Integrated Science Education Journal
Vol. 4, No. 2, May 2023, pp. 43~53
ISSN: 2716-3725, DOI: 10.37251/isej.v4i2.329

Analysis of Problem Solving Ability of First Middle School Students in Learning Science

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Article Info

Article history:

Received Apr 18, 2023
Revised May 7, 2023
Accepted May 30, 2023
OnlineFirst May 30, 2023

Keywords:

Learning
Science
Problem Solving

ABSTRACT

Purpose of the study: The purpose of this study was to analyze the problem-solving abilities of junior high school students in science learning through a literature review.

Methodology: The type of research used in this research is qualitative research with a systematic literature review method. The data collection technique used is a literature study. The data analysis technique used is the synthesis matrix

Main Findings: Based on the research that has been done, it can be concluded that almost all of the articles analyze the level of students' problem-solving abilities, and most of the articles analyzed use an experimental research design in improving junior high school students' natural science problem-solving skills.

Novelty/Originality of this study: The novelty of this research lies in the focus of its research on problem-solving ability analysis, especially in science learning, junior high school research subjects, and using a type of literature review research.

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1. INTRODUCTION

Natural science is one of the sciences that examines the symptoms of natural phenomena. In science learning, students are not only provided with mastery of a number of knowledges, but also provided sufficient space to apply the knowledge learned in everyday life [1-3]. In each educational unit, the science learning process should be carried out interactively, inspiring, fun, challenging, motivating students to actively participate, and providing sufficient space for initiative, creativity and independence in accordance with the talents, interests and physical and psychological development of students [4-6]. This is because in learning science, students not only memorize concepts and answer questions, but students are also expected to be able to understand, observe, analyze and solve problems which will later be useful for everyday life [7-9]. Therefore, the success of learning science is related to students' problem-solving abilities [10-12].

Problem solving ability is an important ability for students to have in learning science. With the ability to solve problems, students' critical, logical, and creative thinking skills can be [13-15]. Students who have problem solving abilities can understand problems, plan strategies and implement plans to solve a problem [16-18] In order to further develop students' problem-solving abilities, an effort can be made to create educational experiences that can provide students with adaptability to be more dynamic in critical thinking during educational experiences [20-22]. This shows that problem solving skills can build critical thinking skills in learning [23-25].

Students' problem solving abilities can be continuously trained and developed. Like research conducted by Lestari (2023) with the findings that there was an increase in problem-solving ability, the highest was in the indicator focusing on problems and the lowest increase was in the indicator evaluating solutions. In his research, the focus was on the analysis of increasing problem-solving ability using the STEM approach. Research by Hanifa et al. (2018) shows that the factors that support students' ability to solve problems are models/methods, media and learning environments created by the teacher, while the inhibiting factors are the provision of motivation from the teacher, student interest and students' cognitive abilities The low one. Research by Suryaningtyas & Setyaningrum. (2020) focuses on analyzing students' metacognitive abilities in solving problems. Furthermore, research by Azzahra & Pujiastuti (2020) uses a qualitative descriptive research type. Research by Santoso & Wulandari. (2020) focuses on the effect of project-based learning combined with problem-solving methods on students' thinking skills. From this research it is known that there are differences with the research that will be carried out lies in the focus of the research and the type of research used.

The novelty of this research lies in the focus of its research on problem solving ability analysis, especially in science learning, junior high school research subjects, and using a type of literature review research. The purpose of this study was to analyze problem solving abilities of junior high school students in science learning through a literature review.

2. RESEARCH METHOD

The type of research used in this research is qualitative research with a systematic literature review method. In this method, systematic reviews are carried out in a transparent manner to search for published research articles, evaluate them by extraction, analysis, and synthesis [28], [29].

