

Development of Cooperative Integrated Reading and Composition Learning Model with Mind Mapping Method to Improve Students' Understanding of Mathematical Concepts

Nurul Fauziah¹, Nurma Izzati¹, Hendri Handoko¹

¹Institut Agama Islam Negeri Syekh Nurjati Cirebon, Cirebon, Indonesia

Article Info

Keywords:

CIRC Learning Model
Mind Mapping Method
Understanding Mathematical
Concepts

ABSTRACT

The development of the CIRC learning model with the mind mapping method was based on the needs analysis results. The findings include that students' understanding of mathematical concepts is still not optimal, and teachers' selection of learning models is still not appropriate. The CIRC learning model applied in schools is still not optimal or has several shortcomings. The objectives of this study are: (1) to determine the development of the CIRC learning model with the mind mapping method to improve students' understanding of mathematical concepts; (2) know the improvement of students' understanding of mathematical concepts who received the application of the CIRC learning model with the mind mapping method; (3) knowing the difference in increasing students' understanding of mathematical concepts between those who received the application of the CIRC learning model with the mind mapping method and those who received the application of the CIRC learning model; (4) knowing students' responses to the application of the CIRC learning model with the mind mapping method. The results showed that: (1) the CIRC learning model with the mind mapping method was included in the valid criteria and should be tested based on the product validation results. (2) there is an increase in students' understanding of mathematical concepts in the experimental class who get the application of the CIRC learning model with the mind mapping method of 0.88 (high criteria). (3) there is a significant difference between the application of the CIRC learning model with the mind mapping method and the application of the CIRC learning model to improve students' understanding of mathematical concepts (4) The student response to the application of the CIRC learning model with the mind mapping method is 79% (very good) positive students (accept).

This is an open-access article under the [CC BY-SA](https://creativecommons.org/licenses/by-sa/4.0/) license.



Corresponding Author:

Nurul Fauziah
Institut Agama Islam Negeri Syekh Nurjati Cirebon, Cirebon, Indonesia
Email: nurulfzh.2211@gmail.com

1. INTRODUCTION

Education is one of the essential factors in efforts to improve human resources in Indonesia. As stated in the Law of the Republic of Indonesia number 20 of 2003 concerning the national education system, that education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have spiritual and spiritual strength, self-control, and personality [1]. Intelligence, noble character, and skills needed by himself, society, nation, and state.

Learning activities are one of the processes or activities carried out in the world of education. Learning is a planned teacher activity in instructional design that focuses on providing learning resources to engage students in teaching and learning activities [2]. Learning is a teacher and student interaction process to achieve a specific goal [3], [4]. Learning activities are not necessarily carried out as an interaction between teachers and students but to achieve the goals of the educational process. In order to realize these goals, the learning process needs to be designed effectively and efficiently.

In the learning process in schools, the learning model is one of the essential aspects that teachers must prepare before learning [5]–[8]. According to Isrok'atun and Rosmala, the learning model is a design that describes in a structured way learning activities to help students build ideas, information, and mindsets to achieve learning objectives [9], [10]. The cooperative learning model widely applied in schools is the cooperative learning model. The cooperative learning model is a group learning that focuses on cooperation between students in understanding the subject matter and making learning activities more meaningful [11]–[14]. In addition, cooperation will help improve student learning outcomes, instill mutual respect, foster an attitude of accountability or responsibility, and develop students' skills in working together [15]. The cooperative learning model has many types, including the Cooperative Integrated Reading and Composition (CIRC) type.

The CIRC is a learning model in which students are formed heterogeneously into groups of four to five. After that, students work on assignments in groups, including reading in pairs, understanding readings, identifying main ideas, summarizing, and then writing them down [16]. Based on the results of the needs analysis, the application of the CIRC learning model in schools is still not optimal. There are still students who do not actively participate in working on group assignments, and there are students who are less enthusiastic about participating in learning activities. Some students do not record learning materials, the application of learning models CIRC requires a relatively long time, and students' understanding of mathematical concepts is not yet optimal. The application of CIRC learning model can not only be applied to language subjects but can also be applied to exact subjects such as mathematics. Mathematics learning is an effort made as a material so that students are active in learning and help students build mathematical concepts and principles based on students abilities, experiences and knowledge through an internalization process so that the concepts and principles are rebuilt [17]. As a subject with abstract characteristics, mathematics requires a good understanding of building concepts and studying them. In addition, understanding the concept is the most crucial aspect that must be possessed by every student and is one of the goals of learning mathematics. As stated in the Regulation of

the Minister of Education and Culture (Permendikbud) No. 58 of 2014 [18], understanding mathematical concepts is competence in explaining the interrelationships between concepts and using concepts and algorithms flexibly, accurately, efficiently, and efficiently precisely in problem-solving.

