

e-Jurnal: <http://doi.org/10.21009/1>

p-ISSN: 2461-0933

e-ISSN: 2461-1433

# JPPPF

Volume 10 Issue 1, June 2024

DOI: [doi.org/10.21009/1.101](http://doi.org/10.21009/1.101)

Jurnal Penelitian dan Pengembangan  
**PENDIDIKAN  
FISIKA**



Pendidikan  
Fisika



LPPM



**JURNAL PENELITIAN & PENGEMBANGAN PENDIDIKAN FISIKA**  
Abstracting and Indexing:

			
			
			
			
			
			

e-Jurnal: <http://doi.org/10.21009/1>

**JPPPF**

Volume 10 Issue 1, June 2024

DOI: [doi.org/10.21009/1.101](http://doi.org/10.21009/1.101)

**Trends of Physics Critical Thinking Skill Research in Indonesia: A Systematic Literature Review**

*Santri Adi Putri, Khairun Nisa, Heru Kuswanto*

**How to Promote the Ability of Physics Teaching Materials Development through Team-Based Project Learning? An Action Research Evidence**

*Mita Anggaryani, Muhammad Satriawan, Oka Saputra, Muhammad Habibulloh*

**How Extensively do Teachers Train Students' Metacognition Abilities in Physics Learning in High School?**

*Okta Alpindo, Edi Istiyono, Widibastuti Widibastuti*

**Development of an Assessment Instrument to Measure High School Students' Collaboration Skills in Physics Learning**

*Nadia Natalia Simamora, Edi Istiyono, Insib Wilujeng*

**Alternative Virtual Lab-Based Practical Learning Model to Improve Scientific Attitude and Science Process Skills**

*Mub. Tawil, Mub. Aqil Rusli, Hasanuddin Bakara, Budi Jatmiko*

**Exploration of Physics Concepts in Local Wisdom of South Sumatera as an Effort to Develop Students' 21st-Century Skills**

*Ketang wijono, Ismet Ismet, Nely Andriani, Alikea Fitonia, Hartisya Nadia, Diana Meitasari, Nauratun Nazhifah*

**Improving Science Literacy Skills through Interactive Physics E-Learning for students at Lapandewa High School**

*Muslimin Boma, Rida Siti Nur'aini Mahmudah, Salam Salam, Ika Pratwi, Syahrir Syahrir, Diki Chen, Nofianti Nofianti, Rezeky Nur Ariatami*

**Educational Tool for Determining Viscosity Coefficient of Cooking Oil Using Arduino UNO**

*F. Shoufika Hilyana, Putut Marwoto, Sunyoto Eko Nugrobo*

**The Augmented Reality Based Flashcards for Learning Heat and Thermodynamics in High School**

*Sardianto Markos Siabaan, Regita Elsa Putri*

**Integrated Physics E-Booklet Model of Tsunami Disaster Mitigation in Outer Islands of The West Coast Sumatra for High School Level**

*Elsi Adelia Fitri, Henny Johan, Bhakti karyadi, Sudirman Sudirman, Eli Putriani*

**Validity and Practicality of Student Worksheet Integrated by Sound Wave Experiment Set Using Smartphone with Sound Analyzer Basic 1.10.2 and Frequency Generator 2.6 Software**

*Yunita Jelijah Jalis Putri, Desnita Desnita, Yulza Satri*

**Student Worksheets Assisted by Augmented Reality on Critical Thinking Skills in High School Physics: Study of Teacher Perceptions in Indonesia**

*Aisyah Anggraini, Sardianto Markos Siabaan, Apit Fathurohman*

**Enhancing Students' Learning Outcomes and Science Process Skills through STEM Project-Based Learning on Global Warming Topics**

*Mona Lisa Hafitri, Shelly Efwinda*

**Impact of Using PhET and NI Multisim Simulation on Understanding Electrical Circuit Concepts**

*A. Halim, Maizha Alinda, Elmi Mahzum, Agus Wabyuni, Ngadimin Ngadimin*

**A Systematic Literature Review: Problem-Solving Skills in Physics Teaching**

*Khairun Nisa, Santri Adi Putri, Heru Kuswanto*

**The Implementation of the Dilemma-STEAM Model in Fluid Dynamics Subjects through the Archimedes Screw Project**

*Hadi Nasbey, Putri Marsha Sabrina, Ni Larasati Kartika Sari, Dewi Muliwati*

e-Jurnal: <http://doi.org/10.21009/1>

**JPPPF**

Volume 10 Issue 1, June 2024

DOI: [doi.org/10.21009/1.101](http://doi.org/10.21009/1.101)

### **Editor-in-Chief**

Fauzi Bakri (Universitas Negeri Jakarta, Indonesia)