The sample data in this study were taken by searching several scientific articles from the results of previous research such as developmental, experimental, and descriptive research, based on literature studies which were then reviewed and conclusions drawn according to the research topic being studied. The process of reviewing articles in this study discusses the analysis of problem solving abilities of junior high school students in learning natural sciences. The data collection instruments used included reviewing scientific articles sourced from the last 25 references from Google Scholar which focused on the topic under study.

The data collection technique used is literature study. Literature study is a technique used by researchers to collect and examine as much theory and information from literature regarding research topics, where these sources must be relevant and academically accountable for their validity and validity as scientific sources such as books, journals, magazines, monographs , research reports, encyclopedias and materials [30], [31].

The data analysis technique used is the synthesis matrix. The synthesis matrix is a table or diagram that is used to group and classify different arguments from several articles and combine different elements to obtain conclusions about the entire article in general [32], [33]. In this study, the researcher created a table consisting of columns for the author (year), research design, and findings. The research procedure begins with choosing the method used, determining the instruments used, determining the sampling technique and research samples and conducting data analysis to draw conclusions.

3. RESULTS AND DISCUSSION

The literature review process was carried out on selected scientific articles based on the topics studied related to the analysis of problem solving abilities of junior high school students in learning natural sciences. The number of articles reviewed was 25 articles. The results of the review of articles about this research are presented in Table 1.

Table 1. Results of Article Reviews

No.	Author (Year)	Title	Research Design	Findings
1.	Adi Winarso, Joko Siswanto, Fenny Roshayanti (2023)	*Pengembangan Perangkat Pembelajaran Pada Materi Interaksi Makhluk Hidup Dengan Lingkungan Ditinjau Dari Kemampuan Pemecahan Masalah Dan Berfikir Kritis Siswa Smp Negeri 2 Moga* [Development of Learning Devices on the Interaction	Desain Penelitian Ini Adalah One Group Pretest-Posttest	Research Results Shows That Application of Learning Devices Can Train Students' Critical Thinking Ability and Problem Solving Ability

No.	Author (Year)	Title	Research Design	Findings
		of Living Things with the Environment in terms of Problem Solving Ability and Critical Thinking of Students of SMP Negeri 2 Moga]		
2.	Else Fenrnadu Dina (2023)	*Pengembangan E-Modul Terintegrasi Stem Pada Materi Pencemaran Lingkungan Berorientasi Untuk Meningkatkan Kemampuan Pemecahan Masalah* [Stem Integrated E-Module Development on Oriented Environmental Pollution Material To Improve Problem Solving Ability]	Penelitian Dan Pengembangan	The finding is that the developed STEM integrated e-module product is also effective in increasing problem-solving abilities.
3.	Mochamad Zumar Firdaus Ermawan, An Nuril Maulida Fauziah (2023)	*Analisis Kemampuan Pemecahan Masalah Ipa Pada Siswa Smp Dalam Menyelesaikan Soal Ipa* [Analysis of Science Problem Solving Ability in Middle School Students in Solving Science Problems]	Deskriptif Kualitatif	The results of his research show that the Ability to Solve Science Problems in Middle School Students Solving Science Problems is Still Very Low
4.	Erni Mariana, Kusuma Wardany, Dwi Aprillia Setia Asih (2022)	*Pengaruh Model Problem Based Learning Terhadap Peningkatan Pemecahan Masalah Siswa Pada Pembelajaran Ipa* [The Effect of Problem Based Learning Models on Increasing Student Problem Solving in Science Learning]	Quasi Eksperimen Dengan Desain Control Group Posttest Design	The findings show that the application of the Problem Based Learning Model Can Affect the Problem Solving Ability of Class VIII Students of Middle School Kartikatama Metro
5.	Hartoyo Yudhawardana (2022)	*Penerapan Model Pembelajaran Kooperatif Creative Problem Solving (Cps) Untuk Meningkatkan Kemampuan Pemecahan Masalah Siswa* [Application of the Creative Problem Solving (Cps) Cooperative Learning Model to Improve Students' Problem Solving Ability]	Kajian Literatur	The results of his research show an increase in students' problem-solving abilities.
6.	I.W. Surita, I.W. Suja, A.A.I.A.R. Sudiatmika (2022)	*Perancangan Dan Validasi Lembar Kerja Peserta Didik Untuk Mendukung Implementasi Model*	Penelitian Dan Pengembangan Dengan Model ADDIE	The findings show that LKPD supports the implementation of the PBL model containing

