P-ISSN: 2776-7329, E-ISSN: 2776-7310
Proceedings
5th Vocational Education International Conference
Semarang, 13 July 2023

Mind Map Method in Improving Basic Learning Outcomes of Metal Treatment in Grade X Students of Machining Engineering SMK Negeri 2 Makassar

Badaruddin Anwar* and Rudianto

Makassar State University
*Email: badaruddin.anwar@unm.ac.id

ABSTRACT
This research is a Class Action Research (*Classroom Action Research).* that aims to improve student learning outcomes in the basic subject of metal treatment class X machining techniques SMK Negeri 2 Makassar. The subject of this research consisted of 30 students. The data collection technique used is to use descriptive analysis. Descriptive analysis shows that the learning outcomes based on the initial test are categorized in the low group with an average value of 54.13, with a percentage of 16.67% after the application of the *Mind Map method* in cycle I show an increase in learning outcomes with an average value of 61.67, with a percentage of 56.67 %. in cycle II there was an increase with an average value of 76.50, with a percentage of 80.00%, So the increase in the average value from cycle I to cycle II was 14.83 with learning completeness of 23%, student activity in the learning process carried out also increased, this can be seen from the observations in each cycle which experienced an increase.

Keywords*: Mind Map, Learning Outcomes, Basic Metal Treatment.*

1. INTRODUCTION

In the development of an increasingly modern era, especially in the era of globalization like Now, this demand exists for source Power quality human high. enhancement quality source Power man is a precondition absolute for reaching objective development. and is one vehicle for increasing quality source Power man is education.

Education is business aware for developing potency source Power man through activity teaching. Constitution system education National No. 20 of 2003, stated that: the purpose of education national is to educate life nation and develop Indonesian people completely that is pious men to God Almighty and virtuous noble character, possess knowledge and skills, physical and spiritual health, strong and independent personality as well as responsibility society and nationality [10].

Implementation of applied education and teaching processes throughout the homeland, yes, Of course, No regardless of demands of the times and needs inclined education involves whole aspect public in a process of interaction and communication. start from level education base until college high [11].

In the world of education, learning is the very basic thing that is not free from life for everyone. along with developing society, the government makes an effort to increase quality education. This is a must in the world of education. To Increase quality education source Power creative and innovative human being, capable finish actual problems in life and can create technology new as repair circumstances before, require careful planning, therefore That knowledge No can move so just from a teacher to a student but must be through the process. student you have to interpret what has taught with adapt to experience them. knowledge or understanding formed by students in a manner active, not only accepted in a manner passive by their teacher [12].

Use paradigm learning constructive for activity teaching-learning in class, change paradigm Study the happened change focus learning from Study teacher-centered Study student-centered [25].

In the learning process teach often very student experience constraints, like not enough understanding material, being lazy, sleepy, bored, and so on. Student owns different abilities in accepting the material presented by the teacher, there is the easy student who understands material delivered by the teacher and there

are also students who do not easily understand the material conveyed by the teacher, so application draft expected biology in life daily No realized with good [24].

Based on observations made at SMK Negeri 2 Makassar, Learning Still happens in One direction learning is Still teacher-centered (student center), and problems with the impact on results Study low students. it can be seen from the mark results Study student students who are still below the standard mark criteria completeness minimum (KKM) is 70, meanwhile mark results acquired learning students under KKM. Based on the source obtained the achievement mark students in lessons biology do Not yet fulfill KKM [1].

Rahmi Nazliah et al, The Effect of the Mind Mapping Learning Model on Other Outcomes It's the learning model used by teachers in schools Still Not yet in accordance with process activities Study teachers and students not enough active during activity Study teaching [16].

Learning models that can help increase results Study one of the students is by using a variety of models, students will increase results learning [12].

Selected models in study This is a Mind Mapping learning model. Mind Mapping learning model or map mind is one method to record material easy lessons students learn [2].

