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ENHANCING STUDENTS' CONCEPTUAL UNDERSTANDING IN GEOGRAPHY USING A GUIDED INQUIRY MODEL ASSISTED BY MIND MAPPING

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ABSTRACT

The Merdeka Curriculum positions conceptual understanding as the primary benchmark in geography assessment. However, in practice, students often struggle to grasp these concepts due to the complexity of the subject matter. This study aims to describe the improvement of students' conceptual understanding through the implementation of the guided inquiry learning model assisted by mind mapping. This study is a Classroom Action Research (CAR) conducted in two cycles, each comprising planning, action, observation, and reflection phases. The research was carried out at MAN 1 Pontianak, employing a purposive sampling technique to select 38 students from class XA. Data were collected using a performance assessment of mind mapping skills, operationalized through a mind mapping skill assessment rubric. The data were then analyzed using quantitative descriptive analysis. The findings indicated a significant improvement in students' conceptual understanding from Cycle 1 to Cycle 2. In Cycle 1, the average score for students' conceptual understanding reached 77.4, which fell below the school's Minimum Mastery Criterion (KKM) of 78. Following corrective actions, the average score increased to 80.2 in Cycle 2. The integration of the guided inquiry model with mind mapping proven effective in enhancing students' conceptual understanding and fostering deep, meaningful geography learning. This study offers a novel perspective on integrating guided inquiry models with concept visualization in geography education.

Keywords: *conceptual understanding; geography; guided inquiry model; mind mapping*

INTRODUCTION

In geography subjects within the Merdeka Curriculum, there are two assessments that serve as benchmarks. These two assessments are process skills and conceptual understanding (Budiharto & Fitriana, 2025). Process skills are assessments that emphasize evaluating the learning process itself. These assessments include the ability to read, rewrite, communicate, and convey existing ideas. Meanwhile, conceptual understanding relates to students'

abilities to identify, understand, analyze, and think critically (Kemendikbudristek, 2022). Between conceptual understanding and process skills, conceptual understanding serves as the main reference in learning assessment within the Merdeka Curriculum.

Conceptual understanding is defined as understanding that discusses principles and is interconnected with one another (Rinneheimo & Suhonen, 2022). This knowledge can be formed when factual knowledge and procedural knowledge can be properly applied in the learning process. This knowledge will be achieved if students are able to describe and apply the knowledge they have previously obtained (Tan et al., 2020; Yani, 2020).

Conceptual understanding consists of several abilities, such as the ability to categorize, classify, generalize, understand structures, models, and theories (Wardani et al., 2020). This understanding is very important to be applied in the learning process because it can build students' cognitive structures (Addido et al., 2022; Höft et al., 2019). Conceptual understanding can be possessed by students if teachers are able to implement meaningful learning (Mills, 2016) through the processes of assimilation, accommodation, and disequilibrium in learning (Taşlıdere, 2021). Students with good conceptual understanding are able to carry out self-assessment in the learning process (Dessie et al., 2024).

Based on the observations and interviews conducted by the researcher, it was found that tenth grade students at MAN 1 Pontianak had not yet developed a strong conceptual understanding. Of the 312 tenth grade students enrolled at the school, only 36 demonstrated a good level of conceptual understanding, while 276 students had not attained an adequate level of conceptual comprehension. The low level of students' conceptual understanding is attributed to the difficulty students experience in comprehending the material in depth, as geography subjects are considered complex and challenging. Another contributing factor is that geography teachers have not yet regarded conceptual understanding as essential foundational knowledge that students must possess.

To develop strong conceptual understanding in the learning process, an appropriate instructional model is required. One learning model that can foster strong procedural understanding is

the guided inquiry learning model. Guided inquiry is an instructional model that emphasizes experiment-based learning through the process of observation. This student-centered learning model develops critical thinking skills, process skills, and scientific attitudes. Through this approach, it is expected that students' curiosity can be stimulated during the learning process (Cahaya et al., 2020; Gunawan et al., 2019).

Maniotes & Kuhlthau (2014) state that the guided inquiry model consists of eight instructional stages: open, immerse, explore, identify, gather, create, share, and evaluate. This instructional model encourages student-centered knowledge construction. Students are directly and actively involved in every stage of the learning process. Through this approach, students no longer occupy a passive role as recipients of information; instead, they take an active role in independently constructing and integrating their knowledge.