No.	Author (Year)	Title	Research Design	Findings
		Problem Based Learning Bermuatan Kearifan Lokal Guna Meningkatkan Kemampuan Pemecahan Masalah [Design and Validation of Student Worksheets to Support the Implementation of Problem Based Learning Models Loaded with Local Wisdom to Improve Problem Solving Ability]		local wisdom to improve students' problem-solving abilities.
7.	Jaka Afriana (2022)	*Pengaruh Pjbl Stem Terhadap Literasi Sains Dan Problem Solving Siswa Smp* [The Effect of Pjbl Stem on Scientific Literacy and Problem Solving of Middle School Students]	Kuasi Eksperimen Dengan Desain The Matching-Only Posttest-Only Control Group	The findings show that Pjbl STEM learning has an effect on students' scientific literacy and problem solving.
8.	Mahrus, Mira Natika Anggraeni, Idam Matus Silmi (2022)	*Pengaruh Authentic Learning Berbasis Lingkungan Terhadap Kemampuan Berpikir Kritis Dan Pemecahan Masalah Ipa* [The Influence of Environment-Based Authentic Learning on Critical Thinking Ability and Science Problem Solving]	Metode True Eksperimental Dengan Desain Pretest Posttest Control Group Design	His Research Results Demonstrate Authentic Learning Methods Environmental Based Influence Against Improvement of Critical Thinking Ability And Solving Student Science Problems
9.	Rizki Anita Bella, Supriyono, Muflikhul Khaq (2022)	*Peningkatan Motivasi Belajar Dan Hasil Belajar Ipa Menggunakan Metode Problem Solving* [Increasing Learning Motivation and Science Learning Outcomes Using the Problem Solving Method]	Penelitian Tindakan Kelas	The results of his research show learning motivation and learning outcomes experience Improvement Using Problem Solving Methods
10.	Sri Rahayu, Abd. Halik, Ahdar (2022)	*Penerapan Strategi Polya Pada Pembelajaran Ipa Dalam Meningkatakan Kemampuan Pemecahan Masalah Ipa Di Kelas Vii Mts Muhammadiyah Punnia Kabupaten Pinrang* [Application of the Polya Strategy in Science Learning in Improving Science Problem Solving Ability in Class VII Mts	Penelitian Tindakan Kelas	The findings show that the lesson plans and textbooks based on the PBL-STEM model with the formative assessments developed have very feasible criteria and have the opportunity to improve students' problem-solving abilities

