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Implementation of Structured Dyadic Methods to Improve Learning Results in Web and Mobile Device Programming Class XI Students in Software Engineering Expertise Program

Nur Helmi Akbar*

SMK Negeri 4 Bandung , Indonesia
*Correspondence: E-mail: helmiakbar@student.upi.edu

A B S T R A C T

This research is a Classroom Action Research (CAR) to 36 students of class XI RPL SMK Negeri 4 Bandung. This study aims to improve learning outcomes in the subjects of Web Programming and Mobile Devices for class XI RPL students of SMK Negeri 4 Bandung for the 2020/2021 academic year through the application of the Structured Dyadic Method. The data collection technique is done by using learning result test, observation and documentation. The data analysis technique used is descriptive quantitative data analysis with a percentage in the form of calculating the learning outcomes test and the observation results. The results of this classroom action research are 1) cognitive learning outcomes increase, in cycle I the average cognitive score of students is 51.25 or 22 students have reached KKM. In the second cycle the average cognitive score of students increased to 83.75 or 36 students had reached the KKM. 2) The learning outcomes of students' affective domains increased, in the first cycle as many as 22 students had reached the very good or good category and increased to 33 students in the second cycle. 3) The students' psychomotor learning outcomes increased, in the first cycle as many as 28 students had reached the very good or good category and increased in the second cycle to 33 students. Therefore, it can be concluded that the application of the Structured Dyadic Method learning method can improve learning outcomes in the cognitive, affective and psychomotor domains of class XI RPL SMK Negeri 4 Bandung Academic Year 2020/2021.

A R T I C L E   I N F O

1. INTRODUCTION

Education is a human need as long as humans live. Human life cannot develop without education. Education is an effort to create a learning atmosphere and learning process for students to actively develop their potential (Intania and Sutama, 2020; Maba, 2017). Planned, directed, and continuous education can help students to develop their abilities optimally, both in cognitive, affective, and psychomotor aspects. This shows that education has an important role in human life and progress (Minamatov and Nasirdinova, 2022). Good education results from successful learning processes. The learning process is successful if during teaching and learning activities the teacher involves the active role of students (Mascolo, 2009). Learning is said to be successful and of good quality if all or at least most of the students are actively involved, both physically, mentally and socially in the learning process.

The 2013 curriculum emphasizes student activity, learning that is no longer teacher-centered but student-centered (Kurniati and Surya, 2017; Ratnasari *et al.*, 2020). Permendikbud 2013 as the legal basis for implementing the 2013 Curriculum, SMK Negeri 2 Klaten is one of the schools currently implementing the 2013 curriculum. The 2013 curriculum makes it possible for each school to focus on and develop certain subjects that are acceptable to students' needs. In the 2013 curriculum students are positioned as learning subjects, where students are more dominant in the learning process (Nasrallah *et al.*, 2022). The 2013 curriculum adheres to the form of joint learning between teachers and students, for example students can express their ideas and can criticize the teacher's opinion which is considered inappropriate. The teacher acts as a facilitator and frees students to think, create and develop (Darsih, 2018). One of the problems that is often found in schools is the lack of activity of students caused by low student activity in the learning process and the lack of positive competition to get maximum results in the class. Most students still depend on their friends, when given assignments only a few students work and do assignments, other students just cheat. Another problem is the emergence of a sense of boredom of students towards the learning process. Students who are less enthusiastic about participating in the learning process are more focused on their online games, watching movies, viewing videos on YouTube that are not related to learning material. Low learning activity will have a big impact on students' understanding of learning, this will also have an impact on learning outcomes.

Based on the problems that have been described, one of the efforts that can be used by teachers to increase student learning activities is to apply a more varied learning model. Cooperative learning as a teaching approach in which students work together with each other in small study groups to complete individual or group assignments given by the teacher. The cooperative learning model is an alternative that can be used. Collaboration in groups as one of the learning processes that students are expected to be more active in participating in learning. Cooperative learning is a learning model where the learning pattern is in groups, where the groups are small groups where each student has different abilities and is used to achieve learning objectives.