Research on the guided inquiry model in learning processes has been widely conducted. These studies indicate that the guided inquiry model is able to improve students' problem-solving skills (Rahayu et al., 2021). This model is also effective in enhancing students' process skills (Gunawan et al., 2019). Learning using the guided inquiry model can foster higher-order critical thinking skills in students due to its in-depth learning process (Lance & Maniotes, 2020).

Based on the findings of previous studies, it is evident that the guided inquiry learning model can be implemented across various educational levels. This learning model is commonly used in science subjects, while its application in social sciences particularly in geography is still limited. The researcher considers it important to implement the guided inquiry learning model integrated with mind mapping to develop students' conceptual understanding. In this study, the researcher introduces a new perspective by combining the guided inquiry model with mind mapping. This approach helps students connect subject matter concepts in a more structured manner. Mind mapping is not merely used as a simple summary tool, but as an analytical instrument that enables students to gain a deeper understanding of complex learning materials. Moreover, the implementation of this instructional model is still relatively rare in the social

sciences, especially in geography education.

The purpose of this study is to integrate mind mapping within the guided inquiry learning framework. This integration is intended to address the issue of students' low conceptual understanding in geography, particularly in the topic of Basic Geography Knowledge, through clear conceptual visualization. This combination is expected to provide a new perspective on the integration of instructional models in geography learning. The researcher emphasizes students' active role within the eight stages proposed by Maniotes & Kuhlthau. In this approach, knowledge is no longer constructed solely by the teacher but is actively built by students under teacher guidance, so that meaningful and holistic learning can occur.

MATERIALS AND METHODS

This study uses classroom action research (Veriansyah et al., 2025). Classroom action research is a type of research conducted to examine students' development through several phases of the learning process. This form of research can assess students' attitudes, knowledge, and psychomotor skills (Meesuk et al., 2020). In this study, the focus is on the knowledge aspect, with particular emphasis on students' conceptual understanding in geography.

The sampling technique used in this study was purposive sampling. Purposive sampling is a sampling technique conducted with a specific objective (Creswell, 2016). This sampling method was applied based on the fact that, among all tenth grade classes at MAN 1 Pontianak, which consists of eight classes with a total of 312 students, there was one class whose conceptual understanding was below the established assessment criteria, namely class XA. Class XA was selected as the research class because its conceptual understanding was lower compared to the other classes. Only 9 students were able to connect one topic to another, while 29 students had not yet been able to effectively relate the learning materials.

This study was conducted in two cycles, with each cycle consisting of the stages of planning, action, observation, and reflection (Indriani et al., 2025; Saptono et al., 2023). Each cycle comprised two meetings. At the end of each cycle, students' conceptual understanding was measured by assessing their work in

creating mind maps. The classroom action research design is presented in **Figure 1**.

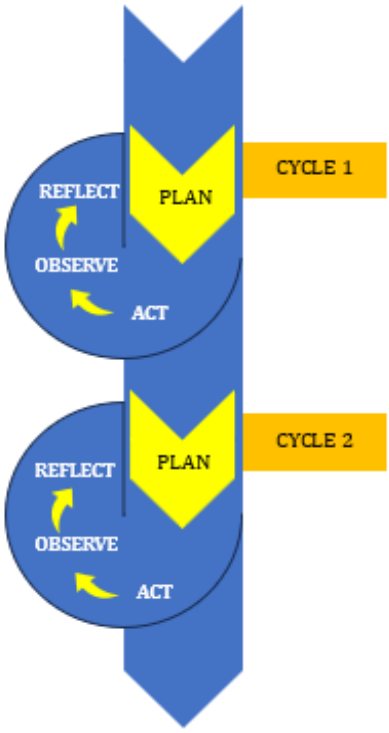

Figure 1. Adapted Classroom Action Research Design based on Kemmis & McTaggart
Source: Hopkins, 2008

The data analysis technique used in this study was descriptive statistical analysis. The researcher assessed students' performance in creating mind maps. After all scores were assigned, the overall mean score of the students was calculated.

