EFFECTIVENESS OF SOCIO-SCIENTIFIC ISSUES WITH MIND MAPPING STRATEGY ON STUDENTS LEARNING OUTCOMES ON HEAT TOPIC

Adilliya Gerda Iramandia* and Laily Rosdiana
Department of Science Education, Faculty of Mathematics and Natural Sciences, Universitas Negeri Surabaya, Indonesia

*Email: adilliya.18035@mhs.unesa.ac.id

INTRODUCTION

In Indonesia, four aspects of assessment are emphasized in the main principles of the 2013 curriculum, namely aspects of knowledge, skills, attitudes, and behaviors that are expected to provide comparable qualities between hard and soft skills[1]. The learning process from the 2013 curriculum is expected that students can play a more active role by providing challenging, inspirational, fun, and interactive learning and motivating students, especially in the aspect of knowledge that is very important for students to know [2].

Cognitive knowledge is student knowledge related to students’ ability to think. Cognitive knowledge is very important in learning [3]. Learning is an activity in helping students get the knowledge that has been designed as well as possible to support the student’s learning process [4].

The learning used in the 2013 curriculum should be learning that can be student-centered so that students can be actively involved in learning. However, in reality, many schools still have not been optimal in implementing the 2013 curriculum [5]. It can be seen from the number of teachers who use the lecture or other teacher-centered methods, especially with the current situation, namely the Covid-19 pandemic. The COVID-19 pandemic has brought major changes to the world of education. The education system that changed from offline to online caused students to lack understanding of learning concepts, so student learning outcomes decreased[6].

In 2022, along with the decline in the Covid-19 rate in Indonesia, the government, in this case, the Education Office, began implementing a limited face-to-face meeting policy. There is a difference between limited face-to-face learning and learning in the pre-Covid-19 pandemic, which lies in the class hours and the number of students who enter the classroom. At the time of limited face-to-face meetings, limited class hours only lasted for 30 minutes, and the number of incoming students was only 50% of the number of students [7].

Innovative learning methods and interesting learning strategies are needed to improve student activities and learning outcomes, one of the learning methods for socio-scientific issues [8]. The socio-scientific issues method is a method with a learning process that requires students to be more active in learning in the classroom. This method is similar to the problem-based method, where the learning process is carried out through contextual problem recognition. The difference lies in the development of the problem [9].

Socio-scientific issues can be implemented with several learning strategies [10]. Several learning strategies and tools have been designed to improve student learning outcomes, such as case-based teaching, role-playing, problem-based learning, discussion groups, didactic learning, concept maps, and mind maps. The mind mapping strategy is one way that can be used to improve student learning outcomes [11]. Mind mapping is an easy learning strategy to help students remember details and key points, understand the main concepts and see the relationship [12].

From the results of observations made with science teachers at SMP Negeri 14 Gresik school, socio-scientific issues have never been used before during learning. Socio-scientific issues with mind mapping strategies in science learners at SMP Negeri 14 Gresik have never been studied. The current study focus on finding the effectiveness of Socio Scientific Issues With Mind Mapping Strategy on Student’s Learning Outcomes on Heat topic.

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RESEARCH METHODS

This study uses a type of pre-experimental design research with a design of one-group pretest-posttest design to describe the effectiveness of the socio-scientific issues method with a mind mapping strategy toward improving learning outcomes in heat material. The study subjects used one class, namely VII-F, with 32 students. This research was conducted in the even semester of the 2021/2022 school year in May 2022 at SMP Negeri 14 Gresik.

Procedure

The data collected uses several methods, namely the observation method, the questionnaire filling method, and the test method. The observation method is used to obtain data on the implementation of learning by the lesson plans. The implementation sheet is filled out as the learning activities occur. Science students carry out observers of the implementation of learning. The questionnaire method aims to obtain student response data after participating in learning using the socio-scientific issues method with a mind mapping strategy. The test method is carried out by giving students multiple choice questions, as many as ten. The questions used are obtained from existing questions which are then developed and modified by socio-scientific issues. Questions are given to students before students get learning using socio-scientific issues (pretests) to describe students' initial knowledge. Then students are given the same questions after getting socio-scientific issues (post-test) learning to describe the students' final knowledge.

