The Application of Mind Mapping Learning Model to Improve the Students' Learning Outcomes and Liveliness

Allan Renaldi Saputro[1], Basori[1], Cucuk Wawan Budiyanto[1]

[1] Informatics and Computer Engineering Education, Universitas Sebelas Maret, Jl. Jend. Ahmad Yani 200A Pabelan, Kartasura, Sukoharjo, Indonesia.

ABSTRACT

The objective of this research is to improve the students' learning outcomes and liveliness through the application of Mind Mapping model in learning web programming. The problems in this research are the existence of a class that still uses the conventional methods, and the value of the students' learning outcomes and liveliness is still under completeness. The research adopted a mixed research method, comprises pre-test/post-test and observation data collection. The data used in this research is through assessment test with cognitive aspects of the pre-test. While to assess the aspects of students' affective, psychomotor, and liveliness is using observation sheets. After the implementation of two cycles of study, the performance assessment indicated the increase in four aspects of learning namely cognitive, affective, psychomotor, and liveliness. The novelty of this research is the use of liveliness as the parameter of classroom action research. This contributes to the three conventional parameters of learning in Bloom Taxonomy.

Keywords: Learning Outcome; Liveliness; Mind Mapping; Web Programming.

INTRODUCTION

Entering the global era, Indonesia must be able to compete with other countries, both in products, services and in the preparation of human resources. Vocational education as one of the sub-systems of national education is expected to prepare and develop human resources that can work professionally in the field, as well as competitive in the world of work [22]. The course of vocational education, however, faced the challenges related to the rapid changes in employment including the negative stigma of vocational graduates that inhibit the progress of training itself. The availability of facilities and infrastructure, the burden of study is growing, study time is dense, and other problems that demanded immediately addressed in the midst of this globalization. An alternative learning method, therefore, is needed that can help students in learning. According to Sujana [21], teachers undertake the teaching methods tend to carry out the instruction conventionally. Such classroom condition drives the student to be passively attending the class. In contrast, teachers should be actively delivering instruction during the class hours.

The Mind Map is a way of noting the creative, effective, and quite literally would be "mapped" human's thoughts [3]. Mind mapping methods can be used as a means of

fitting to make learning methods because, with the methods, a student can take notes with full color. Researchers employ mind mapping learning model as it is appropriate for learning and widely used in various fields of research. Parikh [17], for instance, revealed that mind mapping techniques are more effective than the traditional method. Mind mapping is conceived to have a better ability to memorize than regular way of text writing [14]. Moreover, Liu [15] advocates that Mind Mapping potentially promote teaching efficiency and improve students' ability of practical application. Students tend to cultivate a good habit of thought, aiming at the application of mind mapping in learning.

Despite Mind mapping has been applied in various fields of research, the application of Mind Mapping to increase students' performance and liveliness has not been adequately elaborated. Few if any, delved deeper on the benefits of Mind Mapping as suggested by Buzan [4]. This research contributes to knowledge and literature by investigating two aspects of Buzan's proposed benefits of implementing mind mapping namely the liberating rules, and fun and memorable learning.

LITERATURE REVIEW

Tony Buzan suggested the conception of Mind Mapping Method in the early 1970s. Tony Buzan in his book [4]. "Smart Book Mind Map," advocated that Mind Mapping be a creative, effective, and way of mapping the human's thoughts. According to Caroline Edward [10], Mind Mapping is the depicted as the most effective and efficient way to enter, store and extract data from or to the brain. This system works according to the natural workings of our brains, to optimize the overall potential and capacity of the human brain. A similar thought was suggested by Melvin L. Silberman [20]. He conceived that mind mapping is a creative way for students to record what they have learned, generate ideas, or a new task decision. By using this method, students are expected to understand the material first before recording in the form of Mind Mapping. Students can write and decorate by their creations. From some of the above sources can be interpreted by way of mind mapping is a recording technique that can map the creative and effective mind and unite the potential work of the brain either the right brain hemisphere or the left hemisphere in the person

The mind mapping can be applied to numerous area of practices, for example, in the design of health data management system [5]. Mind mapping is believed to improve the visualization of ideas for a better health data management system. Mind mapping also excels in conceptualizing constructivist learning in technical disciplines [18]. The practice of making collective mind maps using the initial word structure has a positive impact on the quality of learning among the community of learners. The application of mind mapping in a higher education indicated a significant improvement in the students' learning outcomes in comparison to students attending lecture class. Another example of the use of mind mapping in education is in the automotive electrical course [12]. A quasi-experimental study indicated that the mind mapping method is believed to be the driver for a higher performance of the students.