Based on the description of the problems above, it can be seen that students are more effective in learning when they are gathered in small groups, because excessive group formation will make students become busy, chat alone, only a few students work in groups. This becomes the basis for finding an appropriate learning model given to students during research. The cooperative learning model of the Structured Dyadic Methods type is close to the criteria. This method has never been applied by teachers in teaching and learning activities and is still limited to research using the Structured Dyadic Methods method.

Structured Dyadic Methods (SDM) is a pair system (Yunus and Eliastuti, 2020), one of the students becomes the tutor and the other students become students. The tutor teaches the material to the students and gives quizzes to the students. When students cannot answer the quiz, the tutor tries to find alternatives to help encourage students to think again. This is done alternately.

Based on the analysis of the learning process through the Structured Dyadic Methods learning model, it is suspected that it can increase student learning activities which have an impact on student learning outcomes, class action research (CAR) was conducted with the title "Implementation of the HR Learning Method to Improve Learning Outcomes in Data Communication Subject in Class XI Students of the Program Software Engineering Expertise".

2. METHODS

Classroom action research is action research conducted in class with the aim of improving the quality of learning processes and outcomes, overcoming learning problems, increasing professionalism, and fostering an academic culture. This research was conducted in a participatory and collaborative manner. Participatory means that researchers make their own observations when carrying out actions which include determining topics, problem formulation, planning, implementation, analysis, and researcher reports. The collaborative nature in question is that this research involves teachers and colleagues who are tasked with making observations so that observation activities are easier, thorough, and objective.

In this study, the Kemmis and Taggart design was used which consisted of several cycles, where each cycle contained four stages, namely the planning stage, the action stage, the observation stage, and the reflection stage. The Kemmis and Taggart model cycle can be seen in **Figure 1**.
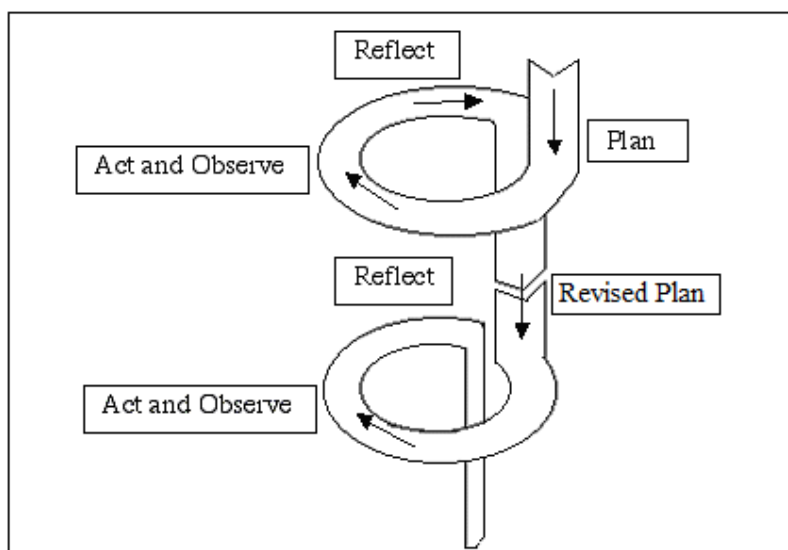

Figure 1. The Kemmis and Taggart Model Cycle.

2.1. Planning

The planning stage activity is to develop a design that will be implemented in accordance with the findings of the problems and ideas in the previous discussion. At this stage, all the needs for carrying out classroom action research are prepared, starting from the Learning Implementation Plan (RPP) with the Structured Dyadic Methods method, research

instruments (activity observation sheets and learning achievement tests), and determining achievement indicators for increasing activity and student learning outcomes.

2.2. Action

The action stage is also called the implementation stage of the planning results. At this stage the teacher carries out the actions according to what has been planned, namely by applying the Structured Dyadic Methods type learning model starting from the initial steps when compiling groups until the final step, namely students following independent evaluations.

2.3. Observation

The implementation of the observation phase coincides with the action stage, where the teacher explains the learning process using the Structured Dyadic Methods method, the observer observes and retrieves data on student learning activities. This stage is assisted by colleagues who participate in observing student activities during the learning process taking place based on observation sheets previously compiled by researchers.