Instruments

This study used to pretest and pons-test tests, observations and questionnaires. Pretest and pons-test tests are used to measure students' cognitive abilities, which will later determine student learning outcomes. Pretest and pons-test questions are ten questions prepared by five critical thinking indicators. Observation instrument sheets are used in research to determine student learning outcomes in learning activities. Questionnaires are given to students to find their responses regarding their learning outcomes. Observation, the implementation of learning, is seen when students do questions from the teacher.

Data Analysis

The analysis process is carried out when the entire data obtained by the researcher has been obtained completely. The analysis of the implementation data that has been obtained is calculated by calculating the percentage of the score obtained using the following equation:

\[ P = \frac{\text{number of observation scores}}{\text{smax score}} \times 100\% \]

The percentage of the assessment results is then converted into the categories contained in the table:

| Percentage (%) | Information   |
|----------------|--------------|
| P<25%          | Not Good     |
| 25%≤P<50%      | Less Good    |
| 50%≤P<75%      | Good         |
| P≥75%          | Very Good    |

Data from student response questionnaires converted into quantitative form based on the Likert scale, namely a score of 1 category "Promising", a score of 2 categories of "Disagree", a score of 3 categories of "Agree", a score of 4 categories of "Strongly Agree" that has been converted in quantitative form, calculated the percentage of each question item using the formula:

\[ \%\text{NRS} = \frac{\sum_{i=1}^{n} \text{NRS}_{	ext{maksimal}}}{\text{NRS}} \times 100\% \]

The percentage obtained on each statement is interpreted according to the following categories:

| %NRS | Category          |
|------|-------------------|
| 25%  ≤ %NRS < 43% | Not Good         |
| 44%  ≤ %NRS < 62% | Less Good        |
| 63%  ≤ %NRS < 81% | Good             |
| 82%  ≤ %NRS < 100%| Very Good        |

The completeness of learning is measured if each student's post-test score can reach the Minimum Completion Criteria (MCC) score [13]. The Minimum Completion Criteria (MCC) score at SMP Negeri 14 Gresik is 75, so if the student's post-test score ≥ 75, then the student can be said to be complete in learning. In knowledge, the magnitude of an increase in learning outcomes is known based on the results of the N-Gain calculation.

RESULTS AND DISCUSSION

This research was carried out at SMP Negeri 14 Gresik for two meetings. After conducting research in the form of "The Effectiveness of Socio Scientific Issues with Mind Mapping Strategy on Student’s Learning Outcomes on Heat Material, "several data were obtained as follows:

Implementation of Learning

Observation of learning implementation aims to describe the teaching and learning process carried out by the Learning Implementation Plan (LIP) that has been made. Science students carry out observers of the implementation of learning. A recapitulation of the data from the observation of the
implementation of the learning process at 2 meetings is shown in Table 3.

Table 3. Percentage of Learning Implementation of Each Stage

| No | Stage                          | Meeting I | Meeting II |
|----|-------------------------------|-----------|------------|
| 1  | Introduction                  | 100%      | 87.5%      |
| 2  | Present goal and set          | 87.5%     | 75%        |
| 3  | Present information            | 100%      | 100%       |
| 4  | Organize students into learning teams | 100% | 100%       |
| 5  | Assist teamwork and study      | 87.5%     | 100%       |
| 6  | Test on the materials         | 100%      | 100%       |
| 7  | Provide recognition            | 75%       | 100%       |
| 8  | Penutup                       | 87.5%     | 100%       |

Table 3 shows the percentage of implementation of each stage of learning using the socio-scientific issues method with a mind mapping strategy during 2 meetings. In the preliminary stage, the percentage at meeting 1 and 2 were obtained by 100% and 87.5%, respectively. In the Present goal and set stage, the percentage at meeting 1 and 2 were obtained by 87.5% and 75%, respectively. In the Present information stage, the percentage at meeting 1 and 2 were obtained by 100% and 100%. In the Assist teamwork and study stage, the percentage at meeting 1 was obtained by 87.5% and meeting 2 by 100%. In the Test on the materials stage, the percentage at meeting 1 was obtained by 100% and meeting 2 by 75%. In the Provide stage, recognition was obtained percentage at meeting 1 by 100% and meeting 2 by 75%. In the Closing stage, the percentage at meeting 1 was obtained by 87.5% and meeting 2 by 100%. Based on the data obtained, the learning carried out at each stage in each meeting with socio-scientific issues with mind mapping strategies has been carried out in a very good category.

