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A Literature Review on the Effectiveness of Mentoring-Based Interactive Mind Map Media in Elementary School Science Learning

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ABSTRACT

Improving learning outcomes in Natural and Social Sciences (IPAS) at the elementary school level remains a challenge, particularly in fostering students' conceptual understanding and critical thinking skills. Conventional instructional approaches often fail to optimally support these competencies, indicating the need for innovative learning strategies. This study aims to analyze the effectiveness of mentoring-based interactive mind map media in enhancing elementary school students' IPAS learning outcomes. A literature review method was employed by examining 241 articles retrieved from Google Scholar and Publish or Perish databases. Through an inclusion and exclusion process, 25 relevant national and international articles published between 2020 and 2025 were selected for analysis. The findings reveal that the integration of interactive mind maps with mentoring consistently contributes to improved learning outcomes, student engagement, conceptual clarity, and critical thinking abilities. The effectiveness of this approach is strongly influenced by systematic instructional planning and teachers' readiness to function as mentors. In conclusion, mentoring-based interactive mind map media represent a promising and innovative instructional alternative for IPAS learning in elementary schools. This study contributes theoretically by synthesizing evidence on integrated visual and mentoring-based learning, and practically by providing insights for educators in designing more effective IPAS instruction.

Keywords: Interactive Mind Maps, Mentoring, Literature Review, Learning Outcomes, Science Learning

INTRODUCTION

Education in the modern era today faces enormous challenges in improving the quality of learning in order to meet the demands of the times. Learning that only relies on conventional methods is often less effective in building students' deep understanding, critical thinking, and problem-solving skills Stelter, Kupersmidt, & Stump, 2021). The use of innovative learning media is one of the keys to increasing the effectiveness of learning itself. One of the media that has been proven to increase students' understanding and creativity is interactive mind mapping. Mind maps allow students to organize information visually, which can help them understand complex concepts more effectively (Alqasham & Al-Ahdal, 2022). This technique has been widely used in various levels of education because of its success in helping students understand complex concepts in a more systematic and memorable way (Buzan, 2020). Previous research has shown that

interactive mind maps can increase student engagement in learning and strengthen the relationship between the concepts being learned (Meilin & Affandi, 2024). Combining interactive mind map media with a mentoring approach will have a substantial impact on providing more optimal results, this can happen because mentoring can build deep interactions between mentors and mentees, encourage critical reflection, and increase learning motivation (templeton, jeong, & pugliese, 2021). Studies show that mentoring applied in learning can increase students' creativity, motivation, and problem-solving skills (tyaningsih et al., 2021). Thus, integrating interactive mind map media based on mentoring in natural and social science (IPAS) learning in elementary schools can be a prospective strategy in improving student learning outcomes. Research related to the use of interactive mind maps and mentoring methods in learning has been widely applied. However, after I studied it more deeply, there is still little research that discusses the integration of these two methods in the context of ipas learning in elementary schools. That means there needs to be research that examines interactive mind map media with a mentoring approach.

According to the Education Standards, Curriculum, and Assessment Agency of the Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia in 2022, the objectives of learning Natural and Social Sciences (IPAS) in Elementary Schools (SD) according to experts are: Increasing Belief in the Greatness of God Almighty: IPAS learning aims to increase students' awareness of the existence and greatness of God through an understanding of nature and life, Developing Knowledge and Understanding: Students are expected to be able to understand basic science concepts and apply them in everyday life, Improving Critical Thinking Skills: IPAS learning also aims to develop students' critical and analytical thinking skills through interactive learning activities. Thus, the objective of IPAS learning in elementary school is to form students who not only have knowledge of science, but also have critical thinking skills and awareness of the existence of God. Based on the background above, this study aims to analyze the literature review on interactive mind map media with a mentoring approach to elementary school IPAS learning.

METHOD

The research method used is descriptive literature study or better known as literature review collecting and analyzing research articles related to a particular problem theme (Juniawan et al., 2023). Researchers used 241 articles that were indicated as syntactic from national and international journals that were in accordance with the title variables in this study. Through an inclusive process, 25 relevant articles were obtained related to the topic while the remaining 216 articles fell into the exclusive category and were not used because they did not match the topic.

The following table displays the findings of the search for prior research articles that fit the research title, which is a literature review on the analysis of the efficacy of mentoring-based interactive media in IPAS learning in elementary schools, and were published between 2020 and 2025.