2.4. Data Analysis

Data analysis techniques in this study aim to determine the increase in student activities and learning outcomes towards the implementation of the Structured Dyadic Methods type cooperative learning model. The data was obtained from observations and tests of student learning outcomes at the end of the cycle.

1. Analysis of Observational Data

The analysis used for student learning activities is by using quantitative descriptive data analysis techniques, where the results will be compared between cycle I and cycle II. The data analyzed were obtained from observational data on student learning activities during the implementation of the HR learning model. Steps taken as follows:

(i). Data from observations, the results of each indicator are processed to determine the total score of each indicator.

(ii). Find the percentage of each indicator that shows in Eqs. (1) and (2):

- Percentage of activity of each indicator $= \frac{score\ for\ each\ indicator}{\varSigma total\ of\ student}$ x 100 % (1)

- Calculating the percentage of student activity in one class with the formula:
Percentage of class activity $= \frac{Score\ for\ each\ indicator}{\varSigma Iindicator x \varSigma total\ of\ student}$ x 100 % (2)

2.5. Analysis of Test Results

Analysis of learning outcomes tests is used to measure the extent to which students' absorption during the lesson. Analysis of student learning outcomes tests can be done with quantitative analysis techniques by determining the average test score. The average test score is obtained from the number of scores obtained by students, then divided by the number of students in the class. The formula for calculating a student's test average is shown in Eq. (3). Meanwhile, the formula used in calculating student percentages can be seen in Eq. (4).

Average Score $= \frac{\varSigma total\ of\ score}{total\ of\ student}$ (3)

Percentage of Student Completeness $= \frac{\varSigma Number\ of\ students\ who\ reach\ KKM}{\varSigma Total\ number\ of\ students}$ x 100% (4)

2.5. Research sites

The location of this classroom action research was conducted at SMKN 4 Bandung which is located at Jl. Kliningan No. 6, Turangga, Kec. Lengkong, Bandung City, West Java 40264. The subjects of this study were students of class XI RPL for the 2020/2021 academic year.

3. RESULTS AND DISCUSSION

Based on observations made by researchers during the pandemic, the learning process is carried out online using Google Meet and Google Classroom. During this pandemic, teachers were not asked to pursue KD which had to be achieved, but were required so that students could understand the material being taught, not face to face. However, the use of Google Classroom and Google Meet does not make students explore their abilities and even tends to be passive in the learning process. Students do not ask if there is material that is not understood.

The lack of student participation in learning can be seen when the learning process takes place. In the learning process many students do not pay attention to the teacher's explanation, quickly feel bored with the lesson, are lazy to take notes, are lazy to ask questions or express opinions and do not immediately complete the assignments given. This causes students to develop their mindset and abilities less, resulting in low student learning outcomes. Many of the students also complained because their study time in class was limited because time in class was limited and they did not understand the material, causing students' understanding of the material to decrease. Even when at home, many students complain that they cannot communicate with the teacher if there is something they want to ask the teacher.

Less varied teacher teaching methods cause students to be inactive in the learning process. The low student learning outcomes caused by the lack of involvement of students in the learning process so that students get bored quickly and are not interested in the lesson can be overcome by applying innovative learning methods. This is in line with the theory which states that poor teacher teaching methods will affect poor student learning as well. The use of appropriate, effective, and efficient teaching methods will help students learn well, because the teaching method is a method chosen/used by the teacher for delivering lesson material to students so that students can receive, master, and develop the lesson material so that this provide flexibility for teachers to make various innovations so that the learning atmosphere is more interesting and fun.

This study applies an innovative learning method, namely the Structured Dyadic Method learning method to improve student learning outcomes in the cognitive domain. Implementation of learning using the Structured Dyadic Method learning method is a combination of conventional learning models with learning models that use information and communication technology so that it can have a positive impact on learning in virtual classes and at home. The combination of these two learning models can be said to be Structured Dyadic Method if the proportion of using online media or information and communication technology is 30% -70% of the total learning time.

