

# Journal of Physics

## Conference Series

The 2nd International Conference on  
Research and Learning of Physics  
(ICRLP 2019)

# 1481

Volume 1481

August 8 (Thursday) to 9 (Friday), 2019  
Padang, Indonesia

**Editor**

Dr. Ramli  
Yohandri, Ph.D  
Dr. Chris Wurster  
Prof. Dr. Suriani Abu Bakar

The Open Access Journal for Conference Proceedings

[iopscience.iop.org/issue/1742-6596/1481/1](http://iopscience.iop.org/issue/1742-6596/1481/1)

## EDITORS

### **Dr. Ramli**

Department of Physics, Faculty of Mathematics and Natural Sciences,  
Universitas Negeri Padang,  
Jl. Prof. Dr. Hamka, Air Tawar, Padang 25231, Indonesia  
ramli@fmipa.unp.ac.id

### **Yohandri, Ph.D**

Department of Physics, Faculty of Mathematics and Natural Sciences,  
Universitas Negeri Padang,  
Jl. Prof. Dr. Hamka, Air Tawar, Padang 25231, Indonesia  
yohandri@fmipa.unp.ac.id

### **Dr. Chris Wurster**

Center for Tropical Environmental & Sustainability Science  
College of Science, Technology and Engineering,  
James Cook University  
Cairns 4870, Australia  
christopher.wurster@jcu.edu.au

### **Prof. Dr. Suriani Abu Bakar**

Fakulti Sains dan Matematik, Universiti Pendidikan Sultan Idris,  
35900 Tanjung Malim Perak, Malaysia  
suriani@fsmt.upsi.edu.my



## ORGANIZING COMMITTEE

### Steering Committees

**Advisory Board** : Prof. Ganefri. Ph.D (Rector of Universitas Negeri Padang)

**Chair** : Prof. Dr. Lufri. M.S (Dean of The Faculty of Mathematics and Natural Sciences, Universitas Negeri Padang)

### Members :

Assoc. Prof. Dr. Haniza Hanim MOHD Zain (Dean of The Faculty of Sciences and Mathematics, UPSI)

Dr. Yulkifli, M.Si (Vice Dean of Academic, Faculty of Mathematics and Natural Science, Universitas Negeri Padang)

Dr. Ratnawulan, M.Si( Head of Physics Department, FMNS UNP) PROF.MADYA

Dr. Farida Lisa BT Supian (Head of Physics Department, FSM UPSI)

### General Chair

Syafriani, Ph.D

### Vice Chair

Dr. Asrizal, M.Si

### Secretary

Fandi Oktasendra, M.Sc

### Treasurer

Dr. Fatni Mufid, M.Si

### Technical Program

Dr. Hamdi. M.Si

Dr. Desnita, M.Si

### Secretariat

Rahmad Hidayat, M.Si

Dola Novianda, S.E

### Information Technology

Zulhamidi, S.Sos. M.Kom

Rio Anshari, S.Pd., M.Si

Doni Fisko, S.Si

### Publication

Dr. Ramli, S.Pd. M.Si

Pakhrur Razi, Ph.D

Prof. Dr. Festiyed, M.S

### Accommodation

Dra. Murtiani, M.Pd

Dra. Hidayati, M.Si

### Transportation and Equipment

Drs. Masril, M.Si

### Documentation

Toni Supriadi, S.Pd

Edi Kurnia. S.Si



## PREFACE

On behalf of the Steering Committee, it is my great pleasure to welcome you to the 2nd International Conference on Research and Learning of Physics (ICRLP 2019), which will be held at the Auditorium of Universitas Negeri Padang, in Padang, West Sumatera, Indonesia from August 8 (Thursday) to 9 (Friday), 2019.

This ICRLP2019 is organized by the Department of Physics, Universitas Negeri Padang. The main objective of this conference is to provide a platform for academics, researchers, professionals practitioners, observers, teachers and students to present their current research in physics and physics learning. In addition, it also aims to discuss strategic issues in related fields. The theme of the conference is “Challenge in research and learning of physics towards industrial revolution 4.0”

The two-day conference is expected to build cooperation between academics, researchers and institutions at both national and international levels. The scope of ICRLP 2019 covers various fields in Physics Research and Physics Learning Research.