Mind Mapping can also be categorized as a technique that records creative, deep more explanation simple, map mind (*Mind Mapping*) is something technique noted that developed a style of visual learning. mind map mix and develop potency Work the brain inside self - someone [4].

Mind Mapping Can be called A map the great route for memory, maybe We compile facts and thoughts such as shape so that the method Work experience brain involved from an early. Stage variations of learning models is very necessary thing carried out by the teacher so that the learning brought by the teacher is more interesting and create student Spirit For following learning to be brought by the teacher [5].

Learning models are something plans made as an effort to create an atmosphere conducive to learning so that objective expected learning can be achieved with time effectively and efficiently. Learning models is something pattern planning learning used in the teaching and learning process [6].

In the research conducted, researchers choose to apply the *Mind Mapping* model in an effort to overcome obstacles. Mind Mapping was first developed by Tony Buzan alone psychologist from England. *Mind Mapping* is a mapping process thought to connect a draft specified into an interesting and creative essay resembling a map city, so the draft from learning will easy Understood by the brain [4].

In line with Buzan's opinion stated *Mind Mapping* is the method easiest for putting information in the brain and taking information when needed [4].

Besides that, the *Mind Mapping model* is an enabling learning model the second part brain in learning. activation second part brain is something effort so that the learning process is accepted by the student walk with well because law brain according to Windura that is brain tend balancing second function part his brain (*balance*) [4].

The Mind Mapping Model is something effort to enable the second function brain in learning.

The use of *Mind Mapping* models will bring benefits for students in learning, including (1) helping students remember something thing (2) helping to make notes (3) helping in issuing ideas (4) making effective and utilizing time well (5) can make more concentration (6) helps for exam [4].

As for steps in making do with methods and materials simple. According to Windura steps in making *Mind Map* is as follows:(1) Set up the ingredients to make a Mind Map: paper plain white and a ballpoint pen or whiteboard marker color, (2) Position paper in circumstances horizontally (landscape), (3) Determine topic main be written, (4) Create center *Mind Map* in the middle paper form picture or given title, (5) Create branch main which is radiating branch direct from mind map center. Then filled with keywords as well as use different colors for every different branch, (6) Information written above branch in the form of keywords no form sentence, (7) Develop branch main with branch other with related information with branch main. So that *Mind Mapping* model learning is held in accordance with the steps that have been prepared. In the next stage, the implementation of the teacher controls and guides the student in the learning process as well as gives help to the difficulties faced by students during the learning process or at the moment student take note meter learning using the *Mind Mapping* model [28].

2. METHOD

Making a map draft can done with follow steps, as following: 1) start at the section middle paper blank that side length laid flat; 2) use picture or Photo for the central idea; 3) use color; 4) connect branches main to picture center and connect branches second degree and ribs to level one and two and so on; 5) make a curved line, not a straight line; 6) use one keyword for each line; 7) use image [4].

To create a customized main map with objective learning. existing concepts chosen arranged in a manner in order, for the most common concept placed in the middle and sorted to lower or side in accordance level it's inclusive. For connecting two or more drafts that an inclusive concept with less concept inclusive depicted

underneath, then will obtain something from the hierarchy on the map concept. connecting words must use to connect between concepts that use the line or sign arrows pointing to related concepts with him [15] [17].

a number of steps taken in internal mind map creation learning in the classroom are as follows:

1. choose a topic for mapping the mind. the topic can form; a problem or issue about desired ideas, concepts, or new skills taught, research is a must be carried out by the participants educate.

2. provide media in the form of paper, pen, and any other resources you think you can afford to help participants educate and make maps interesting thought.

3. give tasks for the participants to educate for map mind.

4. results from map thought presented ahead of class. [16].