The next step is to create materials and assignments that will be uploaded to Google Classroom. The material and assignments are made based on the subject matter contained in the syllabus that applies to the school so that learning is in accordance with the collaborator teacher and the material targets set by the school. After the first preparation is complete, the next stage is the second preparation, namely preparing for face-to-face learning that takes place in the classroom. Classroom learning that will be carried out by researchers includes

introduction, pre-test in cycle I and post-test in cycle II, tests, presentations by researchers, giving pre-tests by providing a Google Form link and giving post-tests downloaded on Google Classroom, as well as cover.

Based on the application of the learning method, the principles described above, as well as the classroom action research phase which includes planning, implementation, observation, and reflection, the classroom action research with the application of the Structured Dyadic Method learning method carried out in two cycles has shown the expected results. namely improving student learning outcomes of class XI RPL SMK Negeri 4 Bandung both for the cognitive domain of students. The following is an increase in student learning outcomes in the cognitive domain in cycle I and cycle II which are supported by research data that has been discussed in the research results sub-chapter.

3.1. Improvement of Student Learning Outcomes Cycle I and Cycle II

The success of learning outcomes in the cognitive domain of students is realized when students are able to master the material being studied. This can be seen from the results of the evaluation carried out by giving a pre-test in cycle I and post-test in cycle II. Students can be said to have achieved the learning completeness criteria if they get a score of ≥78, according to the minimum completeness criteria determined by the school. Learning is said to be successful if at least 78% of students in one class score ≥78.

The results of the action show that there has been an increase in student learning outcomes in the cognitive domain between cycle I and cycle II. In cycle I, the average cognitive score of students in one class was 76.38 with the number of students who achieved a minimum completeness score of 22 students or 51.25% of the number of students in one class. Then in cycle II, the average cognitive score of students increased to 83.75 with the number of students who achieved a minimum completeness score of 36 students or 100% of the number of students in one class participating in class learning activities. The following **Table 1** presents an increase in learning outcomes in the cognitive domain between cycle I and cycle II. Meanwhile, the increase in students' cognitive learning outcomes can also be seen in **Figure 2**.

Table 1. Increasing in learning outcomes in the cognitive domain between cycle I and cycle II.

Category	Score	Cycle 1		Cycle 2	
		Frequency	Percentage	Frequency	Percentage
Very Good	85 – 100	7	20.00%	19	51.43%
Good	78 – 84	18	51.43%	17	48.57%
Adequate	71 -77	5	14.29%	0	0%
Poor	0 -70	5	14.29%	0	0%
Total		35	100%	36	100%

The increase in the average value of 7.51 (9.58%) was recorded from the difference in the average value of Cycle II 85.91 and Cycle I 78.40. Then the number of students who achieved KKM also increased in cycle II, namely as many as 10 students (28.57%) by comparing the number of students who achieved KKM in cycle II as many as 36 students and in cycle I as many as 22 students. The data shows that the number of students who master the learning material thoroughly (N ≥ 78) is 100% or 36 students in one class. This means that the application of the Structured Dyadic Method has succeeded in improving learning outcomes in the cognitive domain of class XI software engineering students.
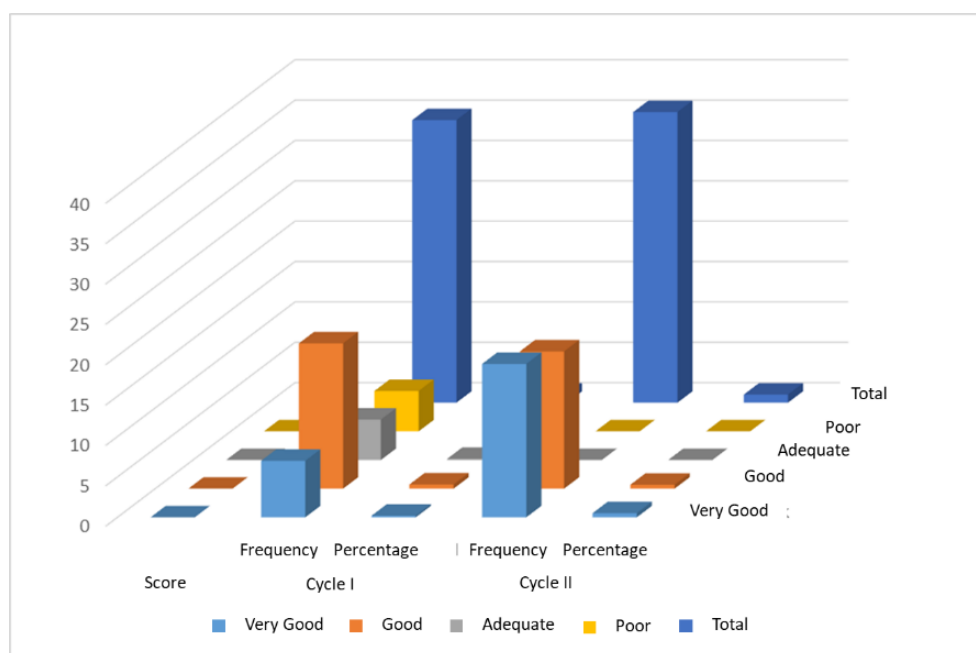
Figure 2. Increasing in students' cognitive learning outcomes.