Student Responses to Learning

Students’ responses to learning were obtained by filling out the questionnaire with 15 statements. Students then fill in by putting a checkmark in the column with scores between 1 and 4. The percentage of response results is converted into a diagram shape as follows:

![Percentage Diagram of Student Responses to Learning](image)

Figure 1. Percentage Diagram of Student Responses to Learning

Figure 1. is a diagram of the student’s response percentage. The picture shows that the percentage of each item of the student’s response statement is from 90.7% to 100%. Based on the student response percentage category, where if the percentage of student responses has a score of 82% ≤ % NRS ≤ 100%, then the response is classified as a very strong category [14].

Learning Outcomes

Learning outcomes are abilities humans have obtained after the learning process [16]. Learning outcomes can be observed in many aspects: skills, knowledge, and attitudes [17]. Learning results in the aspect of knowledge are obtained from the value of pretest and post-test work. The pretest is a question before learning with the socio-scientific issues method with the mind mapping strategy applied. The post-test is a question after learning the socio-scientific issues method with the mind mapping strategy applied. The results obtained were analyzed by descriptive analysis of N-Gain, which can be seen in the following table:

Table 4. Recapitulation of Pretest Value Results, Post-test Value, and N-Gain

| Component | Number of Students | Lowest Value | Highest Value | Average |
|-----------|--------------------|--------------|---------------|---------|
| Pretest   | 32                 | 10           | 65            | 35.63   |
| Post-test | 32                 | 65           | 100           | 81.94   |
| N-Gain    | 32                 | 0.61         | 1.00          | 0.72    |
Table 4 is a table and analysis of pretest, post-test, and N-Gain results obtained from class VII-F students of SMP Negeri 14 Gresik. This table shows that the learning outcomes of 32 students improved to various criteria.

The average student pretest score tends to be low at 35.63 because the questions are given as a reference to see the initial knowledge when students have not studied the material and before the socio-scientific issues learning method is applied. After students had studied the material and applied the socio-scientific issues method with mind mapping strategies, the average post-test score of students increased to 81.94. It indicates that the student's average post-test score has increased from the average pretest score. It can be seen an increase in learning outcomes from normalized N-Gain.

The average n-Gain score of students in Table 6 is 0.72, which is included in the high category. It shows that the socio-scientific issues method with the mind mapping strategy applied to classes VII-F influences learning. It can be seen that the results of the post-test scores are better than the results of the students’ pretest scores. It is by research from Marpuang shows that students are said to have an increase in learning outcomes with a high category if they have an average score with a gain score of $g \geq 0$ [18].

![Figure 2. Completeness Diagram of Student Knowledge Learning Outcomes](image)

CONCLUSION

There is an increase in learning outcomes through applying socio-scientific issues with mind mapping strategies. The learning results that occur at each stage in each meeting occur very well. The data analysis on the response questionnaire shows that the student response is very good. The average percentage of student responses from the fifteen statements was 95.43%, with a very strong category. The use of socio-scientific issues with mind mapping strategies is effectively used to improve student learning outcomes. Student learning outcomes have increased, as evidenced by the average n-Gain score of all students of 0.72 in the High category.

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REFERENCES

[1] Ningrum, A. S., Lestari, N., & Kusmiyati, K. (2018). Perbedaan Hasil Belajar Ipa Biologi Menggunakan Model Pembelajaran Kooperatif Tipe Team Assisted Individualization Dengan Tipe Mind Mapping Pada Siswa Kelas Vii Smp Negeri 19 Mataram. Jurnal Pijar Mipa, 13(1), 37-44..

[2] Rosdiana, L., & Ulya, R. M. (2021, May). The Effectiveness Of The Animation Video Learning Earth’s Layer Media To Improve Students’ Concept Understanding. In Journal Of Physics: Conference Series (Vol. 1899, No. 1, P. 012172). Iop Publishing

[3] Rachmwati, R. C., & Diningsih, E. (2021). Pengenalan Sosio Scientific Issue Secara Daring Terhadap Kemampuan Penalaran Siswa. Media Penelitian Pendidikan: Jurnal Penelitian Dalam Bidang Pendidikan Dan Pengajaran, 15(1), 31-36.

[4] Nabilah, V., Rosdiana, L., & Purnomo, A. R. (2021). Efektivitas Strategi Mind Mapping Terhadap Hasil Belajar Siswa Pada Materi Sistem Ekskresi. Pensa: E-Jurnal Pendidikan Sains, 9(1), 133-138.