Mind mapping benefits users in several ways. The first advantage is the direct value derived by teachers during learning processes [16]. Mind mapping allows student be conveniently capturing their thought as it is facilitating the development. It works well both collaboratively or during the individual learning [1]. Mind mapping is beneficial

for creative processes such as writing [24]. Students participating in an open-ended questionnaire research responded that mind mapping helps them organize their ideas effectively. Topic comprehension and their writing were improved to the extent that they can be easily articulating ideas.

RESEARCH METHODS

A mixed method research was conducted involved 35 high school students. The quantitative aspect of research employed a pre-test/post-test design of a web programming course. The qualitative technique of data collection, on the other hand, carried out by observing student's behavior during the course. Triangulation of data was exercised by the variety of data collection technique and the types of data collected from multiple sources. Quantitative information in the form of a cognitive test instrument validated its contents with the how to make a lattice and the validity of the test by the teacher. Data analysis technique used in this research is a qualitative and descriptive method to calculate its data using quantitative methods of evidence obtained in the form of test results.

Research performance indicators are the success criteria or targets to be achieved by a given action. The performance of the research is indicated by the increase in the score and the liveliness of the learners by more than 70%. Learners learn thoroughly if the stated value of the results of the study of cognitive, affective, and psychomotor respectively has reached the Minimum Exhaustiveness Criteria (MEC). The MEC of the learning outcome of cognitive, psychomotor, affective domain and the liveliness of the classroom are 75.

TABLE I. RESEARCH PERFORMANCE INDICATORS

The measured aspects	The percentage of targeted Learners	How to measure
The results of cognitive domain learning	≥ 70%	Measured from the test results.
The results of studying the affective realm	≥ 70%	Measured by observing student's behavior during learning activities.
Psychomotor domain of learning results	≥ 70%	Measured through observations while learning process was taking place. A psychomotor sheet was applied.
The liveliness of the learners when the learning process takes place	≥ 70%	Measured through observations during the learning process. A liveliness observation sheet was employed. Liveliness was calculated from the number of learners who indicated such behavior.

Each cycle consists of four stages of activity, i.e., planning, implementation, observation, and reflection. It complied with Dwitagama and Kusumah's [8] model of Classroom Action Research that was similar to Kemmis & Taggart's model. It comprises four components, namely: action plan (planning), action (acting), observation (observing), and reflection (reflecting). All four elements constitute one cycle of activities. According to Daryanto [6], a class action research should be enumerated starting from planning, implementation of the measure, observation, and evaluation of

analysis and reflection which encompasses the cycles the action. He argued that the number of cycles perform depend on the satisfaction of researchers, but should be more than one cycle and a minimum of two cycles of action. The cycle is depicted in Figure 1.

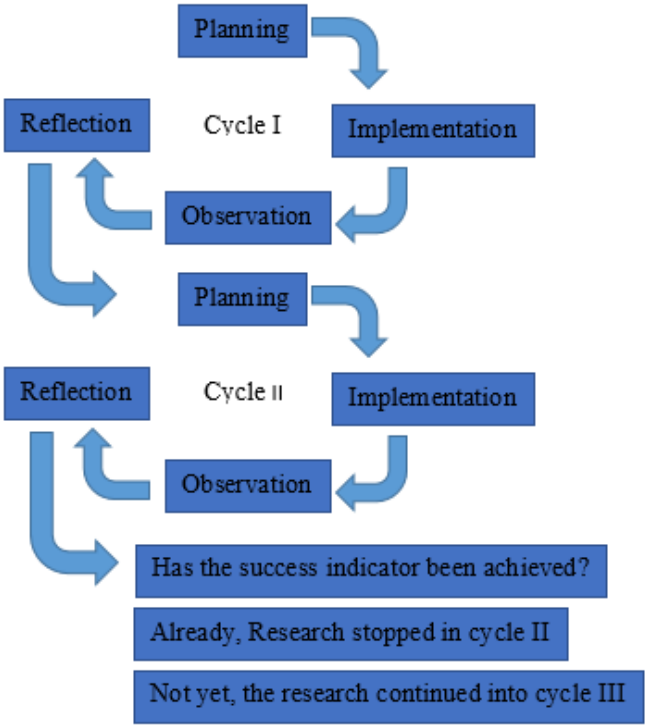

Figure 1. Classroom Action Research Procedures (derived from Dwitagama and Kusumah [8])

RESULTS

Evaluation of the Affective Outcome

A comparison of the average results of affective learners observation for each cycle can be seen in Table II.