3.2. Improving Student Affective Domain Learning Outcomes Cycle I and Cycle II
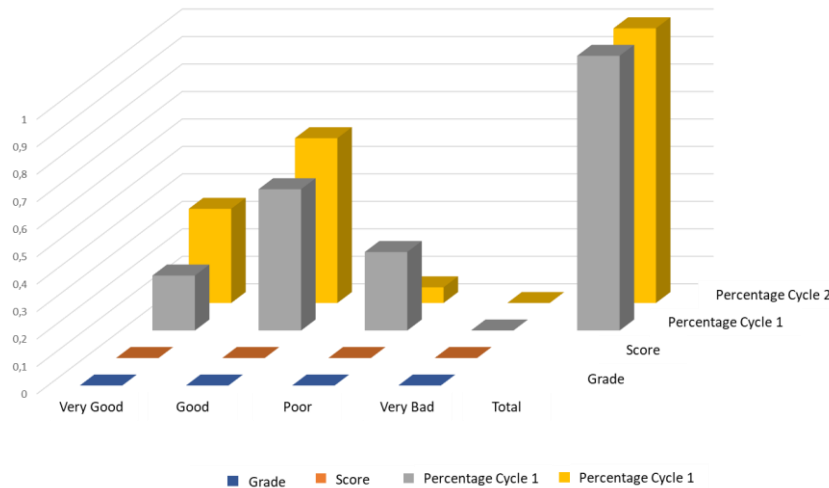
The success of the affective domain is realized when students are able to carry out the affective domains required in the learning process. This can be seen from the results of observations regarding the affective domains of students which were assessed through observation during the learning process. Students are said to have achieved the learning completeness criteria if their average scores from all domains have obtained very good and good scores, learning is said to be successful if at least 75% of students in one class get very good or good grades.

The results of the action show that there has been an increase in student learning outcomes in the affective domain between cycle I and cycle II. In the first cycle, with the application of the Structured Dyadic Method, 51.25% or 22 students out of 36 students in the class in cycle I achieved very good and good category scores with an average score of 13.97. In cycle II the teacher tried to improve students' affective attitudes and succeeded with the achievement of 94.29% of students getting grades in the very good or good category with an average score of 17.11. **Table 2** presents the increase in student learning outcomes in the affective domain between cycle I and cycle II. Meanwhile, the increase in student learning outcomes in the affective domain cycle I and cycle II can be seen in **Figure 3**.

The increase in the average value of 3.2 (22.91%) was shown from the difference in the average value of the second cycle of 17.11 and the first cycle of 13.97. Then the number of students who reached the very good and good categories also increased by 8 students by comparing the number of students who reached the very good and good categories in cycle II as many as 33 students and in cycle I as many as 22 students. This means that the application of the Structured Dyadic Method has succeeded in improving student learning outcomes in the affective domain. Based on the conclusions above, there is an increase in affective domain learning outcomes in each cycle from the class average results and the achievement of classical learning mastery. The results of the implementation of these actions are in accordance with the existing theory. The process within the individual that interacts with the environment will lead to changes in his behavior. The affective learning process provides changes in the realm of the ability to feel.