Based on the results of the needs analysis, the researchers carried out a development of the CIRC learning model combined with the mind mapping method. The choice of mind mapping method is based on the method's advantages, which are expected to assist in optimizing the application of the CIRC learning model. Mind mapping, popularized by Tony Buzan, is a creative, attractive, efficient, and effective way of taking notes by mapping the thoughts and ideas in the brain [19]. According to Monariska [20], mind mapping is taking notes using words, symbols, pictures, lines, numbers, and colors to give a pleasant impression when made and seen. The mind mapping method is used to develop students' knowledge, makes it easier to understand and remember the concepts of the material being studied, can improve students' memory, is designed to stimulate students' creativity, and make learning activities systematic and fun. In addition, Izzati [21] also defines the mind mapping method as a creative and effective way of taking notes that can map mathematical concepts to be patterned visually and graphically to help record, strengthen and recall the information that has been learned.

Based on the explanation above, the development aims to determine the results of developing the CIRC learning model with the mind mapping method to increase understanding of students' mathematical concepts. The student who studies the CIRC learning model with the mind mapping method to find out the difference in increasing students' understanding of mathematical concepts between those who get the application of the CIRC learning model using the mind mapping method with those who obtained the application of the CIRC learning model and knowing student responses to the application of the CIRC learning model with the mind mapping method.

2. METHOD

The research method used in this study is the Research and Development (R&D) method, adapted from the Borg and Gall research and development method [22]. The Borg and Gall method consist of 10 research and development steps, namely: 1) Needs analysis; 2) Planning; 3) Initial Product Development; 4) Limited Testing; 5) Revision of Product Test Results. 6) Main Product Test; 7) Product Revision; 8) Wide-Scale Field Trial; 9) Final Product Revision; 10) Dissemination and Use. However, the researcher limited the development steps in this study due to time, cost, and ability limitations. Limitations of research steps can be done, as stated by Borg and Gall. Research can be limited on a small scale, possibly limiting and simplifying it [23]. The following are the development steps for the CIRC learning model.

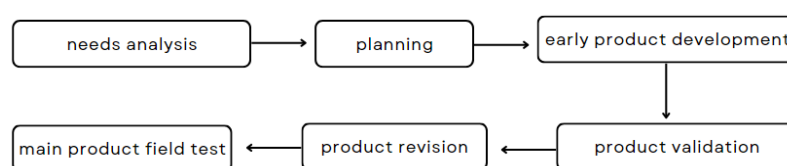


Figure 1. Steps to Develop CIRC Learning Model with Mind Mapping Method

The study used a pretest-posttest control group design to compare two classes by giving different treatments. The subjects of research and development of the CIRC learning model with the mind mapping method were learning design experts and class VIII students of MTs Puteri PUI Talaga. The learning design expert in this study was the validator of the product being developed. Then, students of classes VIII A (Experimental Class) and VIII B (Control Class) are samples to participate in field trials.

3. RESULTS AND DISCUSSION

3.1 RESULTS

3.1.1 Development of CIRC Learning Model with Mind Mapping Method

Researchers conducted research and development to develop a CIRC learning model to produce a product in the form of a CIRC learning model with the mind mapping method. The CIRC learning model's steps are based on the Borg and Gall development method. The steps that researchers have taken in developing the CIRC learning model will be explained as follows:

a. Description of Needs Analysis Results

Needs analysis is the first step in developing a product. Researchers conducted a literature study and reviewed previous research results to obtain information about the problems in the world of education, especially in learning mathematics in schools. The facts obtained results of the needs analysis of the researchers are used as the background of the research and development that the researchers will do.