TABLE II. THE EVALUATION OF AFFECTIVE OBSERVATION OUTCOME

No.	Achievement Of Learning Outcomes Affective	**Pre-cycle**	Cycle I	Cycle II
1.	Mastery learners (the value of ≥ 75)	15	23	30
2.	Learners who hadn't (the value < 75))	20	12	5
3.	The average value	66.43	74.14	77.57
4.	Completeness percentage	42.86%	65.71%	85.71%
5.	Uncompleteness percentage	57.14%	34.29%	14.29%

Table II indicated the proportion of affective learning outcomes that tend to increase in every cycle. The percentage of completeness of the affective learning outcomes

during the pre-cycle was 42.86%. While tt was measured before the application of Mind Mapping, the average value was 66.43.

After the application of the Mind Mapping learning model, the percentage of affective completeness learning outcomes, learner experience increases over cycles as of 65.71% in the Cycle I to 85.71% in Cycle II. The average value rose by 3.13 points from cycle I to cycle II. It is concluded that the application of Mind Mapping model improves learners' affective learning outcomes.

The Evaluation of Cognitive Results

A comparison of the average cognitive test results learners over cycles can be seen in Table III.

TABLE III. THE EVALUATION OF COGNITIVE RESULT

No.	Achievement Of Learning Outcomes Affective	**Pre-cycle**	Cycle I	Cycle II
1.	Mastery learners (the value of ≥ 75)	16	22	30
2.	Learners who hadn't (the value < 75))	19	11	5
3.	The average value	70.08	70,46	77,57
4.	Completeness percentage	45,71%	66,67%	85,71%
5.	Incompleteness percentage	54,29%	33,33%	14,29%

Table III depicted the percentage of cognitive learning outcomes that tend to increase in every cycle. In the percentage of completeness of the cognitive learning outcomes before the application of the method was 45.71%. While it was measured before the application of the Mind Mapping, the cognitive observation score was 70.08.

After the application of the Mind Mapping learning model, the percentage of cognitive completeness learning outcomes, the learner experience increases over cycles as of 66.67% in the Cycle I to 85.71% in Cycle II. The average value inclined steeply by 7.11 points from cycle I to cycle II. It is indicated the significant improvement of the cognitive learning outcomes after the implementation of the Mind Mapping model.

The Evaluation of Psychomotor Observation Results

A comparison of the average results of observation Psychomotor learners among cycles is depicted in Table IV.

TABLE IV. THE EVALUATION OF PSYCHOMOTOR OBSERVATION RESULTS.

No.	The Achievement of Psychomotor Learning	**Pre-cycle**	Cycle I	Cycle II
1.	Mastery learners (the value of ≥ 75)	18	24	31
2.	Learners who hadn't (the value < 75)	17	11	4
3.	The average value	73,74	73,88	79,18
4.	Completeness percentage	51,42%	68,57%	88,57%
5.	Incompleteness percentage	48,58%	31,53%	11,53%

Table IV depicts the result of psychomotor learning outcomes that tend to increase in every cycle. The completeness of the psychomotor learning outcomes prior to the application of Mind Mapping was 51.42%. While the average value of the psychomotor was 73.74

After the application of the Mind Mapping learning model, the psychomotor learning outcome rose by 20% from cycle to cycle. So does the aggregate average value was increasing from 73.88 in Cycle I to 79.18 in Cycles II. It is evident that the application of Mind Mapping learning model improves the learner's psychomotor learning outcomes.

The Evaluation of Liveliness Observation Result

A comparison of the average the results of observation Liveliness learners in each cycle can be seen in Table V.