Table 2. Increasing in learning outcomes in the affective domain between cycle I and cycle II.

Category	Grade	Score	Cycle 1 Percentage	Cycle 2 Percentage
Very Good	A	16.25≤X≤20.00	20.00%	34.29%
Good	B	12.50≤X<16.25	51.43%	60.00%
Poor	C	8.75≤X<12.50	28.57%	5.71%
Very Bad	D	5.00≤X<8.75	0%	0%
Total			100%	100%

Figure 3. Increasing in students' affective learning outcomes.

3.3. Improving Learning Outcomes in the Psychomotor Domain of Students in Cycle I and Cycle II

The success of the psychomotor domain is realized when students are able to carry out the psychomotor domains required in the learning process. This can be seen from the results of observations related to the psychomotor domains of students which are assessed through observations during the learning process. Students are said to have achieved the learning completeness criteria if their average scores from all domains have obtained very good and good scores, learning is said to be successful if at least 78% of students in one class get very good or good grades.

The results of the action show that there has been an increase in student learning outcomes in the psychomotor domain between cycle I and cycle II. In the first cycle with the application of the Structured Dyadic Method, 80% or 22 of the 36 students in the class in the first cycle achieved very good and good category scores with an average score of 14.5. In cycle II the teacher tried to improve students' psychomotor attitudes and succeeded with the achievement of 91.43% of students getting grades in the very good or good category with an average score of 17.11. **Table 3** shows the results of increasing student learning outcomes in the psychomotor domain between cycle I and cycle II. The increase in student learning outcomes in the psychomotor domain cycle I and cycle II can be seen in **Figure 4**.

The increase in the average value of 2.66 (18.33%) is shown from the difference in the average value of the second cycle of 17.11 and the first cycle of 14.5. Then the number of students who have achieved very good and good categories also increased in cycle II, namely as many as 5 students by comparing the number of students who reached very good and good

categories in cycle II as many as 35 students and cycle I as many as 22 students. This means that the application of the Structured Dyadic Method has succeeded in improving student learning outcomes in the psychomotor domain.

Table 3. Increasing in learning outcomes in the psychomotor domain between cycle I and cycle II.

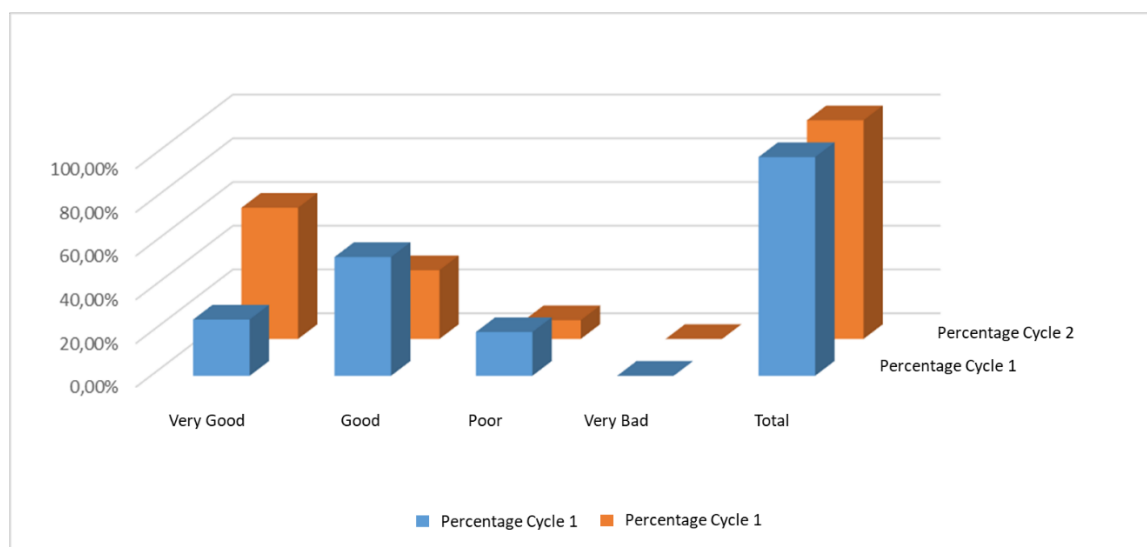| Category	Grade	Score	Cycle 1 Percentage	Cycle 2 Percentage
Very Good	A	16.25≤X≤20.00	25.71%	60.00%
Good	B	12.50≤X<16.25	54.29%	31.43%
Poor	C	8.75≤X<12.50	20.00%	8.57%
Very Bad	D	5.00≤X<8.75	0%	0%
Total			100%	100%

Figure 4. Increasing in students' psychomotor learning outcomes.