No	Author	Research Title mentoring	Research Results
1	Nathan R. Templeton, Shinhee Jeong, dan	Mentoring for continuous	Multidisciplinary Approach: Research findings from a range of disciplines and

	Elisabeth Pugliese (2021)	improvement in teaching and learning.	international contexts are presented in this article, showing that successful mentoring techniques may be modified and used in a wide range of educational settings, including culturally diverse nations.
2	Dana Dughi, PhD (2020)	Mentoring In Lifelong Learning For Teachers Example Of Good Practice	According to this article, mentoring is a transforming process in which professors serve as mentors and catalysts for students' growth, going beyond their conventional duties as knowledge suppliers.
3	Zulfikar Ali Buto Siregar (2024)	Effects of the Halaqah Mentoring Approach on Madrasah Students' Character Development	Contextual mentoring approach: By taking into account the requirements and circumstances of the students, such as enhancing their spiritual and emotional aspects, mentoring gives religious education a fresh perspective that was sometimes absent from earlier approaches.
4	Päivi Tynjälä Matti Pennanen Ilona Markkanen Hannu L T Heikkinen (2022)	Finnish Model Of Peer-Group Mentoring: Review Of Research	According to the research findings, a novel methodology—the constructivist approach—was employed in this investigation. The peer mentoring approach is highly successful and makes a big difference.
5	Emiliya Suprun, Andrijana Horvat, David F. Andersen.(2021)	Making Each Other Smarter: Assessing Peer Mentoring Groups As A Way To Support Learning System Dynamics	The findings of this investigation show that studies employing the peer mentoring group approach significantly enhance learning and support the dynamics of the educational system.
6	Muhammad Farkhan Sayoga, Puri Selfi Cholifah, Khusnul Khotimah (2023)	Development of Digital Map Media for Ethnic Diversity in	According to the attractiveness test findings, the average percentages for the one-on-one, small group,

		Indonesia for 4th Grade Elementary School	and big group tests were 91.67 percent, 90.71 percent, and 94.01 percent, respectively.
7	Ratna Yulis Tyaningsih Nourma Pramestie Wulandari Junaidi Deni Hamdani Sumbaji Putranto (2021)	The Effect Of Group Mentoring Learning On Student's Creativity In Solving Partial Differential Equations Problems	This study employs a novel method for teaching partial differential equations: the Group Mentoring Learning Model (GML). This approach places a strong emphasis on student cooperation, which may improve their inventiveness and level of interest in the material.
8	Rima Meilita Sari (2021)	Increasing Students Critical Thinking Skills And Learning Motivation Using Inquiry Mind Map	The findings of the study also examined if learning desire and critical thinking abilities were the same for both genders and schools. The study's findings demonstrate how the inquiry mind map tool influences the development of critical thinking abilities and motivation for learning. To improve critical thinking abilities, new learning resources and models should be created.
9	Mutiara Zenitha Asra1, Reinita (2023)	The Efficiency of PowerPoint-Based Mind Mapping Media in Elementary Schools	According to the analysis's findings, PowerPoint mind mapping is a legitimate and appropriate tool for usage in the fourth-grade primary school Pancasila Education Merdeka Curriculum.
10	Fahd Hamad Alqasham dan Arif Ahmed Mohammed Hassan Al-Ahdal (2022)	The Effectiveness Of Digital Mind Mapping On EFL Learners' Writing Skills And Attitudes: A Case Study Of Saudi EFL Learners	According to the research findings, the application of digital mind mapping has an impact on the attitudes and writing abilities of English as a foreign language learners.
11	Rebecca L. Stelter Janis B. Kupersmidt Kathryn N. Stump (2021)	Establishing Effective STEM Mentoring Relationships Through Mentor Training	The findings of this study demonstrate that mentoring relationships in STEM fields