TABLE V. THE EVALUATION OF LIVELINESS OBSERVATION RESULT

No.	The Achievement of The Learning Results of Liveliness	**Pre-cycle**	Cycle I	Cycle II
1.	Mastery learners (the value of ≥ 75)	13	23	29
2.	Learners who hadn't (the value < 75)	22	12	6
3.	The average value	65,59	73,09	84,26
4.	Completeness percentage	37,14%	65,72%	82,86%
5.	Incompleteness percentage	62,86%	34,28%	17,14%

Based on Table V, it can be seen that the percentage of learners' learning outcome the liveliness are always increasing in each cycle. The percentage of completeness learning outcomes the liveliness of the learners on the stage of Pre-cycle that is, before the application of the model of learning Mind Mapping is 37.14%, and the average results of observation before the application of the learning model the liveliness of Mind Mapping is 65.59.

After the application of the Mind Mapping learning model, the percentage of learners' liveliness learning outcome rose by 7.14% from cycle to cycle. So does the aggregate average value was increasing from 73.09 in Cycle I to 84.26 in Cycle II. It is evident that the application of Mind Mapping learning model improves the learner's psychomotor learning outcomes.

The Comparison of the Learning Completeness Between Cycles

Based on the data obtained from the research, a comparison of the percentage of each learning cycle's completeness of the cognitive, affective, psychomotor, and liveliness aspects of the learners are represented in Table VI.

TABLE VI. THE COMPARISON OF LEARNING COMPLETENESS ACROSS CYCLES

Cycle	**Affective**	**Cognitive**	**Psychomotor**	**Liveness**
Pre-cycle	42.85%	45.71%	51.42%	37.14%
Cycle I	65.71%	66.67%	68.57%	65.71%
Cycle II	85.71%	82.85%	88.57%	88.57%

A completeness comparison of the percentage of each learning cycle in the realm of cognitive, affective, psychomotor, and liveliness of the learners are represented in diagrams of the stem as depicted in Figure 2.

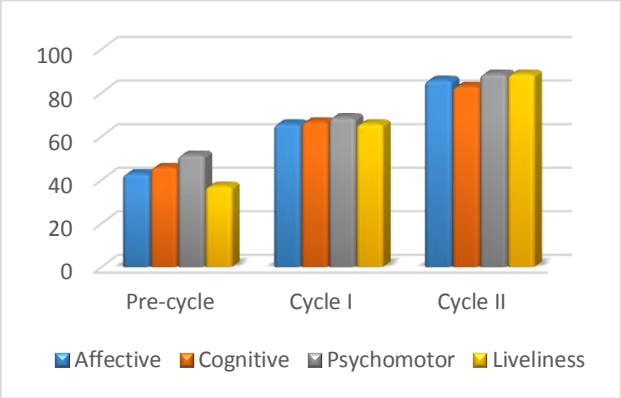

Figure 2 The Proportion of Learning Completeness of Each Cycle.

Figure 2 indicates the dynamic of each learning aspects over cycles. According to data analysis, the increase of liveliness achievement is of the highest value. It increases by 22.86% in Cycle 1 and from 65.71% to 88.57% in Cycle 1 and Cycle 2 respectively. Therefore, in this research liveliness is the best predictor for the impact of Mind Mapping learning model in web programming course.

DISCUSSION

Conditions of Prior Learning Mind Mapping

The analysis of data indicated that student's the liveliness was relatively low at 37.14%. Specific to the Minimum Exhaustive Completeness score, only 54.29% of students did not meet the criteria of 75 score. Prior to the implementation of Mind Mapping method, lecture was the main instruction applied in Web Programming class. Students were not encouraged to be actively asking questions, discuss, and collaborate, as well as exploring new concept or knowledge. Learners tend to become the object during course delivery. They have to listen and become the recipient of the instructions. As it is in a learning phase [9], teachers should prepare for the appropriate learning technique during the learning phase.

Having said the description, the Web Programming course providers are supposed to alter the learning method offered in the class. Mind mapping model was expected for the nature of students' involvement during the learning. The application of the model is expected to improve the results of the study and the liveliness of the learners in the learning in the classroom.