### **Editors**

Md. Nizam Abd Rahman (Universiti Teknikal Malaysia Melaka, Malaysia)

Marie Paz E. Morales (Philippine Normal University, Philippine)

Bayram Coştu (Yildiz Technical University, Istanbul, Turkey)

Po-Sheng Chiu (National Chiayi University, Taiwan)

Ezza Syuhada Sazali (Universiti Teknologi Malaysia, Malaysia)

Diah Ambarwulan (PT Mitra Jurnal Indonesia, Indonesia)

Sunaryo (Universitas Negeri Jakarta, Indonesia)

I Made Astra (Universitas Negeri Jakarta, Indonesia)

Bambang Heru Iswanto (Universitas Negeri Jakarta, Indonesia)

Esmar Budi (Universitas Negeri Jakarta, Indonesia)

Wulandari Fitriani (Universitas Negeri Jakarta, Indonesia)

Vina Bektu Utami (Universitas Negeri Jakarta, Indonesia)

### **Editorial Office**

Program Studi Pendidikan Fisika Fakultas MIPA

Kampus A Universitas Negeri Jakarta

Gedung K.H. Hasyim Asyari Lt.10

Jalan Rawamangun Muka No.1 Rawamangun-Pulogadung

Jakarta Timur, 13220

Indonesia

## **Mitra Bebestari (Mandatory Reviewers)**

Md. Rahim Sahar (Universiti Teknologi Malaysia)  
Festiyed (Universitas Negeri Padang)  
Desnita (Universitas Negeri Padang)  
Abdurrahman (Universitas Lampung)  
Ida Kaniawati (Universitas Pendidikan Indonesia)  
Sahrul Hidayat (Universitas Padjajaran)  
Lia Yuliati (Universitas Negeri Malang)  
Sarwanto (Universitas Sebelas Maret)  
Adam Malik (Universitas Islam Negeri Sunan Gunung Djati)  
Iwan Wicaksono (Universitas Jember)  
Sparisoma Viridi (Institut Teknologi Bandung)  
Triati Dewi Kencana Wungu (Institut Teknologi Bandung)  
Sukarmin (Universitas Sebelas Maret)  
Indri Sari Utami (Universitas Sultan Ageng Tirtayasa)  
Ni Larasati Kartika Sari (Universitas Nasional)  
Netta Liliani (Universitas Islam 45)  
Mutoharoh (Universitas Krisnadwipayana)

## EDITORIAL FOREWORD

JPPPF (Jurnal Penelitian & Pengembangan Pendidikan Fisika) is dedicated to all practitioners of education. JPPPF coverage includes: experimental research, action research, qualitative research, quantitative research, and development research (model, media, and learning evaluation) aimed at improving the quality and building innovation in Physics education.

JPPPF Volume 10 Issue 1 contains 16 articles: 1) Trends of Physics Critical Thinking Skill Research in Indonesia: A Systematic Literature Review; 2) How to Promote the Ability of Physics Teaching Materials Development through Team-Based Project Learning? An Action Research Evidence; 3) How Extensively do Teachers Train Students' Metacognition Abilities in Physics Learning in High School?; 4) Development of an Assessment Instrument to Measure High School Students' Collaboration Skills in Physics Learning; 5) Alternative Virtual Lab-Based Practical Learning Model to Improve Scientific Attitude and Science Process Skills; 6) Exploration of Physics Concepts in Local Wisdom of South Sumatera as an Effort to Develop Students' 21st-Century Skills; 7) Improving Science Literacy Skills through Interactive Physics E-Learning for students at Lapandewa High School; 8) Educational Tool for Determining Viscosity Coefficient of Cooking Oil Using Arduino UNO; 9) The Augmented Reality Based Flashcards for Learning Heat and Thermodynamics in High School; 10) Integrated Physics E-Booklet Model of Tsunami Disaster Mitigation in Outer Islands of The West Coast Sumatra for High School Level; 11) Validity and Practicality of Student Worksheet Integrated by Sound Wave Experiment Set Using Smartphone with Sound Analyzer Basic 1.10.2 and Frequency Generator 2.6 Software; 12) Student Worksheets Assisted by Augmented Reality on Critical Thinking Skills in High School Physics: Study of Teacher Perceptions in Indonesia; 13) Enhancing Students' Learning Outcomes and Science Process Skills through STEM Project-Based Learning on Global Warming Topics; 14) Impact of Using PhET and NI Multisim Simulation on Understanding Electrical Circuit Concepts; 15) A Systematic Literature Review: Problem-Solving Skills in Physics Teaching; and 16) The Implementation of the Dilemma-STEAM Model in Fluid Dynamics Subjects through the Archimedes Screw Project.