The formula for calculating the average value is shown in equation 1.

$$\bar{x} = \frac{\sum x_i}{n} \quad (1)$$

Source: (Rumsey, 2010)

Explanation:

$\bar{x}$: mean score (average score)

$\sum x_i$: total sum of all scores

n : number of students

RESULTS AND DISCUSSION

Cycles in this study are as follows:

1. Cycle I

The first cycle began with the identification of problems in geography learning. This study was conducted at MAN 1 Pontianak. Based on the observation results, the researcher found that the geography teacher had not yet considered the importance of students' conceptual understanding in geography

learning, which resulted in low levels of conceptual comprehension among students. The solution to improve students' conceptual understanding is to implement an appropriate instructional model aligned with the learning content. The guided inquiry learning model was proposed as the instructional approach to be applied in this study. The guided inquiry model is integrated with mind mapping to improve students' conceptual understanding in geography learning through guided inquiry principles and visual concept representation. The stages of Cycle I are as follows:

a. Planning 1

Based on observation data, more than half of the students in class XA did not demonstrate adequate conceptual understanding. A total of 29 students did not meet the established minimum competency criterion, as their scores did not exceed the minimum standard score of 78, while only 9 students demonstrated good conceptual understanding. Based on these findings, an appropriate instructional model is required to improve students' conceptual understanding.

The researcher followed up these findings by designing a geography learning module using a guided inquiry learning model integrated with mind mapping. Prior to developing the learning module, the researcher first formulated the Geography Learning Outcomes (*Capaian Pembelajaran*), learning objectives, learning objective flow (*Alur Tujuan Pembelajaran*), and designed the geography teaching module (*Modul Ajar*).

The instructional material focused on developing the module was Basic Geography Knowledge. The teaching module was coordinated and validated by the geography subject teacher before being implemented in the learning process. The instructional design framework is presented in **Figure 2**.

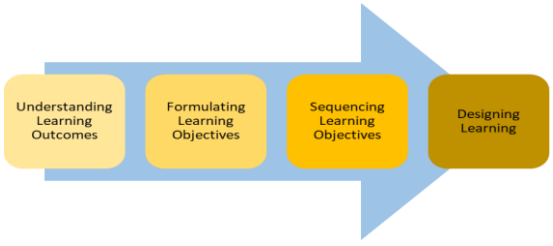

Figure 2. Designing learning modules
Source: Developed by the researcher, 2026

b. Action 1

At this stage, geography learning using the guided inquiry model assisted by mind mapping was implemented in the learning process. Cycle I consisted of two meetings, namely Meeting 1 and Meeting 2. Each meeting had an allocated time of 90 minutes per week. The learning sessions were conducted every Thursday from 13:45 to 15:15.

In the second meeting of Cycle I, the researcher assigned an independent task to students in class XA to design a mind map on the topic of Basic Geography Knowledge, with subtopics including the Definition of Geography, Geographic Approaches, Auxiliary Sciences of Geography, and the Historical Development of Geography.

In creating the mind maps, the researcher allowed students to develop their work freely according to their own preferences. Students used three colored pens blue, red, and black to produce more visually engaging mind maps. The students' mind map results from Cycle I are presented in **Figure 3**.