3. RESULTS AND DISCUSSION

3.1. Preliminary Test

Study results in the student before applied method approach-based problem (Scratch test) results in Study base metal student technical grade X machining SMK Negeri 2 Makassar before applied learning with using *Mind Map* are:

Table 1. Mastery Score Statistics Students on Preliminary Test

Statistics	Value
Subject	30
Ideal score	100
Maximum score	70
Min score	20
Average Score	47.00

Source: 2021 Research Results

Table 1. shows that the ideal value of 100, the value maximum of 70, the minimum value of 20, and the average value of 47.00, so if the mark results Study students the grouped based on technique categorization standards set by the Ministry of Education and Culture [10], then distribution process is obtained frequency and presentation mark results Study student can see in the following table:

Table 2. Distribution frequency and percentage mastery students on the test early.

No	Score	Category	Frequency	Percentage (%)
1	90-100	Very Good	-	-
2	70-89	Good	5	16,67
3	60-69	Enough	5	16,67
4	30-59	Low	16	53,33
5	0-29	Very Low	4	13,33
Amount			30	100

Source: 2021 Research Results

Based on Table 2, see that of the 30 students who used subject study No There is student are in the very good category, 5 students (16.67%) are in the category good, 5 students (16.67%) are in the category medium, 16 students (53.33%) are in the category less, and 4 students with the percentage (13.33%) is in the very less category.

If the average value of the results Study student ie 47.00 is connected with a category such, then the average value of the results Study student is in category less. matter This means level results Study eye student lesson base treatment metal in engineering class X machining at SMK Negeri 2 Makassar on the test beginning are in a category less and no complete results learn it.

Table 3. Distribution frequency completeness Study students on the test beginning

Score	Frequency	Percentage (%)	Category
0 - 69	25	83,33	No complete
70 - 100	5	16,67	complete

Source: 2021 Research Results

Table 3, shows that of 30 students only 5 students reached the value 70 with a percentage of 16.67 % incl in the category complete, while 25 students reached the mark under 70 with a percentage of 83.33% incl in category No complete. matter This show that needs held improvement in the learning cycle I

3.2. Cycle I

Cycle I was carried out for 4 meetings with apply the Mind Map method and data obtained from a sheet given work to students at the end of the cycle. Based on the analysis of the results descriptive score results in Study student class X Mechanical Engineering SMK Negeri 2 Makassar after applying The Mind Map method in cycle I is as follows:

Table 4. Mastery Score Statistics student cycle I

Statistics	Value
Subject	30
Ideal score	100
Maximum score	80
Min score	30
Average Score	61,67

Source: 2021 Research Results

Based on table 4, shows that the ideal value of 100, the value maximum of 80, the minimum value is 30 and the average value is 61.67, so if the mark results Study student the grouped based on technique categorization set standards.

Table 5. Distribution Frequency and percentage mastery students in cycle I

No	Score	Category	Frequency	Percentage (%)
1	90-100	Very Good	-	-
2	70-89	Good	17	56,67
3	60-69	Enough	2	6,66
4	30-59	Low	11	36,67
5	0-29	Very Low	-	-
Amount			30	100

Source: 2021 Research Results

In Table 5, it can be seen that of the 30 students who were made subject study No There is student are in the very good category, 17 students (56.67%) are in the category well, 2 students (6.66%) are in the category sufficient, and 11 students (36.67%) are at low, and not There is the student is in the very low category. The average value of the results Study student of 62.67 connected with a category such, then the average value of the results Study student is in category ok.

Table 6. Distribution frequency completeness Study students in cycle I

Score	Frequency	Percentage (%)	Category
0 – 69	13	43,33	No complete
70 - 100	17	56,67	complete

Source: 2021 Research Results

Table 6, shows that of 30 students there were 17 students reached a value of 70 and above with a percentage of 56.67 % in the category complete, and 13 students reached a value below 70 % with a percentage of 43.33% incl in category No complete. matter This show that exists enhancement results Study students in the cycle I saw from amount achieving students complete increase to 17 people.