Post- Implementation Condition

After a given learning Mind Mapping method next learners are given pre-test to find out the capabilities of the end learners. From post-test, obtained the average value

of cognitive aspects of 66.67% in cycle I and cycled II 82.85%. Post-test results indicate the completeness value obtained has been increased.

After applying the learning Mind mapping method, students are invited to understand the matter by noting the use of colored ballpoint pen. It is in line with [2] that states that the mind map is a simple way to explore information from inside and outside the student's brain. The teacher together with students is digging material from experiments, discussions, book sources, and delivery of the teachers themselves.

All material obtained through such activities and then poured in the student's Mind Mapping. Students are provided with a white paper Folio plain and wide range of colored ballpoint pen. As a result, the white paper students filled with scribbles and drawings from the material presented. The interesting thing is the result of Mind Mapping different students with one another. Mind Mapping results in the form of colors, lines, images, is the interpretation of the results of the work of the students in the shape of the right brain of the imagination, colors, and dimensions [3]. This shows that students can make their mind maps based on materials they received from various sources.

On cycle I students implement the learning done by teachers in methods of Mind Mapping. Learners engage in activities with teachers asking, but only certain students and not all learners engage actively. Other students attend dutifully in early learning activities. In the next minute, students began a rowdy and chatted with other students. This can be caused because students are not involved actively in the learning activities. Sagala [19], noted that the learning experience is an activity, the students noted herself meaningful patterns from the new knowledge, and not just given by the teacher.

The completeness percentage results of a study on cycle II, good learning results of completeness the realm of affective, psychomotor, cognitive, or may have already reached ≥ 70%. So that, the performance indicators (success) research already achieved. Based on the results of observation and cognitive tests on stage Pre-cycle, cycles I and II cycles, then it can be concluded that the application of the model of efficiency of mapping the Mind learning on subjects Web programming can enhance the learning outcome of students of class X RPL C SMK Negeri 2 Karanganyar.

Influences the application of Mind Mapping against Learning Outcomes and Students' liveliness

This research aims to know the effect of Mind Mapping against learning results and the liveliness of the students. The initial conditions are relatively low because the learners receive regular learning research done before, namely teachers delivering informatively without involving the role of students to delve information deeper. Hamalik [11] argued that the regular learning activities focusing on the intellectual development through learning memories about things that have been read and the tasks have been carried out by the teacher.

Make Mind Mapping lets students use their abilities to think they made a map of the material obtained from various sources such as books, experiment, experience, and material from the teacher. According to Jensen Mind Mapping is the perfect method to illustrate the theme of learning to the students [13]. Mind Mapping can also be interpreted as a way to make the record that is not boring to use words, lines, and color images. Apply Mind Mapping is more fun because students get creative with pictures,

lines, colors and all that is on their mind. Through the activities make Mind Mapping, the role of students are also involved in digging up information subject matter.

Learning by applying methods of Mind Mapping is more influential significantly to cognitive learning results than lecturing method and accounting learning faqs. Mind mapping was introduced as a culturally relevant pedagogy aims to improve the experience of teaching and learning in general education, environmental science class for most Language learners Emirates United Kingdom (ELL) [23].

Mind Mapping results of students on average are in the categories above the value of the MEC compared records always, Mind Mapping has more appeal because of the mix of colors, lines; images make the students learn as in the atmosphere of the play. Relevant to De Porter and Hernacki's opinion that that mind mapping is fun because it combines the creativity and imagination of students are not limited to, more fun when compared to make notes [7].

CONCLUSIONS

Based on the results of the research action class that is implemented, then the conclusions that can be drawn using the learning mind mapping methods can improve the results of the study and liveliness of the students. Increasing student learning outcomes and the Liveliness can be proven with increasing the value of the average students in the learning process with mind mapping methods, namely: the average value of affective aspects of 42.86%, increases cognitive aspects of increased 37.14%, increase in psychomotor aspect 37.15%, aspects of liveliness on increased 51.43%. Thus, Mind Mapping learning method can be employed to improve student's performance in Web Programming course.