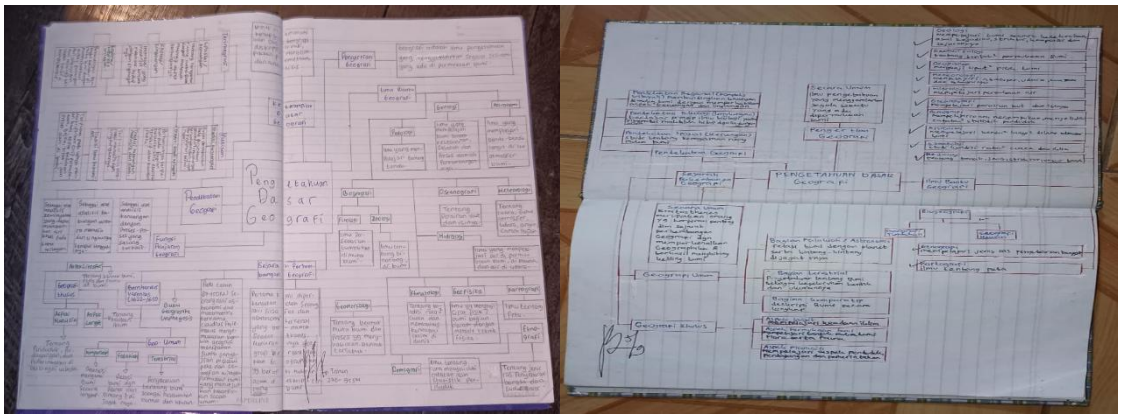

Figure 3. Students' mind mapping work in class XA during Cycle I

Source: Researcher's data, 2026

c. Observation 1

At this stage, observation was conducted by the geography subject teacher to determine whether the implementation of guided inquiry learning integrated with mind mapping was carried out effectively. The teacher also observed the classroom situation and learning conditions during the learning process. The observation results indicated that many students still found it difficult to independently design mind maps and required

guidance from the researcher during the learning process. Students also experienced difficulties in connecting relationships between concepts in the learning material and in using three colored pens when designing their mind maps.

d. Reflection 1

The reflection stage was conducted by assessing students' conceptual understanding in designing mind maps on the topic of Basic Geography Knowledge, with subtopics including the Definition of Geography, Geographic Approaches, Auxiliary Sciences of Geography, and the Historical Development of Geography. The researcher carried out the assessment and held discussions with the subject teacher, followed by self-reflection after implementing the learning model in the classroom. The researcher analyzed and evaluated the mind maps created by students in class XA, and the final average score obtained was 77.4. This mean score was still below the minimum mastery criterion of 78.

2. Cycle II

Cycle II began with the identification of students' conceptual understanding after the implementation of the guided inquiry model integrated with mind mapping. Based on the identification results, students' conceptual understanding in class XA showed an average final score of 77.4. A total of 32 students demonstrated good conceptual understanding, while 6 students still showed inadequate conceptual understanding. Based on these findings, the average score in Cycle I had not yet met the mastery criterion, as it remained below the minimum standard score of 78 set by the school. Therefore, the researcher proceeded with the implementation of the guided inquiry model integrated with mind mapping in Cycle II. The stages of Cycle II are as follows:

a. Planning 2

The reflection results from the implementation of the guided inquiry learning model integrated with mind mapping in Cycle I were used as a basis for designing the activities in Cycle II. The learning process was conducted in accordance with the lesson plan during the third and fourth meetings. The focus of the material

developed to improve students' conceptual understanding was Basic Geography Knowledge, with subtopics including Geographic Principles, Scope of Geography, Objects of Study in Geography, Geographic Aspects, and Geographic Concepts.

b. Action 2

The second action was implemented in accordance with the previously designed guided inquiry lesson module. In the fourth meeting of Cycle II, the researcher again assigned an independent task to students in class XA to design a mind map on Basic Geography Knowledge, with different subtopics, namely Geographic Principles, Scope of Geography, Objects of Study in Geography, Geographic Aspects, and Geographic Concepts.

Students once again used three-colored pens to enhance the visual quality of the mind maps they created. The results of the mind maps in Cycle II are presented in **Figure 4**.