Based on the results of the needs analysis that has been carried out, it is found that the understanding of students' mathematical concepts is still not optimal. It is indicated by the fact that there are still students who have difficulty in specific indicators of understanding mathematical concepts. The second finding is that the teacher's selection of the learning model is still improper, affecting the understanding of students' mathematical concepts. In the third finding, the CIRC learning model widely applied in schools is still not practical or has several shortcomings. Namely, the time required for learning is relatively long, and learning activities tend to be monotonous, which causes students to feel bored while learning takes place and the Lastly, the way students record learning material is less creative, so students' creativity is less developed.

b. Description of Planning Results

The next step is the researcher conducting a plan to develop a solution to solve the problems obtained in the needs analysis step. In the planning stage, the first step taken by the researcher is conducting a literature study to find information that can be used as a solution. With the literature study results, researchers plan to develop a CIRC learning model, which is expected to improve students' understanding of mathematical concepts.

Based on the literature study, to optimize the application of the CIRC learning model so that learning activities are more effective, efficient, and fun, the researchers combined the CIRC learning model with the mind mapping method. The choice of the mind mapping method was based on the advantages of the method, namely being able to develop students' knowledge, making it easier to understand and remember the

concepts of the material being studied, improving students' memory, and designed to stimulate students' creativity and make learning activities systematic and fun.

c. Description of Initial Product Development Results

The product development stage aims to produce the product's initial design. In this study, the product developed was a Cooperative Integrated Reading and Composition (CIRC) learning model. A learning model consists of syntax or learning steps, social systems, reaction principles, support systems, instructional impacts, and accompaniment impacts. The CIRC learning model's development in this study lies in the syntax or learning steps. That is done based on the results of the previous needs analysis. The following presents the syntax or steps of the CIRC learning model with the mind mapping method.

Table 1. Syntax of CIRC Learning Model with Mind Mapping Method

Phase	Learning Activities
Orientation	The teacher gives apperception, conveys learning objectives, briefly explains the material's topic, and asks students questions.
Cooperative	The teacher forms students into several groups by taking into account the student's academic abilities. Then the teacher distributes references in the form of books, articles, and reading sheets related to the learning material to answer the questions given
Integrated Reading and Composition	The teacher provides direction so that group discussions occur, guides in finding and understanding concepts, and guides in making mind-mapping answers to questions asked
Publication	The teacher asks the representatives of each group to publish the results of the mind mapping and guide the group presentations.
Closing	Teachers and students make material conclusions. Then the teacher gives a test as a form of practice to determine students' understanding.

In addition to syntax or learning steps, the CIRC learning model with the mind mapping method is also equipped with other components, namely:

a) Social System

The social system is a system that describes the roles and relationships between teachers and students as well as the required norms. The social system in the CIRC learning model with the mind mapping method is that teachers and students are directly involved in each stage of learning. It can be seen from the teacher preparing reading sheets, giving directions, and guiding in each stage of learning. Likewise, students work together and discuss in completing group assignments and are involved in inferring the material.

b) Reaction Principle

The reaction principle describes how teachers view and respond to students in learning activities. The reaction principle in the CIRC learning model with the mind mapping method is that the teacher acts as a motivator, facilitator, and mediator. The teacher motivates students to be enthusiastic in participating in learning activities, prepares what is needed in the learning process, such as learning media,

and guides students when they face difficulties in understanding the material and in completing group assignments and individual assignments.

c) Support System

The support system is all aspects that support the implementation of the learning model. Such as classroom settings, instructional systems, learning devices, facilities, and learning media. In the CIRC learning model with the mind mapping method, the support system is group learning, and the teacher prepares lesson plans and other learning tools, student books, teacher books, tools, and materials for mind mapping.

d) Instructional Impact

The instructional impact is the output or learning outcomes obtained by students directly through the direction of the teacher on the goals to be achieved. In applying the CIRC learning model with the mind mapping method, the instructional impact is to facilitate and improve students' understanding of mathematical concepts, develop creative thinking and improve student learning outcomes.

e) Accompaniment Impact

The accompanying impact is the output or other learning outcomes obtained through learning activities without any direction from the teacher. In applying the CIRC learning model with the mind mapping method, the accompaniment impact is that students can participate actively in groups, respect other people's opinions and instill an attitude of mutual help with fellow group members.