			are very successful when mentors receive training.
12	Outi Tiainen dan Sonja Lutovac (2024)	Examining Peer Group Mentoring In Teaching Practicum And Its Impact On The Process Of Pre-Service Teachers' Joint Reflection	After a more thorough analysis of peer group mentoring in teaching practice and its effect on aspiring teachers' reflective processes, the research's findings are excellent for assisting instructors in developing into capable mentors for their students.
13	Lan Jin, Aparajita Jaiswal, Daniel C. Jones, Muna Sapkota, Shauna N. McClure, dan Aletha Stahl (2024)	Enhancing Intercultural Learning In Study Abroad Through An Online Curriculum In Group Mentored Intervention	The results of this research revealed that an online curriculum can improve intercultural learning in study abroad programs by providing group supervision.
14	Maeve L. McCarthy, Joan M. Herbers, Dr. Lisa Kunza, Dr. Brooke Long-Fox, dan Dr. Robin Zhang (2025)	Learning From Each Other: Faculty Peer Mentoring Circles At ADVANCE Institutions	We may make the following deductions based on the findings of the mentoring program research published in the journal Mentoring in a Post-Affirmative Action World: (1) The findings of the study indicated that minority students favored the psychosocial function of the mentoring program, which includes companionship, counseling, motivation, and role modeling, above the vocational function alone.
15	Jiaxing Tian (2024)	Application Of Mind Mapping To Primary School English Teaching	This research reveals that the use of mind mapping in English language teaching in elementary schools in China provides several significant benefits, such as improved vocabulary comprehension, reading skills, and writing abilities of students. With this method, students can organize information visually and structurally, which enhances their engagement and motivation in the

			learning process. Mind mapping is suitable for the cognitive development stage of students that requires an interactive learning approach, and it can be applied in various aspects of teaching, including vocabulary, reading, and writing.
16	Dyah Astriani	Mind Mapping In Learning Models: A Tool To Improve Student Metacognitive Skills	The study's findings demonstrate how well guidance services foster students' inventiveness.
17	Nurlaila dan Enok Rohayati, (2022)	Group Guidance Services' Impact on Students' Creativity	The study's findings, which were analyzed using sophisticated statistical techniques like regression analysis and Pearson Product Moment Correlation, improved our comprehension of the extent to which mentoring influences teenage self-identity.
18	Rahmil Humaerah, Arsad Bahri, Evi Ristiana (2020)	The Impact of Mind Mapping on Enhancing Science Learning Outcomes for Students in Elementary Schools	The data analysis results indicate that the experimental class utilizing mind map media had an average learning outcome of 93%, compared to 79% for the control class using traditional media.
19	Andy Riski Pratama, Wedra Aprison, Salmi Wati, Iswantir M, Wilda Irsyad, (2024)	The Impact of Mind Mapping on Student Learning Outcomes and Critical Thinking	The findings of the study, which were gathered through observations, literature reviews, and interviews, show that MTS Miftahussaadah Mijen's mentorship programs significantly and favorably affect parents, instructors, and children. The research findings thus support the idea that mentoring activities have a beneficial effect, such as making it simpler to read and

			commit the Qur'an to memory.
20	Yunia Filiyanda, Fina Fakhriyah, Ika Ari Pratiwi (2024	The Impact of Using the Mind Mapping Model with Media Puzzle to Help Fifth Grade Students Improve Their Concept Understanding	According to the research findings, fifth-grade students' knowledge may be improved by combining puzzle media with the mind mapping technique. Thus, ho is rejected and ha is accepted. One may argue that puzzle media and the mind mapping technique can improve pupils' conceptual understanding.
21	Kurnia Perdana Dharma Fortuna, Kurotul Aeni, (2024)	The Effectiveness Of The Mind Mapping In Pjbl On The Learning Outcomes And The Creativity Of Elementary School Students	In the aspect of creativity, data was obtained showing the average creativity scores of students on each indicator. During the four meetings in the experimental class, the scores were higher compared to the control class, and the n-gain scores for each indicator in the experimental class improved in each meeting.
22	Rizka Karima Meilin, Lalu Hamdian Affandi, dan Husniati, (2024)	The Impact of the Mind Mapping Learning Model on Fifth Grade Social Studies Students' Capacity for Creative Thought at SDN 1 Batu Mekar	Findings from studies on how well interactive media-based inquiry learning models and mind mapping affect students' learning outcomes in science education The learning results of pupils are impacted by the usage of interactive media.
23	Horidatus Saadah, Moh. Nurul Fatah, Diah Novianti, Sri Utami, dan Soesiana Tri Eka Silver (2024)	The Impact of Interactive Media-Based Mind Mapping and Inquiry Learning Models on Science Education Student Learning Outcomes	Journal Research Results on Improving Students' Critical Thinking Capabilities and Learning Motivation Students who utilize the inquiry mind map tool and those who are taught using traditional teaching techniques have significantly different critical thinking abilities. Students' critical thinking abilities have been found to be improved more