Based on these conclusions, there is an increase in learning outcomes in the psychomotor domain in each cycle of the class average and the achievement of classical learning mastery. The results of the implementation of these actions are in accordance with the theory that has been developed. The learning process results in changes in the psychomotor domain, namely providing learning outcomes in the form of skills.

Based on the scores obtained by students in the three domains of learning outcomes in the implementation of this class action, it can be said that students who have achieved completeness of more than 78% of students in the class and class average scores have also increased from cycle I and cycle II. The criteria for the success of the actions in this study which included the cognitive, affective, and psychomotor domains as well as an increase in the class average scores from cycle I and cycle II had been successfully achieved by applying the Structured Dyadic Method of Learning.

Based on the discussion above which includes the implementation of actions, results of actions, and theoretical support as well as existing research results, it can be concluded that the use of the Structured Dyadic Method Learning Method can improve learning outcomes in the cognitive, affective and psychomotor domains of class XI RPL students of SMK Negeri 4 Bandung in 2020/2021.

4. CONCLUSION

Based on this study, the following conclusions can be drawn from the research results:
(i).   The application of the Structured Dyadic Method to class XI students of software engineering SMK Negeri 4 Bandung can improve student learning outcomes.
(ii). This method can also support student activity in completing assignments given by the teacher because students can exchange ideas with their classmates.
(iii). This method is able to assist teachers in solving problems of understanding students who are lacking in class and assisted by classmates who are cognitively good.

The suggestions for further research are
(i).   Future research that applies classroom action research using the Structured Dyadic Method should prepare everything needed for smooth learning.
(ii). Future research should establish good communication with the subject teachers concerned so that research can be assisted by collaborator teachers.
(iii). Future research should make media more interesting so that students are happy and not bored to open the media.

5. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

6. REFERENCES

Darsih, E. (2018). Learner-centered teaching: What makes it effective. *Indonesian EFL Journal*, *4*(1), 33-42.

Intania, E. V., and Sutama, S. (2020). The role of character education in learning during the COVID-19 pandemic. *Jurnal Penelitian Ilmu Pendidikan*, *13*(2), 129-136.

Kurniati, I., and Surya, E. (2017). Students' perception of their teacher teaching styles. *International Journal of Sciences: Basic and Applied Research (IJSBAR)*, *33*(2), 91-98.

Maba, W. (2017). Teacher's perception on the implementation of the assessment process in 2013 curriculum. *International Journal of Social Sciences and Humanities*, *1*(2), 1-9.

Mascolo, M. F. (2009). Beyond student-centered and teacher-centered pedagogy: Teaching and learning as guided participation. *Pedagogy and the Human Sciences*, *1*(1), 3-27.

Minamatov, Y. E. O. G. L., and Nasirdinova, M. H. Q. (2022). Application of ICT in education and teaching technologies. *Scientific Progress*, *3*(4), 738-740.

Nasrallah, N., Rama, B., and Rahman, U. (2022). The application of behavioristic theory in the 2013 curriculum learning to shape the principles of students'characters. *JICSA (Journal of Islamic Civilization in Southeast Asia)*, *11*(1), 33-60.

Ratnasari, N., Kurniawati, K., and Syukur, A. (2020). Maximizing the implementation of scientific approach in history lessons through student-centered learning model. *Journal of Education Research and Evaluation*, *4*(3), 234-239.

Yunus, S., and Eliastuti, M. (2020). Improvement of scientific writing ability through dyadic essay techniques. *Lingua: Jurnal Ilmiah*, *16*(1), 45-57.