d. Product Validation

After the product is developed, the next step is to validate the product—the product validation of CIRC learning model development with the mind mapping method using expert judgment as formative evaluation. Validation is carried out by learning design experts to determine the feasibility of the learning model developed before being tested. Product validation is carried out until the validator states that the learning model is feasible to be tested.

e. Product Revision

Product revisions are carried out if the results of validation by expert judgment state that it is necessary to improve the products developed. After the product is revised, it is re-validated by expert judgment until it is declared worthy of being tested.

f. Main Product Field Test

The revised product was then tested to find out whether there was an increase in the understanding of mathematical concepts of students who received learning with the CIRC learning model with the mind mapping method and to find out whether there were differences between students who received the application of the CIRC learning model with the mind mapping method and those who received the application of the model. CIRC learning. This step was carried out using an experimental pretest-posttest control group design. The design consisted of two groups: the experimental and the control groups. Both were randomly selected and then given a pretest to determine the students' prior knowledge [24]. In this case, the experimental group will follow the

lesson using the CIRC learning model with the mind mapping method, while the control group will follow the lesson using the CIRC learning model.

3.1.2 Description and Analysis of Differences in Students' Understanding of Mathematical Concepts between Experiment Class and Control Class

Om de analyse te achterhalen van het verschil in het gemiddelde begrip van wiskundige concepten van leerlingen tussen de experimentele klas en de controleklaas, is een analyse uitgevoerd met behulp van SPSS Versie 23-software.

Table 2. Test the mean difference between the experimental class and the control class
Independent Samples Test

	Levene's Test for Equality of Variances		t-test for Equality of Means							
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference		
								Lower	Upper	
NGain_Score	Equal variances assumed	19.201	0,000	8.772	48	0,000	0,12858	0,01466	0,09911	0,15806
	Equal variances not assumed			8.772	29,585	0,000	0,12858	0,01466	0,09863	0,15854

Based on table 2 above, it is concluded that there is a significant difference between the application of the CIRC learning model with the mind mapping method and the application of the CIRC learning model to improve students' understanding of mathematical concepts.

3.1.3 Description of Student Response Data to the Application of the CIRC Learning Model with the Mind Mapping Method

To find out students' responses to the CIRC learning model with the mind mapping method, researchers used a Likert scale with alternative answers: Strongly Agree, Agree, Disagree, and Strongly Disagree. The questionnaire made contains 22 statements developed from 5 indicators, namely indicators of student activity in learning with eight statements, indicators of student interest in learning with four statements, indicators of student creativity in learning with three statements, indicators of student understanding of learning materials with two statements, and indicators of student responses to teachers in learning with five statements. Each indicator consists of positive and negative statements.

The results of the recapitulation of student responses to the application of the CIRC learning model with the mind mapping method to improve students' understanding of mathematical concepts are presented in the following table:

Table 3. Recapitulation of Student Response Questionnaires on the Application of the CIRC Learning Model with the Mind Mapping Method

No.	Indicator	Percentage	Criteria
1.	Student Activities in Learning	85%	Very good
2.	Student Interest in Learning	83%	Very good
3.	Student Creativity in Learning	83%	Very good
4.	Students' Understanding of Learning Materials	73%	Good
5.	Student Responses to Teachers in Learning	70%	Good
	Cumulative	79%	Very good

3.2 DISCUSSION

The research and development carried out aim to determine the validity and effectiveness of the product developed, namely the Cooperative Integrated Reading and Composition (CIRC) learning model with the mind mapping method, which is the result of the development of the CIRC learning model. The development of the CIRC learning model is carried out to increase students' understanding of mathematical concepts.

The research and development method uses the Borg and Gall research and development stages: needs analysis, planning, initial product development, limited testing, product test results revision, main product testing, product revision, wide-scale field testing, final product revision, and dissemination and use [25]. However, the researcher limited the stages of research and development of Borg and Gall. Thus, the stages of research and development used are needs analysis, planning, initial product development, product validation, product revision, and field testing of the main product.

In the needs analysis stage, the researcher conducted a literature study by reviewing the literature from previous research results to obtain information about the problems in the world of education, especially in learning mathematics in schools. The results of the initial analysis show that students' the CIRC learning model that teachers widely use is still not practical or has some shortcomings, and the way students record learning material is still monotonous or less creative. The results of the needs analysis of the researchers are used as the background for conducting research and development.