I would like to express my sincere appreciation to all the participants, financial sponsors, exhibitors, supporting organizations and all the committee members who has made ICRLP2019 successful. With these strong support, we are sure ICRLP will be beneficial to all the participants, and you enjoy in Padang.

We are looking forward to meeting you in the next ICRLP.



## Peer review statement

All papers published in this volume of *Journal of Physics: Conference Series* have been peer reviewed through processes administered by the proceedings Editors. Reviews were conducted by expert referees to the professional and scientific standards expected of a proceedings journal published by IOP Publishing.



## **OPEN ACCESS**

### Preface

[Open abstract](#), [Preface View article](#), [Preface PDF](#), [Preface](#)

011002

## **THE FOLLOWING ARTICLE IS OPEN ACCESS**

### Organizing Committee

[Open abstract](#), [Organizing Committee View article](#), [Organizing Committee PDF](#), [Organizing Committee](#)

011003

## **THE FOLLOWING ARTICLE IS OPEN ACCESS**

### Editors

[Open abstract](#), [Editors View article](#), [Editors PDF](#), [Editors](#)

011004

## **THE FOLLOWING ARTICLE IS OPEN ACCESS**

### Peer review statement

[Open abstract](#), [Peer review statement View article](#), [Peer review statement PDF](#), [Peer review statement](#)

---

## **Physics**

012001

## **THE FOLLOWING ARTICLE IS OPEN ACCESS**

### Establishing a method to determine impact force in tennis – a preliminary study

S B Baktiar, I H Sujae, S Kudo, W R Wan Zakariah, A Ong and J Hamill

[Open abstract](#), [Establishing a method to determine impact force in tennis – a preliminary study View article](#), [Establishing a method to determine impact force in tennis – a preliminary study PDF](#), [Establishing a method to determine impact force in tennis – a preliminary study](#)

012002

## **THE FOLLOWING ARTICLE IS OPEN ACCESS**

### Local stress and seismic activity at West Sumatra

S Syafriani, Muhammad Raeis and Hamdi

[Open abstract](#), [Local stress and seismic activity at West Sumatra View article](#), [Local stress and seismic activity at West Sumatra PDF](#), [Local stress and seismic activity at West Sumatra](#)

012003

## **THE FOLLOWING ARTICLE IS OPEN ACCESS**

### Implementation of robust constraint inversion method on resistivity geoelectric data to study landslide precursors (case study : Sungai Lasi District and Gunung Talang Solok District, West Sumatra).

Akmam Akmam, Harman Amir and Amali Putra

[Open abstract](#), [Implementation of robust constraint inversion method on resistivity geoelectric data to study landslide precursors \(case study : Sungai Lasi District and Gunung Talang Solok District, West Sumatra\). View article](#), [Implementation of robust constraint inversion method on resistivity geoelectric data to study landslide precursors \(case study : Sungai Lasi District and Gunung Talang Solok District, West Sumatra\). PDF](#), [Implementation of robust constraint inversion method on resistivity geoelectric data to study landslide precursors \(case study : Sungai Lasi District and Gunung Talang Solok District, West Sumatra\).](#)

012004

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Spectral properties of Lampyris Noctiluca firefly from Sumatra](#)

Ratnawulan, Endah Pertiwi, Erni Septika Arma and Yuni Ahda

[Open abstract](#), [Spectral properties of Lampyris Noctiluca firefly from Sumatra](#) [View article](#), [Spectral properties of Lampyris Noctiluca firefly from Sumatra](#) [PDE](#), [Spectral properties of Lampyris Noctiluca firefly from Sumatra](#)

012005

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Effects of interface state density on the carrier transport and performance of metal-insulator-semiconductor \(MIS\) type thin film solar cells](#)

Fandi Oktasendra, Rahmat Hidayat and Rizky Indra Utama

[Open abstract](#), [Effects of interface state density on the carrier transport and performance of metal-insulator-semiconductor \(MIS\) type thin film solar cells](#) [View article](#), [Effects of interface state density on the carrier transport and performance of metal-insulator-semiconductor \(MIS\) type thin film solar cells](#) [PDE](#), [Effects of interface state density on the carrier transport and performance of metal-insulator-semiconductor \(MIS\) type thin film solar cells](#)

