valid because of its r-results > r-table. . The total score of Question 4 was 0.689 so that Question 4 was valid as its r-results > r-table.

The Reliability Test of Pre-test Questions

After the reliability test was done by using SPSS, the following results were obtained:

Table 14. The Results of Reliability test of pre test questions

Reliability Statistics	
Cronbach's Alpha	N of Items
.656	4

The above table revealed that the value of **Cronbach's Alpha** was 0.656. Since the value of **Cronbach's Alpha** > 0.6, the pre-test questions were claimed reliable.

Validity Test for the Post-test

After conducting the validity test by using SPSS, the results obtained are as follow:

Table 15. The results of validity test for the Post-test

		Correlations				
		Question 1	Question 2	Question 3	Question 4	TOTAL SCORE
Question 1	Pearson Correlation	1	.825**	.612**	.816**	.952**
	Sig. (2-tailed)		.000	.004	.000	.000
	N	20	20	20	20	20
Question 2	Pearson Correlation	.825**	1	.375	.638**	.905**
	Sig. (2-tailed)	.000		.103	.002	.000
	N	20	20	20	20	20
Question 3	Pearson Correlation	.612**	.375	1	.499*	.673**
	Sig. (2-tailed)	.004	.103		.025	.001
	N	20	20	20	20	20
Question 4	Pearson Correlation	.816**	.638**	.499*	1	.830**
	Sig. (2-tailed)	.000	.002	.025		.000
	N	20	20	20	20	20
TOTAL SCORE	Pearson Correlation	.952**	.905**	.673**	.830**	1
	Sig. (2-tailed)	.000	.000	.001	.000	
	N	20	20	20	20	20

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

The validity of the pre-test can be seen in the Total Score column. It was known that the number of respondents was 20, so $DF= N-2 = 18$ with a significance level of 0.05. According to the R table (Sugiyono), the value of the R table was 0.468. It can be seen from the table that the total score for

question 1 was 0.952, question 2 was 0.905, question 3 was 0.673, question 4 was 0.830, therefore all of them were categorized as valid because r result $>$ r table.

Reliability test for The Post-test

After conducting reliability test by using SPSS, the results obtained are as follow:

Table 16. The result of reliability test for the post-test

Reliability Statistics		
Cronbach's Alpha	N of Items	

From Table 16, it can be seen that the value of Cronbach's Alpha was 0.798. Since the value of Cronbach's Alpha was $>$ 0.6, the pre-test was reliable. A Shapiro-Wilk test was carried out to test the data normality of the pre-test and post-test scores. After conducting the test, the results are presented as follow:

Table 17. The result of Normality test for the pre-test and post-test

Tests of Normality							
	Group	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Learning Outcomes	Pre-test	.212	15	.069	.917	15	.175
	Post-test	.167	15	.200*	.932	15	.293

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

From the table, it can be seen that the value of Sig. of the pre-test was 0.175, and the post-test was 0.293. It can be concluded that the data of pre-test and post-test scores were normally distributed since Sig. value for pre-test and post-test were higher than 0.05.

Paired Sample T-test Test

Research Hypothesis:

H₀= There was no difference between pre-test and post-test

H_a= There was a difference between pre-test and post-test

Decision making guidelines:

1. If the value of Sig. $<$ 0.05, then H₀ was rejected and H_a was accepted.
2. If the value of Sig. $>$ 0.05, then H₀ was accepted and H_a was rejected.

After conducting paired sample T-test test by using SPSS, the results obtained were as follow:

Table 18. The result of Paired sample Statistic

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	PRE- TEST	71.67	15	5.876	1.517
	POST- TEST	85.00	15	6.268	1.618

Table 19. The result of Paired Sample T-test

Paired Samples Test								
		Paired Differences				t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference			
					Lower	Upper		
Pa	PRE	-	6.726	1.737	-	-9.609	-	.000

ir	TEST	-	13.33	17.058	7.67	4
1	POST		3		8	
	TEST					

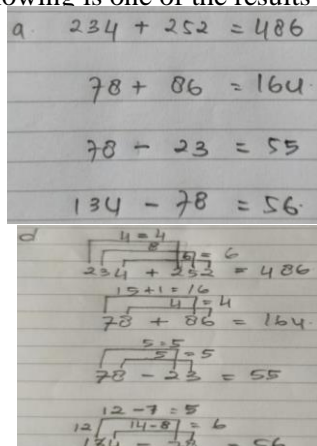
Based on the descriptive statistics, it can be seen that the pre-test mean score = 71.67, while the post-test mean score = 85. It can be concluded that there was a difference in the pre-test and post-test scores ($85 > 71.67$). From the table, the Sig. (2-tailed) = 0.000, which means that Sig. < 0.05 . Based on the calculation result, it can be concluded that H_0 was rejected and H_a was accepted. In other words, there was a significant difference between the pre-test and post-test mean scores.

Field Try out

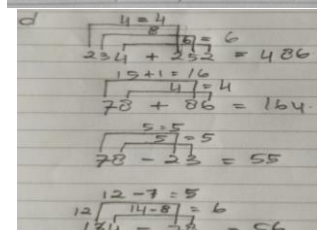
This stage aimed to assess the practicality and effectiveness of the learning tool developed and examine the effect of collaborative skills on STAD-type cooperative learning tools. In this research, the materials taught were addition and subtraction. The population in this study were all third-grade students of SDN Tanggul Wetan 01 in the odd semester of the 2020/2021 academic year.