At the planning stage, the researcher designs a solution to solve the problems obtained at the needs analysis stage. Researchers conduct literature studies to collect information that can be a solution to the problem. From the literature study results, the researchers decided to develop the CIRC learning model, which is expected to increase students' understanding of mathematical concepts. The researcher developed the CIRC learning model by combining the model with the mind mapping method. The choice of mind mapping is based on the advantages of the mind mapping method, which is expected to optimize the CIRC learning model. At the initial product development stage, the researcher compiled the components of the CIRC learning model using the mind mapping method. The components of the learning model consist of syntax or learning steps, social systems, reaction principles, support systems, instructional impacts, and accompaniment impacts. The syntax of the CIRC learning model with the mind mapping method consists of 5 (five) phases, namely orientation, organization (cooperative), understanding of concepts (Integrated Reading and Composition), publication, and closing. In addition, at the product development stage, researchers also compiled a validation sheet for learning models, lesson plans, test instruments, and questionnaires.

In the product validation and revision stages, learning design experts and math subject matter experts validate the development and instruments used. Validation was carried out to determine the validity and feasibility of the CIRC learning model with mind mapping methods, lesson plans, test instruments, and student response questionnaires.

In the main product field test phase, the researcher conducted a field test for students of class VIII A and VIII B MTs PUI Puteri Talaga. Sample selection was made by

random cluster sampling. Class VIII A is an experimental class that will learn with the CIRC learning model with the mind mapping method, while class VIII B is a control class that will learn with the CIRC learning model. Field testing was carried out for six meetings. At the first meeting, a pretest was conducted in both classes to determine the student's initial abilities before participating in the lesson. At the second to fifth meetings, learning activities were carried out. Then at the sixth meeting, a posttest was conducted in both classes to determine the final ability of students after participating in learning activities. There are 12 pretest and posttest questions in the form of descriptions. The pretest and posttest questions are the same questions tested for validity, reliability, difficulty level, and distinguishing power. At the sixth meeting, student response questionnaires were also filled out in the experimental class to determine student responses to applying the CIRC learning model with the mind mapping method.

During four meetings in the experimental class, the researchers applied the CIRC learning model with the mind mapping method. The syntax or steps performed on the model [26], including:

1. Orientation: In this phase, the teacher gives an apperception, conveys learning objectives, and briefly asks students a question.



Figure 2. Orientation Phase

2. In this phase, the teacher forms students into several groups by considering students' academic abilities. Then the teacher distributes references in books related to the subject matter.



Figure 3. Cooperative Phase

3. In integrated reading and composition, in this phase, the teacher provides direction for group discussions, guides students in understanding concepts, and guides them in mind mapping.



Figure 4. Integrated Reading and Composition Phase

4. In this phase, the teacher asks student representatives from each group to present the results of their group discussions, and the teacher guides the presentation.



Figure 5. Publication Phase

5. In closing, in this phase, the teacher and students make material conclusions, then the teacher gives a test as a form of student practice to find out the student's understanding.



Figure 6. Closing Phase

After the pretest and posttest were conducted, the data obtained were analyzed to determine the increase in students' understanding of mathematical concepts in the experimental and control classes. Then after knowing the increase, it was analyzed by statistical tests to find out the difference in the increase in students' understanding of mathematical concepts between the experimental class and the control class. After the results obtained that the data were normally distributed but not homogeneous, a t-test was carried out to determine whether or not there was a significant difference between the experimental class that received the application of the CIRC learning model with the mind

mapping method and the control class that received the application of the CIRC learning model. The t-test was carried out with the help of SPSS version 23 software. The decision-making refers to the significance value (2-tailed). Equal Variances not Assumed obtained a significance value of 0.000 which is smaller than 0.05 (<0.05). Thus, it can be concluded that there is a significant difference between the application of the CIRC learning model with the mind mapping method and the application of the CIRC learning model to improve students' understanding of mathematical concepts.