			successfully when inquiry mind maps are used
24	Rima Meilita Sari (2020)	Increasing Students Critical Thinking Skills And Learning Motivation Using Inquiry Mind Map	Through a comparison of several papers, the study's findings determined the impact of the mind mapping-assisted problem-based learning paradigm on students' cognitive biology learning outcomes. demonstrating how students' learning outcomes in cognitive biology are impacted by the PBL technique with mind mapping assistance.
25	Nurochmah, Suidat, Muslimah, Salwa Marsela, Ignasius Tasi (2024)	Thematic Educational Resources: Mind Mapping as Creative Approaches for Primary Schools	According to research findings, primary school teachers' ignorance of how mind mapping was created in Bogor Regency results in theme learning materials based on mind mapping that are not properly arranged.

Based on an examination of 25 national and international works, it was identified that the interactive mind map media based on mentorship aids students in achieving higher academic performance. For effective aid and improvement of conceptual comprehension, roles of the mentor and mentee must synergistically function in a mentoring-based learning framework. Mentees need to possess a greater understanding of the IPAS curriculum and also skills of leadership and offering rationale (Templeton, Jeong, & Pugliese, 2021).

Results from the literature analysis highlighted the potential of mentoring to enable learners to effectively understand the concepts and increase their self-efficacy in learning (Siregar, 2024). The challenge in this case is that many mentors remain subpar due to a lack of training and outdated resources which makes it difficult for them to guide their mentees without coming across as ‘a second teacher.’

As previously described, the lesson needs to be planned carefully in order to fully utilize the interactive mind maps in the mentoring process. Students are able to better structure information and understand complex topics with the use of validated mind mapping (Mahrunnisya, 2023). Especially in primary school, students find it easier to process information with the aid of mind mapping. Using interactive mind maps, for example, students can relate concepts from other subjects in IPAS learning like natural science ecosystems and social science their influences in society. This relates to the multidisciplinary nature of ipas, therefore requiring a visual aid that can help students understand the relations between the subjects (Isnaeni, Saepudin, & Rachmah, 2024).

Also, the use of technology in interactive mind maps allows students to create digital mind maps which is more flexible than analogue paper methods. Tools such as

MindMeister and Coggle can increase student engagement and add life to the classroom (Ching & Zainudin, 2023). In addition to improving educational outcomes, this will also enhance students' creativity.

RESULTS AND DISCUSSION

Based on the analysis of 25 selected national and international articles, this literature review demonstrates that mentoring-based interactive mind map learning media has a consistently positive impact on elementary school students' learning outcomes in Natural and Social Sciences (IPAS). The findings indicate that the integration of visual learning tools and structured mentoring processes supports not only cognitive achievement but also students' engagement, motivation, and higher-order thinking skills. These results align with contemporary learning theories emphasizing active, student-centered, and scaffolded learning experiences.

Effectiveness of Interactive Mind Maps on IPAS Learning Outcomes

The reviewed studies reveal that interactive mind maps significantly enhance students' ability to organize, connect, and recall information. IPAS, as an integrated subject combining natural and social sciences, requires students to understand relationships between concepts rather than memorizing isolated facts. Interactive mind maps enable learners to visually represent these relationships, making abstract concepts more concrete and meaningful. Several studies reported that students taught using mind mapping strategies achieved higher post-test scores compared to those taught using conventional methods, indicating improved conceptual understanding and academic performance. In addition, interactive mind maps encourage active participation by allowing students to construct knowledge collaboratively or individually. Digital mind mapping tools further enhance this process by providing flexibility, multimedia integration, and opportunities for revision. This visual–spatial approach is particularly suitable for elementary school students, whose cognitive development benefits from concrete representations and exploratory learning environments. Consequently, interactive mind maps function not only as instructional media but also as cognitive tools that facilitate meaningful learning.

Role of Mentoring in Strengthening Learning Processes

Beyond the use of interactive media, mentoring emerges as a critical factor that amplifies the effectiveness of mind map-based learning. The literature highlights mentoring as a form of guided learning that supports students in interpreting information, reflecting on their understanding, and developing critical thinking skills. In mentoring-based learning environments, teachers or peers act as facilitators who provide feedback, pose guiding questions, and help learners overcome conceptual difficulties. The reviewed studies indicate that mentoring enhances students' confidence and self-efficacy, particularly when dealing with complex or interdisciplinary IPAS content. Mentoring helps students remain focused on learning goals while encouraging reflective thinking and problem-solving. This finding supports constructivist learning principles, which emphasize the importance of social interaction and guidance in knowledge construction. When combined with interactive mind maps, mentoring ensures that visual representations are not merely decorative but are meaningfully connected to learning objectives.