The articles in this issue from 3 countries: Indonesia, China, and Taiwan. We are grateful for all the contributions of the authors. We also appreciate the professional reviewers who are an essential part of this issue and JPPPF is fortunate to have some excellent reviewers.

Hopefully, JPPPF can be a reference for readers and researchers in developing physics education.

Jakarta, 30 June 2024  
Editor-in-Chief,

Fauzi Bakri





## TABLE OF CONTENTS

<b>Trends of Physics Critical Thinking Skill Research in Indonesia: A Systematic Literature Review</b> <i>Santri Adi Putri, Khairun Nisa, Heru Kuswanto</i>	1 - 14
<b>How to Promote the Ability of Physics Teaching Materials Development through Team-Based Project Learning? An Action Research Evidence</b> <i>Mita Anggaryani, Muhammad Satriawan, Oka Saputra, Muhammad Habibbullob</i>	15 - 26
<b>How Extensively do Teachers Train Students' Metacognition Abilities in Physics Learning in High School?</b> <i>Oekta Alpindo, Edi Istiyono, Widihastuti Widihastuti</i>	27 - 38
<b>Development of an Assessment Instrument to Measure High School Students' Collaboration Skills in Physics Learning</b> <i>Nadia Natalia Simamora, Edi Istiyono, Insib Wilujeng</i>	39 - 46
<b>Alternative Virtual Lab-Based Practical Learning Model to Improve Scientific Attitude and Science Process Skills</b> <i>Mub. Tawil, Mub. Aqil Rusli, Hasanuddin Bakkarra, Budi Jatmiko</i>	47 - 60
<b>Exploration of Physics Concepts in Local Wisdom of South Sumatera as an Effort to Develop Students' 21st-Century Skills</b> <i>Ketang wiyono, Ismet Ismet, Nely Andriani, Alike Fitonia, Hartisya Nadia, Diana Meitasari, Nauratun Nazhifah</i>	61 - 78
<b>Improving Science Literacy Skills through Interactive Physics E-Learning for students at Lapandewa High School</b> <i>Muslimin Boma, Rida Siti Nur'aini Mahmudah, Salam Salam, Ika Pratiwi, Syabrir Syabrir, Diki Chen, Nofianti Nofianti, Rezky Nur Ariatami</i>	79 - 86
<b>Educational Tool for Determining Viscosity Coefficient of Cooking Oil Using Arduino UNO</b> <i>F. Shoufika Hihyana, Putut Marwoto, Sunyoto Eko Nugrobo</i>	87 - 98
<b>The Augmented Reality Based Flashcards for Learning Heat and Thermodynamics in High School</b> <i>Sardianto Markos Siabaan, Regita Elsa Putri</i>	99 - 108
<b>Integrated Physics E-Booklet Model of Tsunami Disaster Mitigation in Outer Islands of The West Coast Sumatra for High School Level</b> <i>Elsi Adelia Fitri, Henny Johan, Bhakti karyadi, Sudirman Sudirman, Eli Putriani</i>	109 - 122
<b>Validity and Practicality of Student Worksheet Integrated by Sound Wave Experiment Set Using Smartphone with Sound Analyzer Basic 1.10.2 and Frequency Generator 2.6 Software</b> <i>Yunita Jeliyah Jalis Putri, Desnita Desnita, Yulza Satri</i>	123 - 138
<b>Student Worksheets Assisted by Augmented Reality on Critical Thinking Skills in High School Physics: Study of Teacher Perceptions in Indonesia</b> <i>Aisyah Anggraini, Sardianto Markos Siabaan, Apit Fathurohman</i>	139 - 146
<b>Enhancing Students' Learning Outcomes and Science Process Skills through STEM Project-Based Learning on Global Warming Topics</b> <i>Mona Lisa Hafitri, Shelly Efwinda</i>	147 - 160

<b>Impact of Using PhET and NI Multisim Simulation on Understanding Electrical Circuit Concepts</b>	<b>161 - 172</b>
<i>A. Halim, Maizha Alinda, Elmi Mahzum, Agus Wahyuni, Ngadimin Ngadimin</i>	
<b>A Systematic Literature Review: Problem-Solving Skills in Physics Teaching</b>	<b>173 - 184</b>
<i>Khairun Nisa, Santri Adi Putri, Heru Kuswanto</i>	
<b>The Implementation of the Dilemma-STEAM Model in Fluid Dynamics Subjects through the Archimedes Screw Project</b>	<b>185 - 200</b>
<i>Hadi Nasbey, Putri Marsba Sabrina, Ni Larasati Kartika Sari, Dewi Mulyati</i>	