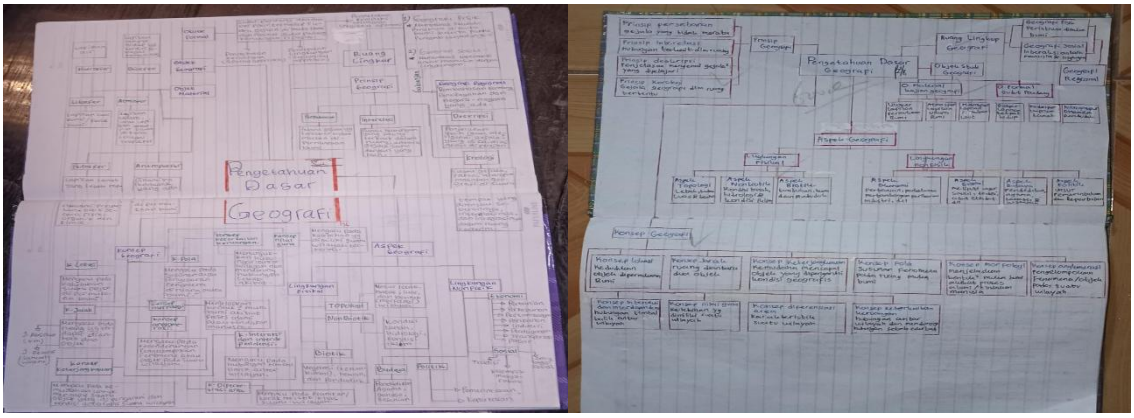

Figure 4. Students' mind mapping work in class XA during Cycle II

Source: Researcher's data, 2026

c. Observation 2

During the learning process, the researcher conducted observations of students' activities while creating mind maps. The geography teacher also re-observed the implementation of the guided inquiry learning model integrated with mind mapping during this session. The teacher further monitored classroom conditions throughout the learning process. The observation results indicated that the majority of students were able to independently connect concepts within the learning material through mind mapping. Students were also

able to effectively use three-colored pens. In addition, the researcher's role as a facilitator and guide in the learning process gradually decreased, as students were increasingly capable of independently linking and organizing the concepts in the learning material through mind mapping.

d. Reflection 2

In the second reflection stage, the final average score of students' conceptual understanding was 80.2. A total of 33 students were able to design mind maps and demonstrated good conceptual understanding, while 5 students were still not fully able to connect knowledge between concepts. Based on these results, the average score in Cycle II had met the mastery criterion, as it exceeded the minimum standard score of 78.

At this stage, the researcher also compared the final average scores of students' conceptual understanding after the implementation of the guided inquiry learning model integrated with mind mapping. The comparison of students' average scores is presented in **Table 1**.

Table 1. Average Conceptual Understanding of Class XA Students

	N	Min	Max	Mean	Std. Deviation
Cycle 1	38	.00	85.00	77.4737	13.20879
Cycle 2	38	.00	85.00	80.2632	13.77951

Source: Research Analysis, 2026

Based on the processed data, there was an improvement in the conceptual understanding of class XA students after the implementation of the guided inquiry learning model assisted by mind mapping in geography learning. In Cycle I, the average final score of students' conceptual understanding was 77.4, while in Cycle II, the average final score increased to 80.2. The comparison of the average final scores is presented in **Figure 5**.

The implementation of the guided inquiry learning model is indicated by high student learning interest. Students appeared more enthusiastic during the learning process because they were actively involved in independently constructing conceptual understanding. As stated by Chandra et al. (2020), students are more engaged in guided inquiry learning because they are able to identify problems, conduct investigations, and apply logical thinking

in the learning process. Furthermore Rahayu et al. (2021) noted that students are also able to solve problems effectively. In this study, the guided inquiry learning model did not stand alone but was integrated with mind mapping. The use of mind mapping in the learning process helped students connect interrelated concepts within the learning materials.

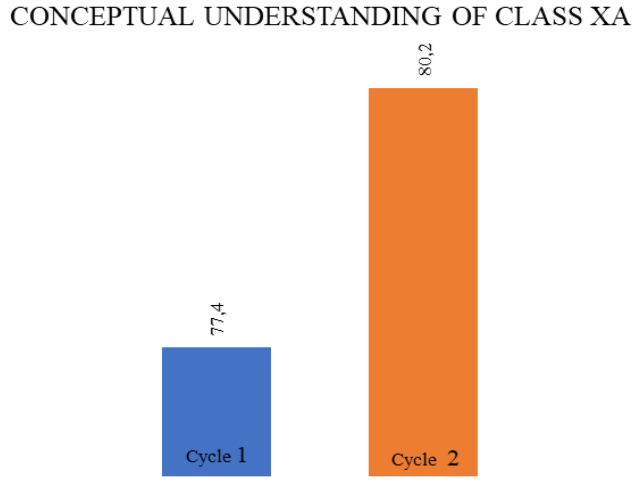

Figure 5. Improvement in Students' Conceptual Understanding

Source: Research Analysis, 2026

Students' learning motivation continues to increase through the application of mind mapping in classroom learning. In this study, students' learning motivation improved significantly because they independently constructed their own knowledge. Learning activities became more dynamic as students frequently asked questions during classroom discussions. This occurs because mind mapping is used to associate prior learning concepts with new concepts through lines, images, colors, keywords, and symbols in the learning process (Buzan, 2008). By using mind mapping, students are able to connect broad conceptual understanding and integrate these concepts into a single new idea (Polat & Aydın, 2020). This study demonstrates that students' ability to create mind maps improved from Cycle I to Cycle II. Many students were able to independently construct mind maps without further guidance. Thus, students were able to connect geographical concepts effectively without extensive assistance from the researcher.