012006

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Microwave absorption properties of Fe<sub>3</sub>O<sub>4</sub>/PANi nanocomposites synthesized by sol-gel methods](#)

Nidya Yulfriska, Zurian Affandi, Yohandri, Letmi Dwiridal and Ramli Ramli

[Open abstract](#), [Microwave absorption properties of Fe<sub>3</sub>O<sub>4</sub>/PANi nanocomposites synthesized by sol-gel methods](#) [View article](#), [Microwave absorption properties of Fe<sub>3</sub>O<sub>4</sub>/PANi nanocomposites synthesized by sol-gel methods](#) [PDE](#), [Microwave absorption properties of Fe<sub>3</sub>O<sub>4</sub>/PANi nanocomposites synthesized by sol-gel methods](#)

012007

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Optimization of harvesting solar cell energy based on MPPT to be applied during the rainy season in the tropics](#)

Mairizwan, Rio Anshari and Wahyuni Satria Dewi

[Open abstract](#), [Optimization of harvesting solar cell energy based on MPPT to be applied during the rainy season in the tropics](#) [View article](#), [Optimization of harvesting solar cell energy based on MPPT to be applied during the rainy season in the tropics](#) [PDE](#), [Optimization of harvesting solar cell energy based on MPPT to be applied during the rainy season in the tropics](#)

012008

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Modeling of aquifer using vertical electrical sounding data with kriging interpolation in Padang City](#)

A Octova, M Gusman, P Razi, R R Putra and A E Putra

[Open abstract](#), [Modeling of aquifer using vertical electrical sounding data with kriging interpolation in Padang City](#) [View article](#), [Modeling of aquifer using vertical electrical sounding data with kriging interpolation in Padang City](#) [PDE](#), [Modeling of aquifer using vertical electrical sounding data with kriging interpolation in Padang City](#)

012009

### **THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Land deformation modelling of Taiwan earthquake using interferometry technique](#)

Pakhrur Razi, Josaphat Tetuko Sri Sumantyo, Yulkifli, Joko Widodo, Daniele Perissin and Jefriza  
[Open abstract](#), [Land deformation modelling of Taiwan earthquake using interferometry technique](#) [View article](#), [Land deformation modelling of Taiwan earthquake using interferometry technique](#) [PDF](#), [Land deformation modelling of Taiwan earthquake using interferometry technique](#)

012010

### **THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Design of a simple and low cost electrical property tester for graphene material : a preliminary study](#)

Rahmat Hidayat and Fandi Oktasendra

[Open abstract](#), [Design of a simple and low cost electrical property tester for graphene material : a preliminary study](#) [View article](#), [Design of a simple and low cost electrical property tester for graphene material : a preliminary study](#) [PDF](#), [Design of a simple and low cost electrical property tester for graphene material : a preliminary study](#)

012011

### **THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Optimization of hydrophobic nanocomposite thin film from silica/polietilen](#)

Ahmad Fauzi, Lathifa Zonesya Putri and Ratnawulan

[Open abstract](#), [Optimization of hydrophobic nanocomposite thin film from silica/polietilen](#) [View article](#), [Optimization of hydrophobic nanocomposite thin film from silica/polietilen](#) [PDF](#), [Optimization of hydrophobic nanocomposite thin film from silica/polietilen](#)

012012

### **THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Biosorption of Cd \(II\) ion from aqueous solution using immobilized \*Lengkeng \(euphoria longan lour\)\* shell](#)

Desy Kurniawati, Bahrizal and Cillia Marfania

[Open abstract](#), [Biosorption of Cd \(II\) ion from aqueous solution using immobilized \*Lengkeng \(euphoria longan lour\)\* shell](#) [View article](#), [Biosorption of Cd \(II\) ion from aqueous solution using immobilized \*Lengkeng \(euphoria longan lour\)\* shell](#) [PDF](#), [Biosorption of Cd \(II\) ion from aqueous solution using immobilized \*Lengkeng \(euphoria longan lour\)\* shell](#)

012013

### **THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Chitosan nano film a chemical sensor: Preparation, characterization and application for detection of Nickel ions in aqueous solution](#)