Based on the analysis of the results of the observation cycle I show a change in students during activity Study teach going on, like the following:

1. Research results in the presence of students, by 90%
2. Understanding students about making a Mind Map in the first cycle around 50.8%
3. Requesting student explanation, in the first cycle of 55.80%
4. Students who do percentage by 54.10%
5. Chaotic and disruptive student moment Study of 45.80%.

Based on the evaluation of the results, can conclude that to see enhanced results Study students so can continue in cycle II with a drip focus on things following:

1) students were directed to do learning independently,
2) students were pushed to ask when There is part really material not yet understandable,
3) students were guided more intensively in making *Mind Map.*

3.3. Cycle II

Based on the analysis of the results descriptive, then the score statistic results Study student technical grade X machining SMK Negeri 2 Makassar after learning with the Mind Map method in cycle II is as follows:

Table 7. Mastery Score Statistics Students in Cycle II

Statistics	Value
Subject	30
Ideal score	100
Maximum score	90
Min score	50
Average Score	76.50

Source: 2021 Research Results

Table 7, shows that the ideal value of 100, the value maximum of 90, the minimum value is 50 and the average value is 76.50, so Mark results Study students are then grouped based on the technique categorization standard set, then the distribution process is obtained frequency and percentage mark results Study student as follows:

Table 8. Distribution Frequency and Percentage mastery students in cycle II

No	Score	Category	Frequency	Percentage (%)
1	90-100	Very Good	4	13,33
2	70-89	Good	20	66,67
3	60-69	Enough	3	10.00
4	30-59	Low	3	10.00
5	0-29	Very Low	-	-
Amount			30	100
Average Score			76.50	

Source: 2021 Research Results

Based on table 8. shows that 30 students were made respondents there were 4 students (13.33%) were in the very good category, 20 students (66.67%) were in the poor category well, 3 students were in the category enough (10%), and 3 students are in category low (10%), with the average score of the results Study base treatment metal of 77.41 with category ok. matter the means that average yield Study base treatment metal, students technical grade X machining at SMK Negeri 2 Makassar, in cycle II in category ok.

Table 9. Distribution frequency completeness Study students in cycle II

Score	Frequency	Percentage (%)	Category
0 – 69	6	20.00	No complete
70 - 100	24	80.00	complete

Source: 2021 Research Results

Table 9. shows that of the 30 students who became respondents, there were 24 students who reached a value of 70 and above with a percentage of 80.00% with the category complete, while 6 students achieved a mark under 70 with a percentage of 20.00% in the category No complete. matter This show that exists enhancement results Study student seen from amount achieving students complete increase to 24 people.

Based on the results of observation research, change data students during learning process activities teach took place in cycle II as follows:

1. Research results in the presence of students the more increased, in cycle I attendance student by 90%, and in cycle II increased to 98%. matter This show student feel like with method of learning *Mind Map.*
2. Students who understand Mind Map creation experience upgrade, this was seen in the first cycle around 50.8% and in the second cycle increased to 75.00%. matter This show makes notes in the form *Mind Map*.
3. Students who ask for an explanation experience a decrease, wherein the first cycle of 55.80% and decreased to 32.50% in cycle II. matter This happen Because student starts to understand learning *Mind Map*.
4. Students who do presentations experience an increase, in the first cycle of 54.20% and to 78.30% in the second cycle. matter This caused Because students realize with percentage *Mind Map* material easier to remember.
5. Students who are noisy and disturbing during the learning process teach experience a decrease, in the first cycle of 45.80% decrease in the second cycle of 20.80%. matter This is caused because students start to realize with his behavior will make, they didn't pass the class base treatment metal.

4. CONCLUSION

Based on the results of ongoing research for two cycles, can conclude that there are enhancement results Study base treatment metal with the application method *Mind Map* on the student's technical grade X machining at SMK Negeri 2 Makassar. where in the first cycle the average value of 61.67 as well and completeness to learning by 56.67% and in cycle II increased the average value of 76.50 was good completeness to learning by 80.00%, So enhancement of the average value from cycle I to cycle II of 14.83 with completeness learn by 23%.