As stated by Lance & Maniotes (2020) this learning model can produce deep and meaningful learning experiences for students. Deep learning occurs when students are directly involved in the

process of knowledge construction. Such learning makes classroom activities more meaningful. Students are able to understand the concepts in geography and apply them in their daily lives. The integration of the guided inquiry learning model with mind mapping in this study was able to enhance students' conceptual understanding.

CONCLUSIONS

The implementation of the guided inquiry learning model assisted by mind mapping in geography learning on the topic of Basic Geography Knowledge showed positive results. This study was conducted in two cycles, with findings indicating an improvement in students' conceptual understanding. The average conceptual understanding score in Cycle I was 77.4, while in Cycle II it increased to 80.2, successfully exceeding the Minimum Mastery Criterion (KKM) set by MAN 1 Pontianak, which is 78. The guided inquiry model assisted by mind mapping was able to transform students' conceptual understanding independently. Students became more enthusiastic about learning because they were directly involved in constructing their own knowledge. As a result, students were able to effectively connect concepts within the learning material.

This study empirically demonstrates that the integration of guided inquiry and mind mapping was successfully implemented in geography learning. Therefore, further research is needed to explore the application of various instructional models in geography education. Such exploration is important to encourage students to become more active and to foster greater enjoyment in learning geography.

REFERENCES

Addido, J., Burrows, A., & Slater, T. (2022). The effect of the conceptual change model on conceptual understanding of electrostatics. *Education Sciences*, *12*(10). https://doi.org/10.3390/educsci12100696

Budiharto, S., & Fitriana, D. (2025). Analisis keterampilan proses peserta didik pada mata pelajaran geografi dengan menggunakan model project based learning berbantu google earth. *Jurnal Jendela Pendidikan*, *5*(02), 292–300. https://doi.org/10.57008/jjp.v5i02.1318

Buzan, T. (2008). *Buku pintar mind map*. Gramedia.

Cahaya, I. M. E., Suarni, K., Dantes, N., & Margunayasa, I. G. (2020). The effect of guided inquiry learning model on creativity and linguistic

ability viewed from social interaction ability among kindergarten children of group b. *Journal of Education and E-Learning Research*, *7*(4), 421–429. https://doi.org/10.20448/journal.509.2020.74.421.429

Chandra, K., Degeng, I. N. S., Kuswandi, D., & Setyosari, P. (2020). Effect of guided inquiry learning model and social skills to the improving of students' analysis skills in social studies learning. *Journal for the Education of Gifted Young Scientists*, *8*(1), 603–622. https://doi.org/10.17478/JEGYS.654975

Creswell, J. W. (2016). *Reserch design: Pendekatan metode kualitatif, kuantitatif dan campuran edisi keempat.* Pustaka Belajar.

Dessie, E., Gebeyehu, D., & Eshetu, F. (2024). Motivation, conceptual understanding, and critical thinking as correlates and predictors of metacognition in introductory physics. *Cogent Education*, *11*(1). https://doi.org/10.1080/2331186X.2023.2290114

Gunawan, Harjono, A., Hermansyah, & Herayanti, L. (2019). Guided inquiry model through virtual laboratory to enhance students' science process skills on heat concept. *Cakrawala Pendidikan*, *38*(2). https://doi.org/10.21831/cp.v38i2.23345

Höft, L., Bernholt, S., Blankenburg, J. S., & Winberg, M. (2019). Knowing more about things you care less about: Cross-sectional analysis of the opposing trend and interplay between conceptual understanding and interest in secondary school chemistry. *Journal of Research in Science Teaching*, *56*(2). https://doi.org/10.1002/tea.21475

Hopkins, D. (2008). A teacher's guide to classroom research: Fifth edition. In *Improving Schools*. Open University Press.