Moersilah

[Open abstract](#), [Chitosan nano film a chemical sensor: Preparation, characterization and application for detection of Nickel ions in aqueous solution](#) [View article](#), [Chitosan nano film a chemical sensor: Preparation, characterization and application for detection of Nickel ions in aqueous solution](#) [PDF](#), [Chitosan nano film a chemical sensor: Preparation, characterization and application for detection of Nickel ions in aqueous solution](#)

012014

### **THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Tube catalyst \(TK<sup>plus</sup>\) to crack gasoline fuel vapor in motor vehicle](#)

Erdawati, Alvika Meta Sari, Sugeng Priyatno and Anwar Ilmar Ramadhan



[Open abstract](#), Tube catalyst (TKplus) to crack gasoline fuel vapor in motor vehicle [View article](#), Tube catalyst (TKplus) to crack gasoline fuel vapor in motor vehicle [PDF](#), Tube catalyst (TKplus) to crack gasoline fuel vapor in motor vehicle

012015

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Genes and physical properties of iron sand from Kinali Pasaman](#)

Fadhilah and Heri Prabowo

[Open abstract](#), Genes and physical properties of iron sand from Kinali Pasaman [View article](#), Genes and physical properties of iron sand from Kinali Pasaman [PDF](#), Genes and physical properties of iron sand from Kinali Pasaman

012016

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Fabrication of methacrylate polymer-based on the silica capillary modified with dimethylamine](#)

Budhi Oktavia and Robi Prasmi Kardi

[Open abstract](#), Fabrication of methacrylate polymer-based on the silica capillary modified with dimethylamine [View article](#), Fabrication of methacrylate polymer-based on the silica capillary modified with dimethylamine [PDF](#), Fabrication of methacrylate polymer-based on the silica capillary modified with dimethylamine

012017

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Magnetic susceptibility of pre- and post caldera lavas from Maninjau, West Sumatra](#)

M R Fadila, H Rifai, E D Ningsih, R Putra, C B de Maisonneuve, F Forni, S Eisele and M Phua

[Open abstract](#), Magnetic susceptibility of pre- and post caldera lavas from Maninjau, West Sumatra [View article](#), Magnetic susceptibility of pre- and post caldera lavas from Maninjau, West Sumatra [PDF](#), Magnetic susceptibility of pre- and post caldera lavas from Maninjau, West Sumatra

012018

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Identification of magnetic mineral forming elements in peatland Alahan Panjang West Sumatra Indonesia, section DD REP B 693 using X-Ray Fluorescence](#)

Ella Destari Ningsih, Rizaldi Putra, Caroline De La Maisonneuve, Marcus Phua, Steffan Eisele, Francesca Forni, Jeffrey Oalman and Hamdi Rifai

[Open abstract](#), Identification of magnetic mineral forming elements in peatland Alahan Panjang West Sumatra Indonesia, section DD REP B 693 using X-Ray Fluorescence [View article](#), Identification of magnetic mineral forming elements in peatland Alahan Panjang West Sumatra Indonesia, section DD REP B 693 using X-Ray Fluorescence [PDF](#), Identification of magnetic mineral forming elements in peatland Alahan Panjang West Sumatra Indonesia, section DD REP B 693 using X-Ray Fluorescence

012019

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Identification of magnetic minerals in the peatlands cores from Lake Diatas West Sumatra, Indonesia](#)

Amelia Sasmita, Hamdi Rifai, Rizaldi Putra, Nur Aisyah, Marcus Phua, Steffen Eisele, Francesca Forni and Caroline Bouvet de la Maisonneuve

[Open abstract](#), Identification of magnetic minerals in the peatlands cores from Lake Diatas West Sumatra, Indonesia [View article](#), Identification of magnetic minerals in the peatlands cores from Lake

Diatas West Sumatra, Indonesia [PDF](#), Identification of magnetic minerals in the peatlands cores from Lake Diatas West Sumatra, Indonesia

012020

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Preliminary study of inert gas flow analysis on thermal systems with natural convection conditions](#)

R Anshari, Mairizwan, A Asrizal and A Akmam

[Open abstract](#), Preliminary study of inert gas flow analysis on thermal systems with natural convection conditions [View article](#), Preliminary study of inert gas flow analysis on thermal systems with natural convection conditions [PDF](#), Preliminary study of inert gas flow analysis on thermal systems with natural convection conditions