AUTHORS' CONTRIBUTIONS

Based on the results research, they can be advised, as follows:

1. Application learning with the use method *Mind Map* need management class with a good time, so needed planning activity learning to use time in learning can be more effective.
2. Learning with the method *Mind Map* can use as alternative activity learning base treatment metal in SMK because the method *Mind Map* can increase motivation Study student

ACKNOWLEDGMENTS

1. Saying accept love be delivered to the Rector of UNM above directions and coaching during the activity process study going on.
2. Saying accept love be delivered to the Dean of FT UNM who has given permission to research and conduct monitoring and evaluation activity study until done.

Accept thanks to the SMK Negeri 2 Makassar which has been involved direct as a partner and placed in the implementation study.

REFERENCE

[1] Campbell, J. (2015). Complete casting handbook: metal casting processes, metallurgy, techniques and design. Butterworth-Heinemann.

[2] Astriani, D., Susilo, H., Suwono, H., Lukiati, B., & Purnomo, A. (2020). Mind mapping in learning models: A tool to improve student metacognitive skills. International Journal of Emerging Technologies in Learning (iJET), 15(6), 4-17.

[3] Johnson, D. W., Johnson, R. T., & Holubec, E. J. (1994). The new circles of learning: Cooperation in the classroom and school. ASCD.

[4] Bambang, G., Prihadi, B., Girindraswari, N. A., Retnowati, T. H., & Tyas, W. P. (2019, June). Effectiveness of the Application of Mind Maps in Learning Illustration in Elementary Schools. In International Conference on Art and Arts Education (ICAAE 2018) (pp. 245-249). Atlantis Press.

[5] D'Antoni, A. V., & Zipp, G. P. (2006). Applications of the mind map learning technique in chiropractic education: A pilot study and literature review. Journal of Chiropractic Humanities, 13, 2-11.

[5] Erdem, A. (2017). Mind Maps as a Lifelong Learning Tool. Universal Journal of Educational Research, 5(n12A), 1-7.

[6] Keswari, P. H., & Abadi, I. B. G. S. (2022). Improving Mathematical Knowledge Through The Student Facilitator And Explaining Learning Model Assisted By Fraction Board Media. Journal for Lesson and Learning Studies, 5(3), 420-428.

[7] Gao, X., Wang, L., Deng, J., Wan, C., & Mu, D. (2022). The effect of the problem based learning teaching model combined with mind mapping on nursing teaching: A meta-analysis. Nurse Education Today, 111, 105306.

[8] Wahidaturrahmi, W., Sari, M. P., Hayati, L., Kurniawan, E., & Astria, F. P. (2021, May). Analysis of Student Perceptions about Online Lectures in Terms of Student Learning Styles: Study of the Covid-19 Pandemic. In 2nd Annual Conference on Education and Social Science (ACCESS 2020) (pp. 80-83). Atlantis Press.

[9] LESTARI, N. (2017). Implementation of Cooperative Learning Model Type Stad with Mind Map to Improve Accounting Learning Activities of Class XI AK 4 Students of SMKN 2 Purworejo Academic Year 2016/2017. Skripsi.

[10] Sukasni, A., & Efendy, H. (2017). The problematic of education system in Indonesia and reform agenda. International journal of education, 9(3), 183.

[11] Sukasni, A., & Efendy, H. (2017). The problematic of education system in Indonesia and reform agenda. International journal of education, 9(3), 183.

[12] Zubaidah, S., Fuad, N. M., Mahanal, S., & Suarsini, E. (2017). Improving creative thinking skills of students through differentiated science inquiry integrated with mind map. Journal of Turkish Science Education, 14(4), 77-91.