No.	Author (Year)	Title	Research Design	Findings
		Muhammadiyah Punnia Pinrang Regency]		
11.	Zuana Habibaturrohmah, Parno, Isnanik Juni Fitriyah (2022)	*Pengembangan Buku Ajar Ipa Berbasis Pbl-Stem Dengan Asesmen Formatif Untuk Meningkatkan Kemampuan Pemecahan Masalah Siswa Kelas Vii Smp Pada Tema Pencemaran Lingkungan* [Development of PBL-Stem-Based Science Textbooks with Formative Assessments to Improve the Problem-Solving Ability of Class VII Junior High School Students on the Theme of Environmental Pollution]	Penelitian Dan Pengembangan	The findings show that the lesson plans and textbooks based on the PBL-STEM model with the formative assessments developed have very feasible criteria and have the opportunity to improve students' problem-solving abilities.
12.	Endang Wahyudiana, Julius Sagita, Vina Iasha, Ari Setiantini, Ari Setiarini (2021)	*Modul Praktikum Ipa Berbasis Problem Based Learning Untuk Meningkatkan Kemampuan Pemecahan Masalah* [Problem Based Learning Science Practicum Module to Improve Problem Solving Ability]	Research And Development Yang Dikemukakan Oleh Dick And Carey	The research results show that there is an average increase Ability to Solve Problems During Learning Using the Science Module Based on Problem Based Learning to Improve Solving Ability Problems Are Shown By Pre-Test And Post-Test Results.
13.	Moneyta Kurnia Pangestu, Erni Yulianti, Novida Pratiwi (2021)	*Pengembangan Instrumen Penilaian Bermuatan Steam Untuk Mengukur Kemampuan Berpikir Kreatif Dan Problem Solving Pada Tema Getaran Dan Gelombang* [Development of a Steam Loaded Assessment Instrument to Measure Creative Thinking Ability and Problem Solving on the Theme of Vibration and Waves]	Penelitian Dan Pengembangan, Dengan Model 4D	Assessment of Creative Thinking Ability and Problem Solving Using the STEAM Approach Is Valid and Reliable and Can Be Used to Measure Students' Creative Thinking Ability and Problem Solving.
14.	Oktaviana Rahayu, Martua Ferry Siburian, Andri Suryana (2021)	*Analisis Kemampuan Pemecahan Masalah Ipa Siswa Kelas Vii Pada Konsep Pencemaran Lingkungan Di Mts. Asnawiyah Kab. Bogor*	Deskriptif Kualitatif	The results of his research show that the lowest score for students' natural science problem solving abilities is in the checking stage

No.	Author (Year)	Title	Research Design	Findings
		[Analysis of Science Problem Solving Ability of Grade VII Students on the Concept of Environmental Pollution at Mts. Asnawiyah Kab. Bogor]		Back Truth Solutions
15.	Silva Ayu Indah Permata, Widha Sunarno Dan Harlita (2021)	*Studi Literatur Double Loop Problem Solving (Dlps) Terhadap Kemampuan Pemecahan Masalah Ipa Siswa Smp* [Literature Study Double Loop Problem Solving (Dlps) Against Science Problem Solving Ability of Junior High School Students]	Deskriptif Dengan Metode Studi Literatur Dan Wawancara	The results of his research show that students' abilities are classified as low when solving problems
16.	Sindy Vega Artinta, Hanin Niswatul Fauziyah (2021)	*Faktor Yang Mempengaruhi Rasa Ingin Tahu Dan Kemampuan Memecahkan Masalah Siswa Pada Mata Pelajaran Ipa Smp* [Factors Affecting Students' Curiosity and Problem-Solving Ability in Science Subjects, Middle School]	Penelitian Kualitatif Dengan Desain Naturalistic Dan Pendekatan Deskriptif	The findings show that the factors that influence the ability to solve problems are the strategies used by the teacher, the material presented, teacher motivation, students' initial abilities, The Level of Complexity of Material, Environment and Family.
17.	Indriyani, Mochammad Ahied, Irsad Rosidi (2020)	*Penerapan Model Pembelajaran Double Loop Problem Solving (Dlps) Terhadap Kemampuan Pemecahan Masalah Siswa Pada Materi Bencana Alam* [Application of the Double Loop Problem Solving (Dlps) Learning Model to Students' Problem Solving Ability in Natural Disaster Materials]	Penelitian Kuantitatif Dengan Metode Eksperimen	The Application of the Double Loop Problem Solving (DLPS) Learning Model Can Improve Students' Problem Solving Ability in Natural Disaster Materials.
18.	Indriyawanti, S K Handayanto, Dan E Latifah (2020)	*Studi Kuantitatif Kemampuan Pemecahan Masalah Siswa Smp Melalui Penerapan Scaffolding Gabungan Dalam Pembelajaran Ipa Berbasis Stem* [Quantitative Study of Students' Problem Solving Ability Middle School	Kuasi Eksperimen Dengan Rancangan Penelitian Non-Equivalent Control Group Design	The research results show that there are differences in problem solving abilities Significance Between Students Who Learn Through STEM-Based PBL (Control Class) And STEM-Based PBL With Combined Scaffolding