The research distributed student response questionnaires to the experimental class to find students' responses to applying the CIRC learning model with the mind mapping method; the questionnaire distributed contained 22 statements consisting of positive and negative statements. Student response questionnaires were measured using a Likert scale with four alternative answers, namely Strongly Agree, Agree, Disagree, and Strongly Disagree, with the scoring rules for positive statements 4, 3, 2, 1 and negative statements 1, 2, 3, 4. Student response questionnaire statements are prepared based on indicators of student activity in learning (indicator 1), indicators of student interest in learning (indicator 2), indicators of student creativity in learning (indicator 3), indicators of student understanding of learning materials (indicator 4) and indicators of student responses towards teachers in learning (indicator 5).

The distribution of student response questionnaires aims to determine student responses to applying the CIRC learning model with the mind mapping method: positive (accept) or negative (reject). The recapitulation of the results of the student response questionnaire shows that the percentage of student activity indicators in learning is 85% (excellent), the percentage of student interest in learning is 83% (excellent), and the percentage of student creativity in learning is 83% (excellent). The percentage indicator of students' understanding of learning materials is 73% (good), and the percentage of students' responses to teachers in learning is 70% (good). From these results, it is also known that the cumulative percentage of student response questionnaires is 79% which is included in the excellent criteria, so it can be concluded that student responses to the application of the CIRC learning model with the mind mapping method are positive (accept).

4 CONCLUSION

Based on the research and development results, it was concluded that the validation of learning model design experts and mathematics subject matter experts on The CIRC learning model with the mind mapping method show an average of 4, which is included in the very valid criteria. That shows that the CIRC learning model with the mind mapping method is included in the valid criteria and deserves to be tested. In addition, from the results of the n-gain in the experimental class with the application of the CIRC learning model with the mind mapping method, the average value of n-gain is 0.88, which is included in the high criteria. That shows the increase in students' understanding of mathematical concepts before treatment (pretest) and after treatment (posttest) is 0.88. From the results of the t-test, the significance value (2-tailed) on Equal Variance not Assumed is 0.000, which is smaller than 0.05 (<0.05). That shows a significant difference between applying the CIRC learning model with the mind mapping method and applying

the CIRC learning model to improve students' understanding of mathematical concepts. On the other hand, based on the results of the questionnaire distribution, the average cumulative percentage of student response questionnaires to the application of the CIRC learning model with the mind mapping method was 79% which was included in the very good criteria. That shows that the response of students in the experimental class to applying the CIRC learning model with the mind mapping method is positive (accepting).