REFERENCES

[1] BetsyD., Robert G., Carol R., M. S. (2012). Using Mind Mapping to Influence Creativity and Innovation. Proceeding of Conference for Industry Education Collaboration.
[2] Buzan, T. (2007). *Buku Pintar Mind Map Untuk Anak*. Jakarta: Gramedia.
[3] Buzan, T. (2008). *buku pintar Mind Map*. Jakarta: Gramedia.
[4] Buzan, T. (2009). *Buku pintar mind mapping*. Jakarta: Gramedia.
[5] Communication, S., Yawen, Y., Nakamura, M., & Nakashima, N. (2016). Journal of Health & Medical Informatics Designing Health Data Management Systems : Learning From Prominent Worldwide Applications, 7(1), 7–9. https://doi.org/10.4172/2157-7420.1000216
[6] Daryanto. (2011). *Penelitian Tindakan Kelas*. yogyakarta: GAVA MEDIA.
[7] De Porter, Bobbi & Hernacki, M. (2003). *Quantum Learning: Membiasakan Belajar Nyaman dan Menyenangkan. (Alih Bahasa: Allawiyah Abdurrahmad)*. Bandung: Kaifa.
[8] Dwitagama, D & Kusumah, W. (2010). *Mengenal Penelitian Tindakan Kelas*. Jakarta: PT. Indeks.
[9] Dimyati & Mudjiono. (2009). *Belajar dan Pembalajaran*. Jakarta: Asdi Mahasatya.

[10] Edward, C. (2009). Mind Mapping untuk Anak Sehat dan Cerdas. yogyakarta: sakti.
[11] Hamalik, O. (2011). *Kurikulum dan pembelajaran*. jakarta: Bumi aksara.
[12] Harsono. (2016). Pengaruh Cara Pencatatan MIND MAPPING Terhadap Hasil Belajar Sisiwa Pada Mata Pelajaran Dasar-Dasar Kelistrikan Otomotif Kelas X SMK NEGERI 2 PEMEKASAN.
[13] Jensen, E. (2008). *Pembelajaran Berbasis Kemampuan Otak. (Alih bahasa: Narulita Yusron)*. yogyakarta: Pustaka Pelajar.
[14] Kalyanasundaram, M., Abraham, S. B., Ramachandran, D., Jayaseelan, V., Bazroy, J., Singh, Z., & Purty, A. J. (2017). Effectiveness of Mind Mapping Technique in Information Retrieval Among Medical College Students in Puducherry-A Pilot Study. *Indian Journal of Community Medicine : Official Publication of Indian Association of Preventive & Social Medicine*, *42*(1), 19–23. https://doi.org/10.4103/0970-0218.199793
[15] Liu, G. (2016). Application of Mind Mapping Method in College English Vocabulary Teaching, (June), 202–206.
[16] Noviyanti, F. (2013). Penggunaan Mind Map sebagai Instrumen Penilaian Hasil Belajar Siswa pada Pembelajaran Konsep Sistem Reproduksi di SMPN 1 Anyar, (2007), 393–398.
[17] Parikh, N. D. (2016). Effectiveness of Teaching through Mind Mapping Technique. *The International Journal of Indian Psychology*, *3*(3), 3.
[18] Radix, C., & Abdool, A. (2013). Using Mind maps for the Measurement and Improvement of Learning Quality. Caribbean Teaching Scholar, 3(1), 3–21.
[19] Sagala, S. (2010). *Kemampuan Profesional Guru dan Tenaga Kependidikan*. Bandung: Alfabeta.
[20] Silberman, M. L. (2013). Active Learning: 101 Cara Belajar Siswa Aktif. Bandung: Nuansa Cendekia.
[21] Sujana, N. (2009). *Penilaian Hasil Proses Belajar Mengajar*. Bandung: PT Remaja Rosdakarya.
[22] Suryadi, A. (2010). Permasalahan dan alternatif kebijakan peningkatan relevansi pendidikan, 1–13.
[23] Wilson, K., Copeland Solas, E., & Guthrie-Dixon, N. (2016). A Preliminary study on the use of Mind Mapping as a Visual-Learning Strategy, in General Education Science classes for Arabic speakers in the United Arab Emirates. *Journal of the Scholarship of Teaching and Learning*, *16*(1), 31. https://doi.org/10.14434/josotl.v16i1.19181
[24] Yunus, M., & Chien, C. H. (2016). The Use of Mind Mapping Strategy in Malaysian University English Test (MUET) Writing, (April), 619–626. https://doi.org/http://dx.doi.org/10.4236/ce.2016.74064