No.	Author (Year)	Title	Research Design	Findings
		Through the Implementation of Inner Joint Scaffolding Stem-Based Science Learning]		(Experimental Class).
19.	K. S. K. Wardani, A. N. Rahmatih, N. L. P. N. Sriwarthini, Nurwahidah, F.P. Astria (2020)	*Pengaruh Model Pembelajaran Creative Problem Solving Terhadap Hasil Belajar Siswa* [The Effect of the Creative Problem Learning Model Solving Against Student Learning Outcomes]	Desain Penelitian Quasi Eksperimen Dengan Cara Pretest-Posttest Nonequivalent Control Group Desain	The findings show that the learning outcomes of students who study with the Creative Problem Solving Learning Model are higher than those of the students Conventional Learning Model.
20.	Nurul Heni Astuti, Ani Rusilowati, Bambang Subali, Putut Marwoto (2020)	*Analisis Kemampuan Pemecahan Masalah Model Polya Materi Getaran, Gelombang, Dan Bunyi Siswa Smp* [Analysis of Problem Solving Ability Polya Model Vibration, Wave, and Sound Material of Junior High School Students]	Penelitian Survey Dengan Analisis Deskriptif Kualitatif	The results of his research show that the ability of students to work on problem solving questions is still at a low level and below the minimum completeness criteria (KKM) for science subjects.
21.	Rahmania, Muhammad Danial, Tabrani Gani (2020)	*Pengembangan Perangkat Pembelajaran Ipa Smp Berbasis Discovery Learning Berorientasi Kemampuan Pemecahan Masalah Dan Hasil Belajar Peserta Didik* [Development of Discovery-Based Science Middle School Learning Devices Learning Oriented Problem Solving Ability And Student Learning Outcomes]	Penelitian Dan Pengembangan, Dengan Model 4D	The results of his research indicate that the problem-solving ability-oriented learning tools developed can improve students' natural science learning outcomes.
22.	N L.Eka Sumiantari, I Nyoman Suardana, Kompyang Selamet (2019)	*Pengaruh Model Problem Based Learning Terhadap Kemampuan Pemecahan Masalah IPA Siswa Kelas VIII SMP* [The Effect of Problem Based Learning Models on Science Problem Solving Ability of Grade VIII Middle School Students]	Eksperimen Semu	The results of his research show that students who are taught with the PBL model have better problem solving abilities From STAD Type Cooperative Model.
23.	Muhamad Habibi, Zainuddin, Dan	*Pengembangan Perangkat Pembelajaran*	Penelitian Dan Pengembangan	The findings show that the Physics Science

No.	Author (Year)	Title	Research Design	Findings
	Misbah (2017)	*Ipa Fisika Berorientasi Kemampuan Pemecahan Masalah Menggunakan Model Pengajaran Langsung Pada Pokok Bahasan Tekanan* [Development of Learning Devices Ipa Physics Oriented Problem Solving Ability Using the Direct Teaching Model On the subject of pressure]		Learning Device is Oriented to Problem Solving Ability Using the Direct Teaching Model Developed is Worth Using in the Learning Process
24.	Syir Anatut Taqiyyah, Bambang Subali, Langlang Handayani (2017)	*Implementasi Bahan Ajar Sains Berbahasa Inggris Berbasis Metakognitif Untuk Meningkatkan Kemampuan Pemecahan Masalah Siswa Smp* [Implementation of Metacognitive Based Science Teaching Materials in English To Improve the Problem Solving Ability of Junior High School Students]	Metode Penelitian Menggunakan Eksperimen, Dengan Desain Quasi Experimental Teknik Nonequivalent Control Group Design	The findings show that metacognitive-based English teaching materials can be used to improve students' problem-solving abilities
25.	T. Nurita, P. W. Hastuti, D. A. P. Sari (2017)	Problem-Solving Ability Of Science Students In Optical Wave Courses	Kuantitatif Deskriptif	This Study Shows Students' Problem Solving Ability Has Improved