[5] Irawati, I., Ilhamdi, M. L., & Nasruddin, N. (2021). Pengaruh Gaya Belajar Terhadap Hasil Belajar Ipa. Jurnal Pijar Mipa, 16(1), 44-48.

[6] Alviaturrohmah, K., Fauziah, H. N., Aristiawan, A., & Kusumaningrum, A. C. (2021). Efektivitas Model Pembelajaran Pdeoode (Predict–Discuss–Explain–Observe–Discuss–Explain) Berorientasi Pada Socio
Scientific Issue Terhadap Kemampuan Observasi Peserta Didik. *Jurnal Tadris Ipa Indonesia*, 1(2), 171-178.

[7] Millatana, M. E. (2019). Peningkatan Prestasi Belajar Matriks Dengan Pembelajaran Blended Learning Berbantuan Google Classroom Di Kelas Xi Ips 1 Sma Negeri 7 Yogyakarta. *Ideguru: Jurnal Karya Ilmiah Guru*, 4(2), 76-85.

[8] Riski, N. (2019). Penerapan Metode Pembelajaran Brainstorming Dengan Media Miniatur Untuk Meningkatkan Hasil Belajar Siswa Pada Kelas V Min 5 Aceh Besar.

[9] Siska, S., Triani, W., Yunita, Y., Maryunningsih, Y., & Ubadillah, M. (2020). Penerapan Pembelajaran Berbasis Socio Scientific Issues Untuk Meningkatkan Kemampuan Argumentasi Ilmiah. *Edu Sains: Jurnal Pendidikan Sains Dan Matematika*, 8(1), 22-32.

[10] Wachidah, U. (2015). Penerapan Strategi Mind Mapping Untuk Meningkatkan Keterampilan Metakognitif Siswa Pada Materi Alat-Alat Optik Kelas X Sma Negeri 1 Krembung. *Inovasi Pendidikan Fisika*, 4(2).

[11] Alsuraihi, A. A. (2022). The Effect Of Implementing Mind Maps For Online Learning And Assessment On Students During Covid-19 Pandemic: A Cross Sectional Study. *Bmc Medical Education*, 22(1), 1-16.

[12] Amijaya, L. S., Ramdani, A., & Merta, I. W. (2018). Pengaruh Model Pembelajaran Inkuiri Terbimbing Terhadap Hasil Belajar Dan Kemampuan Berpikir Kritis Peserta Didik. *Jurnal Pijar Mipa*, 13(2), 94-99.

[13] Dewi, L. V., Ahied, M., Rosidi, I., & Munawaroh, F. (2019). Pengaruh Aktivitas Belajar Terhadap Hasil Belajar Siswa Menggunakan Model Pembelajaran Discovery Learning Dengan Metode Scaffolding. *Jurnal Pendidikan Matematika Dan Ipa*, 10(2), 299-313.

[14] Siregar, S. (2015). Metode Penelitian Kuantitatif: Dilengkapi Dengan Perbandingan Perhitungan Manual & Spss.

[15] Subagia, I. W., & Wiratma, I. G. (2016). Profil Penilaian Hasil Belajar Siswa Berdasarkan Kurikulum 2013. *Ipi (Jurnal Pendidikan Indonesia)*, 5(1), 39-55.

[16] Sudjana, N. (2010). Penilaian Hasil Proses Belajar Mengajar.

[17] Putri, I. S., Juliiani, R., & Lestari, I. N. (2017). Pengaruh Model Pembelajaran Discovery Learning Terhadap Hasil Belajar Siswa Dan Aktivitas Siswa. *Jurnal Pendidikan Fisika*, 6(2), 91-94.

[18] Putri, N. T. A., & Marpaung, R. R. T. (2019). Pengaruh Model Discovery Learning Terhadap Aktivitas Dan Hasil Belajar Kognitif Peserta Didik. *Jurnal Bioterdidik: Wahana Ekspresi Ilmiah*, 7(4), 22-32.

[19] Busdayu, Z. A., Artayasa, I. P., & Kusmiyati, K. (2021). The effect of implementation of animated video on online learning during the covid-19 pandemic on students science learning outcomes. *Jurnal Pijar MIPA*, 16(4), 498-504.

[20] Zeidler, D. L., & Nichols, B. H. (2009). Socioscientific issues: Theory and practice. *Journal of elementary science education*, 21(2), 49-58.