Integration of Interactive Mind Maps and Mentoring

The most significant finding of this review lies in the synergistic integration of interactive mind maps and mentoring. Studies that explicitly combined these two approaches reported more substantial learning gains compared to those implementing mind mapping or mentoring separately. Interactive mind maps provide a structured visual framework, while mentoring ensures that students actively engage with and reflect on the content represented in the maps. This integration supports differentiated instruction by allowing mentors to adapt guidance based on students' individual needs, learning pace, and prior knowledge. For example, mentors can help students refine their mind maps, correct misconceptions, and establish deeper conceptual connections across IPAS topics such as ecosystems, social interactions, and human–environment relationships. As a result, learning becomes more personalized, meaningful, and contextually grounded.

Impact on Higher-Order Thinking Skills and Learning Motivation

Several reviewed articles emphasize that mentoring-based interactive mind map learning contributes to the development of higher-order thinking skills, including critical thinking, creativity, and problem-solving. By constructing and revising mind maps under mentor guidance, students are encouraged to analyze relationships, evaluate information, and generate new ideas. These activities align with higher levels of Bloom's taxonomy, moving learning beyond remembering and understanding toward analyzing and creating. Moreover, the literature consistently reports increased learning motivation and engagement among students exposed to this integrated approach. Interactive mind maps, particularly when supported by digital tools, create an enjoyable and stimulating learning environment. Mentoring further strengthens motivation by fostering positive teacher–student interactions and providing emotional and academic support. This combination helps students feel valued and capable, which positively influences their learning attitudes and persistence.

Teacher Readiness and Instructional Planning

Despite the positive outcomes, the reviewed studies also highlight several challenges in implementing mentoring-based interactive mind map learning. One key issue is teacher readiness. Effective mentoring requires pedagogical competence, content mastery, and mentoring skills, including the ability to guide without dominating the learning process. Some studies indicate that inadequate mentor training may reduce the effectiveness of mentoring and lead to its misinterpretation as merely an extension of traditional teaching. Instructional planning also plays a crucial role in determining the success of this approach. The literature emphasizes the need for systematic lesson design that clearly integrates learning objectives, mind map activities, and mentoring strategies. Without careful planning, interactive mind maps risk becoming superficial visual aids rather than meaningful learning tools. Therefore, professional development and instructional support for teachers are essential to maximize the potential of this integrated approach.

Implications for IPAS Learning in Elementary Schools

The findings of this literature review have important implications for IPAS learning in elementary schools. First, mentoring-based interactive mind map media can serve as an effective alternative to conventional teaching methods, particularly in addressing the interdisciplinary nature of IPAS. Second, this approach supports the development of essential 21st-century skills, such as critical thinking, creativity, collaboration, and self-

directed learning. Third, it aligns with curriculum demands that emphasize active learning, conceptual understanding, and character development. Furthermore, the use of digital interactive mind maps supports the integration of technology in education, preparing students for digital literacy from an early age. When implemented thoughtfully, this approach can enhance not only academic outcomes but also students' learning experiences and attitudes toward science and social studies.

CONCLUSION

This literature review concludes that mentoring-based interactive mind map learning media is an effective instructional approach for improving elementary school students' learning outcomes in Natural and Social Sciences (IPAS). The integration of visual mind mapping and structured mentoring supports students' conceptual understanding, critical thinking skills, and learning motivation. Interactive mind maps help students organize and connect interdisciplinary IPAS concepts, while mentoring provides guidance that strengthens reflection and meaningful learning. The effectiveness of this approach is strongly influenced by teacher readiness, mentoring competence, and systematic instructional planning. Therefore, mentoring-based interactive mind map media can be recommended as an innovative alternative to enhance the quality of IPAS learning in elementary schools. Future studies are encouraged to explore its implementation in diverse contexts and examine broader learning outcomes beyond cognitive achievement. Future research is recommended to explore longitudinal impacts, experimental comparisons, and the role of different mentoring models in IPAS learning. Studies examining student collaboration, digital literacy development, and teacher professional growth would further enrich understanding of this approach. Expanding literature reviews to include meta-analyses or mixed-method studies may also provide deeper insights into its effectiveness.

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