Based on Table 1, it is known that previous research focused on increasing students' problem-solving skills in learning by applying various learning models, developing learning tools and learning media that can improve science learning outcomes for junior high school (SMP) students. In this study, an analysis of 25 articles was carried out based on the research design and findings with a research focus on analyzing the problem-solving abilities of junior high school students in learning natural sciences.

Based on the analysis of the findings of 25 articles related to problem solving abilities in physics learning for high school level, it is known that there are 9 articles that apply learning models, methods, and strategies to improve students' natural science problem solving abilities, including 5 articles applying learning models, 2 applying learning methods , and 2 articles implementing learning strategies. The learning models applied are problem solving, double loop problem solving, STAD, problem based learning, project based learning, authentic learning methods, polya strategies. In addition, there are 4 articles that implement the development and application of learning media such as books and modules. Then, there are 4 articles that develop and apply learning tools to improve students' problem solving abilities. While 7 other articles analyzed the level of students' problem-solving abilities in science learning, among the results of their research stated that the level of students' problem-solving abilities varied, some were still classified as very low, low, and some were classified as high. One of the 25 articles, namely research by (Artinta & Fauziyah, 2021) states that there are several factors that affect problem solving abilities, namely the strategies used by the teacher, the material presented, teacher motivation, students' initial abilities, the level of complexity of the material, the environment and family. This is what affects the difference in the level of students' problem solving abilities.

Based on the analysis of the research design of 25 articles related to problem solving abilities in physics learning for junior high school level, it is known that there are 8 articles using the type of development research including using the ADDIE model and the 4D model. In addition, there are 2 articles with the type of classroom

action research, 1 article using the type of survey research, 9 articles using the experimental method, and 2 articles using the literature review method, 3 articles with the type of qualitative research, and 1 article with quantitative research.

From the analysis of the 25 articles, it shows that students' problem-solving abilities can be increased by implementing learning models such as research conducted by Solong et al. (2022) showing that project-based learning models have an effect on students' problem-solving abilities, where project-based learning with raising a contextual problem is proven to be able to train students to identify problems, formulate problems, analyze problems, make conclusions, and create problem solving solutions. In addition, research by Latifah et al. (2022) states that the blended learning model uses Prezi, students are active in answering questions or asking things they don't understand, students work together with their respective group mates, between groups compete with each other, so they can improve students' problem solving abilities. Furthermore, research by Darsani (2023) states that problem-based learning is the presentation of learning to students with problem situations, by presenting problems according to authentic and meaningful situations that can make it easy for students to carry out investigations and inquiries. By implementing various learning models, it can help teachers improve students' problem-solving skills.

The update in this study was to conduct a literature review for 25 articles by analyzing the research design and findings from previous studies. The focus of this study was the analysis of problem solving skills in science learning for junior high school students. Whereas previous research only developed learning tools and learning media, and applied learning models to improve problem solving abilities.

The limitations of this study are that it only analyzes the research design and the findings of previous studies related to problem solving in science learning, and only uses junior high school students as research subjects. Therefore, the researcher hopes that further research can be carried out on background analysis, samples, and others, and can be carried out on research subjects for students at the elementary, high school, and tertiary levels.

4. CONCLUSION

Based on the research that has been done, it can be concluded that almost all of the articles analyze the level of students' problem-solving abilities and most of the articles analyzed use an experimental research design in improving junior high school students' natural science problem-solving skills.

ACKNOWLEDGEMENTS

I gratefully acknowledge to all colleagues who have provided support so that this paper can be completed

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