012021

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Preparation and characterization of sago \(\*metroxylon\* sp.\) Starch nanoparticles using hydrolysis-precipitation method](#)

Maryam, Anwar Kasim, Novelina and Emriadi

[Open abstract](#), Preparation and characterization of sago (*metroxylon* sp.) Starch nanoparticles using hydrolysis-precipitation method [View article](#), Preparation and characterization of sago (*metroxylon* sp.) Starch nanoparticles using hydrolysis-precipitation method [PDF](#), Preparation and characterization of sago (*metroxylon* sp.) Starch nanoparticles using hydrolysis-precipitation method

012022

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Analyzing magnetic susceptibility and elemental composition of rocks and soil around Danau Diatas, West Sumatra, Indonesia](#)

Rizki Nurul Fajri, Rizaldi Putra, Pika Afriyeni, Caroline De Maisonneuve, Marcus Phua, Steffen Eisele, Francesca Forni and Hamdi Rifai

[Open abstract](#), Analyzing magnetic susceptibility and elemental composition of rocks and soil around Danau Diatas, West Sumatra, Indonesia [View article](#), Analyzing magnetic susceptibility and elemental composition of rocks and soil around Danau Diatas, West Sumatra, Indonesia [PDF](#), Analyzing magnetic susceptibility and elemental composition of rocks and soil around Danau Diatas, West Sumatra, Indonesia

012023

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[The electrical properties of NiFe<sub>2</sub>O<sub>4</sub>-PVDF nanocomposite prepared by sol-gel method](#)

Alia Hanafia Fadli, Yulkifli, Yenni Darvina, Ambran Hartono and Ramli Ramli

[Open abstract](#), The electrical properties of NiFe<sub>2</sub>O<sub>4</sub>-PVDF nanocomposite prepared by sol-gel method [View article](#), The electrical properties of NiFe<sub>2</sub>O<sub>4</sub>-PVDF nanocomposite prepared by sol-gel method [PDF](#), The electrical properties of NiFe<sub>2</sub>O<sub>4</sub>-PVDF nanocomposite prepared by sol-gel method

012024

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Analysis of potential earthquake energy in the sianok segment](#)

Muhammad Raeis and S Syafriani

[Open abstract](#), Analysis of potential earthquake energy in the sianok segment [View article](#), Analysis of potential earthquake energy in the sianok segment [PDF](#), Analysis of potential earthquake energy in the sianok segment

012025

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Scanning electron microscope \(SEM\) imaging and analysis of magnetic minerals of lake Diatas peatland section DD REP B 693](#)

Nur Aisyah, Hamdi Rifai, Caroline Bouvet De La Maisonneuve, Jeffrey Oalmann, Francesca Forni, Steffen Eisele, Marcus Phua and Rizaldi Putra

[Open abstract](#), Scanning electron microscope (SEM) imaging and analysis of magnetic minerals of lake Diatas peatland section DD REP B 693 [View article](#), Scanning electron microscope (SEM) imaging and analysis of magnetic minerals of lake Diatas peatland section DD REP B 693 [PDF](#), Scanning electron microscope (SEM) imaging and analysis of magnetic minerals of lake Diatas peatland section DD REP B 693

012026

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Microwave absorbent properties of Fe<sub>3</sub>O<sub>4</sub> nanoparticle from iron sand prepared by high energy milling ellips-3 dimension](#)

Sandra Rahma Diana, Muhammad Ikhsan, Yohandri, Letmi Dwiridal and Ramli Ramli

[Open abstract](#), Microwave absorbent properties of Fe<sub>3</sub>O<sub>4</sub> nanoparticle from iron sand prepared by high energy milling ellips-3 dimension [View article](#), Microwave absorbent properties of Fe<sub>3</sub>O<sub>4</sub> nanoparticle from iron sand prepared by high energy milling ellips-3 dimension [PDF](#), Microwave absorbent properties of Fe<sub>3</sub>O<sub>4</sub> nanoparticle from iron sand prepared by high energy milling ellips-3 dimension

012027

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Identification of magnetic minerals in peatland at the section of DD REP B 693 lake Diatas using XRD \(X-ray Diffraction\)](#)