Indriani, C., Hidayat, S., & Astriani, M. (2025). Improving learning outcomes through discovery learning on the human respiratory system material. *Journal of Education and Learning*, *19*(3), 1307–1316. https://doi.org/10.11591/edulearn.v19i3.20987

Kemendikbudristek. (2022). *Capaian pembelajaran geografi fase E-fase F untuk SMA/MA/Program Paket C*. Badan Standar, Kurikulum, dan Asesmen Pendidikan, Kementerian Pendidikan, Kebudayaan, Riset, dan Asesmen Pendidikan. https://kurikulum.kemdikbud.go.id/

Lance, K. C., & Maniotes, L. K. (2020). Linking librarians, inquiry learning, and information literacy? *Phi Delta Kappan*, *101*(7), 47–51. https://doi.org/10.1177/0031721720917542

Maniotes, L. K., & Kuhlthau, C. C. (2014). Making the shift: from traditional research to guiding inquiry learning. *Knowledge Quest*, *43*(2), 8–17.

Meesuk, P., Sramoon, B., & Wongrugsa, A. (2020). Classroom action research-based Instruction: The sustainable teacher professional development strategy. *Journal of Teacher Education for Sustainability*, *22*(1). https://doi.org/10.2478/jtes-2020-0008

Mills, S. (2016). Conceptual understanding: A concept analysis. *Qualitative Report*, *21*(3), 546–557. https://doi.org/10.46743/2160-3715/2016.2308

Polat, Ö., & Aydın, E. (2020). The effect of mind mapping on young children's critical thinking skills. *Thinking Skills and Creativity*, *38*. https://doi.org/10.1016/j.tsc.2020.100743

Rahayu, D. P., Fredy, Lieung, K. W., Yampap, U., Hermansyah, A. K., & Ainani, A. F. (2021). Implementation of guided inquiry models to improve problem solving skills and environmental stewardship of elementary school students in Papua. *Review of International Geographical Education Online*, *11*(5), 332–340. https://doi.org/10.48047/rigeo.11/5/34

Rinneheimo, K. M., & Suhonen, S. (2022). Languaging and conceptual understanding in engineering mathematics. *LUMAT*, *10*(2), 171–189. https://doi.org/10.31129/LUMAT.10.2.1729

Rumsey, D. (2010). *Statistics Essentials For Dummies*. Wiley Publishing, Inc.

Saptono, B., Herwin, H., & Dahalan, S. C. (2023). Video scribe's sparkol-based learning to improve learning outcomes: A Classroom action research. *International Journal of Information and Education Technology*, *13*(4). https://doi.org/10.18178/ijiet.2023.13.4.1863

Shi, Y., Yang, H., Dou, Y., & Zeng, Y. (2023). Effects of mind mapping-based instruction on student cognitive learning outcomes: a meta-analysis. *Asia Pacific Education Review*, *24*, 303–317. https://doi.org/10.1007/s12564-022-09746-9

Tan, R. M., Yangco, R. T., & Que, E. N. (2020). Students' conceptual understanding and science process skills in an inquiry-based flipped classroom environment. *Malaysian Journal of Learning and Instruction*, *17*(1). https://doi.org/10.32890/mjli2020.17.1.7

Taşlıdere, E. (2021). Relative effectiveness of conceptual change texts with concept cartoons and 5e learning model with simulation activities on pre-service teachers' conceptual understanding of waves. *Participatory Educational Research*, *8*(4). https://doi.org/10.17275/PER.21.87.8.4

Veriansyah, I., Nurhakim, I., & Mawardi, P. (2025). Improving students learning outcomes using group investigation method. *GeoEco*, *11*(1), 239. https://doi.org/10.20961/ge.v11i1.95520

Wardani, S., Kusuma, I. W., Liu, S. T., & Harjito. (2020). Comparison of learning in inductive and deductive approach to increase student's conceptual understanding based on international standard curriculum. *Jurnal Pendidikan IPA Indonesia*, *9*(1). https://doi.org/10.15294/jpii.v9i1.21155

Yani, H. (2020). Meningkatkan pendidikan karakter dan pemahaman konsep geografi melalui penerapan model pembelajaran kooperatif tipe

STAD berbantuan google form. *Indonesian Journal of Social Science Education (IJSSE)*, *2*(2), 171. https://doi.org/10.29300/ijsse.v2i2.3411