[13] Huda, S., Buditjahjanto, I. A., & Yundra, E. (2019, December). Robotic Learning Media Development for D3 Students of Information Management Unesa. In 1st Vocational Education International Conference (VEIC 2019) (pp. 206-213). Atlantis Press.

[14] Agboola, J. B., Abubakre, O. K., Mudiare, E., & Adeyemi, M. B. (2015). Effects of Bath Temperature on Cooling Rate, Mechanical properties and microstructure of medium carbon steel during quenching operations.

[15] Prastiwi, D., Haryani, S. H. S., & Lisdiana, L. (2018). The effectiveness of guided inquiry with mind mapping to improve science process skills and learning motivation. Journal of Primary Education, 7(2), 195-203.

[16] Nazliah, R., Harahap, R. D., & Hasibuan, E. R. (2019). Pengaruh model pembelajaran mind mapping terhadap hasil belajar siswa pada materi respirasi di kelas XI SMA Negeri 2 Bilah Hulu. Jurnal Biolokus: Jurnal Penelitian Pendidikan Biologi dan Biologi, 2(2), 180-185.

[17] Septiani, A. N. N. S. I., & Rejekiningsih, T. (2020). Development of Interactive Multimedia Learning Courseware to Strengthen Students' Character. European Journal of Educational Research, 9(3), 1267-1280.

[18] Redhana, I. W., Widiastari, K., Samsudin, A., & Irwanto, I. (2021). Which is more effective, a mind map or a concept map learning strategy?. Jurnal Cakrawala Pendidikan, 40(2), 520-531.

[19] Rezapour-Nasrabad, R. (2019). Mind map learning technique: An educational interactive approach. International Journal of Pharmaceutical Research, 11(1), 1593-1597.

[20] Purwaningroom, D. L., Ishii, T., Setiowati, T., Munawaroh, S., & Rosjidi, C. H. (2019). he Analysis of Antihypertensive and Toxicity Potential of Cantaloupe (Cucumis melo var. cantalupensis) Methanol Extract.

[21] Dirgeyasa, I. W. (2017). College Academic Writing A genre-based perspective. Prenada Media.

[22] Irman, I. (2019). The effectiveness of mind mapping techniques in counseling of enhancement ability memory students in learning. Ta'dib, 22(2), 131-140.

[23] Sari, R., Sumarmi, S., Astina, I., Utomo, D., & Ridhwan, R. (2021). Increasing students critical thinking skills and learning motivation using inquiry mind map. International Journal of Emerging Technologies in Learning (iJET), 16(3), 4-19.

[24] Danielson, C. (2007). Enhancing professional practice: A framework for teaching. AsCD.

[25] Lang, J. M. (2021). Small teaching: Everyday lessons from the science of learning. John Wiley & Sons.

[26] Pujawan, I. N., Vanany, I., & Baihaqi, I. Organized by: Laboratory of Logistics and Supply Chain Management, Industrial Engineering Department, Institut Teknologi Sepuluh Nopember (ITS) Surabaya-Indonesia.

[27] Emaliana, I., Puspitasari, I., & Mulia, D. R. (2022). Student-teachers' ideas for research in ELT. Media Nusa Creative (MNC Publishing).

[28] Adimah, N. (2022). Penggunaan Media Mind Mapping untuk Meningkatkan Aktivitas Siswa dalam Pembelajaran Pendidikan Kewarganegaraan. Lucerna: Jurnal Riset Pendidikan dan Pembelajaran, 2(1), 9-15.

[29] de OLIVEIRA, L. C., GUERINO, G. C., de OLIVEIRA, L. C., & PIMENTEL, A. R. (2023). Information and communication technologies in education 4.0 paradigm: a systematic mapping study. Informatics in Education, 22(1), 71-98.

[30] Willis, C. L., & Miertschin, S. L. (2006). Mind maps as active learning tools. Journal of computing sciences in colleges, 21(4), 266-272.