The learning activities were carried out online in two meetings via zoom cloud. In the first meeting, the discussion was about addition with and without carrying techniques using the associating operation technique. In the second meeting, the discussion was about subtraction with and without borrowing techniques by associating operating techniques. Two observers observed the learning activities in the classroom.

The first meeting was implementing the first open lesson, which was held on Monday, September 21st, 2020; the materials were an addition with and without carrying techniques and subtraction with and without borrowing techniques. The learning activities were done through zoom cloud meetings. The following is one of the results of the best group work on STAD-based cooperative worksheets.




Student 1 was less good, lack of ability in developing AOT and still using old techniques



Student 4 was excellent compared to the others, it was proved by giving correct explanation and answers

Figure 2. The result of Student worksheet in STAD

The second meeting was held on Wednesday, September 23rd, 2020; the materials were an addition with and without carrying techniques and subtraction with and without borrowing techniques. The learning activities were conducted through zoom cloud meetings. The problems that students must resolve in the second meeting are as follows:



Kerjakan!

Selilah kalian membicarakan jawaban kalian dengan temannya berdiskusi kelompok tentang AOT

Kesimpulan

Nah sekarang coba hitung pengurangan bilangan cacah berikut tentukan penyelesaiannya

1. Kakek pergi ke pasar membawa 134 butir mangga untuk dijual. Sore harinya kakek pulang dan membawa 78 butir mangga yang ternyata tidak terjual. Berapa butir mangga yang berhasil dijual oleh Kakek di pasar?...
2. Pak Hadi menanam 78 benih kacang. Ternyata 23 benih mati. Berapa benih kacang yang tumbuh?...

Aktifitas Belajar 1

Kerjakan soal dibawah ini dengan teknik AOT!

3. Seorang pedagang memiliki 67 buah jeruk. kemudian pedagang itu membeli jeruk lagi sebanyak 55 buah jeruk. Jadi sekarang jumlah buah jeruk si pedagang?...
4. Pada hari pertama paman mencetak 160 batu bata. Pada hari kedua dapat mencetak lagi 125 batu bata. Berapa batu bata yang di cetak paman selama dua hari?...

Figure 3. The Problems 2

From the problems, the following is one of the results of the best group work on STAD-based LKPD:

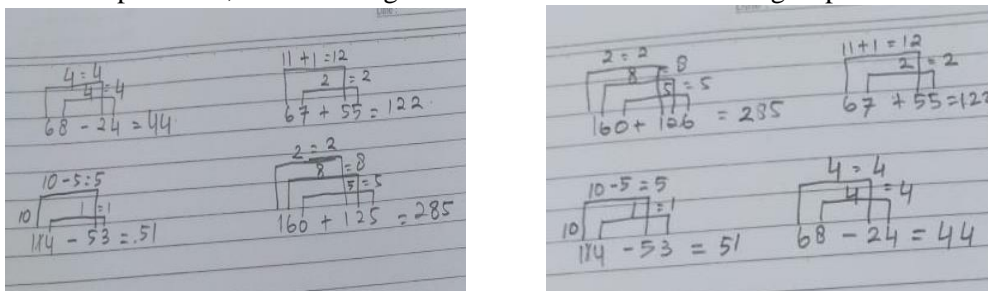


Figure 4. The result of Best Group Work

4. Dissemination Stage

This fourth stage aimed to test the effectiveness of the learning tools in teaching and learning activities. This stage was done by printing the guidebook of the learning model implementation. The book was disseminated to be understood by others and used (implemented) in class. However, the researchers implemented this tool before it was disseminated on a broader scale.

This research produced STAD-type cooperative learning tools in improving the students' collaborative skills. The research method used was Research and Development (R&D) by Thiagarajan, which consisted of four stages: defining, designing, developing, and disseminating. The tools developed were lesson plan, LKPD and THPD. Three validators validated the tools. The results of the pre-test & post-test validation indicated that the developed tools had met the valid criteria. The validity test was carried out using SPSS 14 program. The Sig. (2-tailed) value was less than 0.05. Therefore, it was concluded as valid, while the Cronbach's Alpha value was higher than 0.05 ($p = 0.60$). Therefore, it was categorized as reliable. The validity test toward the practicality observation results showed that it was very practical. The effectiveness was tested by using a one-sample t-test comparing the pre-test and post-test scores, which showed that the activity scores of students and teachers in limited classes met the practical and effective criteria. The STAD-type cooperative learning tools that had been developed significantly affected students' collaborative skills in solving addition and subtraction problems. Based on the descriptive table of the results of the paired sample t-test, it can be concluded that there was a difference in the mean score because $85 > 71.67$. Then $\text{Sig. (2-tailed)} = 0.000$ which means $\text{Sig.} < 0.05$. Therefore, it can be concluded that H_0 was rejected and H_a was accepted. In other words, there was a difference in the pre-test and post-test mean scores. This is in line with the research conducted by Ahmad Nasih, Chairil Faif Pasani & Kamaliyah (2021), that the relationship between students' collaborative skills and the STAD learning model showed: (1) the application of the STAD model could develop students' collaborative skills in learning mathematics, (2) the application of the STAD model improved students' learning outcomes in mathematics learning, (3) there was a strong relationship between students' collaborative skills and students' mathematics learning outcomes.

CONCLUSION

The results of the validation, practicality and effectiveness tests of the tools that have been developed in the research showed valid, practical and effective criteria. Therefore, the STAD-type cooperative learning tools produced could improve students' collaborative skills. Thus, the results of this research can be widely used in other different classes with the same school level

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