REFERENCES

- [1] Pemerintah RI, "Undang-Undang RI Nomor 20 Tahun 2003 Tentang Sistem Pendidikan Nasional," Jakarta, 2003.
- [2] Dimiyati and Mudjiono, *Belajar dan pembelajaran*. Jakarta: Rineka Cipta, 2015.
- [3] S. F. Fauziah, M. A. Misri, and H. Hendri, "Pembelajaran matematika menggunakan media kartu matematika untuk meningkatkan kemampuan pemahaman konsep matematis dan self efficacy siswa," *J. Integr.*, vol. 10, no. 2, pp. 1–12, 2019.
- [4] N. T. Fitri, A. Muchyidin, and R. O. Akbar, "Mastery of Trigonometry Material and Its Effect on Students' Ability to Solving Three Dimensional Problems," *J. Math. Instr. Soc. Res. Opin.*, vol. 1, no. 2, pp. 33–41, 2022.
- [5] C. Moreno Rubio, "Effective teachers-professional and personal skills," *Ensayos Rev. la Fac. Educ. Albacete*, no. 24, pp. 35–46, 2009, [Online]. Available: <http://dialnet.unirioja.es/servlet/extart?codigo=3282843%5Cnhttp://dialnet.unirioja.es/descarga/articulo/3282843.pdf>.
- [6] A. H. Sequeira, "Introduction to Concepts of Teaching and Learning," *SSRN Electron. J.*, no. September 2012, 2012, doi: 10.2139/ssrn.2150166.
- [7] K. M. Oliver and D. T. Stallings, "Preparing Teachers for Emerging Blended Learning Environments," *J. Technol. Teach. Educ.*, vol. 22, no. 1, pp. 57–81, 2014.
- [8] Munawaroh, "The Influence of Teaching Methods and Learning Environment to the Student's Learning Achievement of Craft and Entrepreneurship Subjects at Vocational High School," *Int. J. Environ. Sci. Educ.*, vol. 12, no. 4, pp. 665–678, 2017.
- [9] Isrok'atun and A. Rosmala, *Model-model pembelajaran matematika*. Jakarta: Bumi Aksara, 2018.
- [10] Kosim, "Application Ability of Students in Integrated Computer-Aided Numerical Analysis Learning," *J. Math. Instr. Soc. Res. Opin.*, vol. 1, no. 1, pp. 54–62, 2022.
- [11] C. Lee, M. Ng, and G. M. Jacobs, "Cooperative Learning in the Thinking Classroom: Current Research," *Educ. Pract. Theory*, vol. 20, no. 1, pp. 59–73, 2013, doi: 10.7459/ept/20.1.07.
- [12] T. F. Silalahi and A. F. Hutauruk, "The Application of Cooperative Learning Model during Online Learning in the Pandemic Period," *Budapest Int. Res. Critics Inst. Humanit. Soc. Sci.*, vol. 3, no. 3, pp. 1683–1691, 2020, doi: 10.33258/birci.v3i3.1100.
- [13] M. Nurjamaludin, W. S. Nugraha, E. F. Suryaningrat, and N. Alani, "The effect of make a match cooperative learning model on student learning outcomes in grade IV Mathematic subjects," *J. Phys. Conf. Ser.*, vol. 1987, no. 1, 2021, doi: 10.1088/1742-6596/1987/1/012041.
- [14] I. Yuliasri, "Cooperative Learning for Undergraduate Translation and Interpreting Classes," *English Lang. Lit. Int.* ..., pp. 2–7, 2017, [Online]. Available: <https://jurnal.unimus.ac.id/index.php/ELLIC/article/view/2604>.
- [15] G. M. Jacobs and W. A. Renandya, *Student centered cooperative learning linking concepts in education to promote student learning*. Singapore: Springer, 2019.
- [16] M. Calderón, R. Hertz-Lazarowitz, and R. Slavin, "Effects of Bilingual Cooperative Integrated Reading and Composition on students making the transition from Spanish to English reading," *Elem. Sch. J.*, vol. 99, no. 2, pp. 153–165, 1997.
- [17] P. A. Rahmi, "Penerapan Model pembelajaran Needham Terhadap Pemahaman Konsep Siswa Kelas VIII Darul Ihsan," Universitas Islam Negeri Ar-Raniry, 2019.
- [18] Mendikbud, *Peraturan Menteri Pendidikan dan Kebudayaan Republik Indonesia Nomor 103 Tahun 2014 Tentang Pembelajaran Pada Pendidikan Dasar dan Pendidikan Menengah*. Indonesia, 2014.
- [19] T. Buzan, *Buku Pintar Mind Map*. Jakarta: Gramedia Pustaka Utama, 2006.
- [20] E. Monariska, "Penerapan Metode Mind Mapping Untuk Meningkatkan Kemampuan Pemahaman Konsep Matematis Mahasiswa Pada Mata Kuliah Kalkulus I," *J. Prism.*, vol. VI, no. 1, pp. 17–31, 2017.
- [21] N. Izzati, "Meningkatkan Kemampuan Pemahaman Konsep Matematis Mahasiswa pada Mata Kuliah

-
- Kapita Selektta melalui Penerapan Model Pembelajaran Mind Mapping,” *EduMa*, vol. V, no. 2, pp. 60–69, 2016.
- [22] J. P. Gall, M. D. Gall, and W. R. Borg, *Applying Educational Research: How to Read, Do, and Use Research to Solve Problems of Practice*, 6th ed. Essex: Pearson Education Limited, 2014.
- [23] I. M. Nur, “Pengembangan Media Pembelajaran Animathica Berbasis Web Menggunakan Blog Pada Materi Bangun Datar Untuk Siswa SMP,” Universitas Muhammadiyah Malang, 2018.
- [24] Sugiyono, *Metode Penelitian Kuantitatif, Kualitatif, dan R&D*. Bandung: Alfabeta, 2017.
- [25] A. Hamzah, *Metode Penelitian Dan Pengembangan (Research & Development) Uji Produk Kuantitatif Dan Kualitatif Proses Dan Hasil*. Malang: Literasi Nusantara, 2019.
- [26] R. E. Slavin, *Cooperative learning : teori, riset dan praktik*, 15th ed. Bandung: Nusamedia, 2015.
-