Pika Afriyeni, Hamdi Rifai, Caroline Bouvetde Maisonneuve, Francesca Forni, Steffen Eisele, Marcus Phua and Rizaldi Putra

[Open abstract](#), Identification of magnetic minerals in peatland at the section of DD REP B 693 lake Diatas using XRD (X-ray Diffraction) [View article](#), Identification of magnetic minerals in peatland at the section of DD REP B 693 lake Diatas using XRD (X-ray Diffraction) [PDF](#), Identification of magnetic minerals in peatland at the section of DD REP B 693 lake Diatas using XRD (X-ray Diffraction)

012028

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[The effect of jogging exercise to improve hemoglobin levels](#)

Sepriadi, Khainur Jannah and Eldawaty

[Open abstract](#), The effect of jogging exercise to improve hemoglobin levels [View article](#), The effect of jogging exercise to improve hemoglobin levels [PDF](#), The effect of jogging exercise to improve hemoglobin levels

012029

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Development of digital based vertical jump test instruments](#)

Andika Prabowo, Nurul Ihsan, Eri Barlian and Wilda Welis

[Open abstract](#), Development of digital based vertical jump test instruments [View article](#), Development of digital based vertical jump test instruments [PDF](#), Development of digital based vertical jump test instruments

012030

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Using the Schlumberger configuration resistivity geoelectric method to analyze the characteristics of slip surface at Solok](#)

T R Rahmani, D P Sari, A Akmam, H Amir and A Putra

[Open abstract](#), [Using the Schlumberger configuration resistivity geoelectric method to analyze the characteristics of slip surface at Solok](#) [View article](#), [Using the Schlumberger configuration resistivity geoelectric method to analyze the characteristics of slip surface at Solok](#) [PDF](#), [Using the Schlumberger configuration resistivity geoelectric method to analyze the characteristics of slip surface at Solok](#)

012031

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Design and characterization of membrane molecularly imprinted polymer \(MIP\) as cholesterol absorbent](#)

Jihan Niesa and Alizar Ulianas

[Open abstract](#), [Design and characterization of membrane molecularly imprinted polymer \(MIP\) as cholesterol absorbent](#) [View article](#), [Design and characterization of membrane molecularly imprinted polymer \(MIP\) as cholesterol absorbent](#) [PDF](#), [Design and characterization of membrane molecularly imprinted polymer \(MIP\) as cholesterol absorbent](#)

012032

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Digital based sit-up test instrument development](#)

Sutrisno Saputra and Nurul Ihsan

[Open abstract](#), [Digital based sit-up test instrument development](#) [View article](#), [Digital based sit-up test instrument development](#) [PDF](#), [Digital based sit-up test instrument development](#)

012033

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Preparation of TiO<sub>2</sub> thin layer on ceramics using dip coating method for degradation humic acid](#)

Rohadatul Nadya Maurani, Devi Purnamasari and Rahadian Zainul

[Open abstract](#), [Preparation of TiO<sub>2</sub> thin layer on ceramics using dip coating method for degradation humic acid](#) [View article](#), [Preparation of TiO<sub>2</sub> thin layer on ceramics using dip coating method for degradation humic acid](#) [PDF](#), [Preparation of TiO<sub>2</sub> thin layer on ceramics using dip coating method for degradation humic acid](#)

012034

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Using the Schlumberger configuration resistivity geoelectric method to estimate the rock structure at landslide zone in Malalak agam](#)

R S Permana, A P Buana, A Akmam, H Amir and A Putra

[Open abstract](#), [Using the Schlumberger configuration resistivity geoelectric method to estimate the rock structure at landslide zone in Malalak agam](#) [View article](#), [Using the Schlumberger configuration resistivity geoelectric method to estimate the rock structure at landslide zone in Malalak agam](#) [PDF](#), [Using the Schlumberger configuration resistivity geoelectric method to estimate the rock structure at landslide zone in Malalak agam](#)

012035

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Seismic cycle before the main earthquake and the end of time after shocks in West Sumatra](#)

F A Savitri, S Syafriani and F Anggriani

[Open abstract](#), Seismic cycle before the main earthquake and the end of time after shocks in West Sumatra [View article](#), Seismic cycle before the main earthquake and the end of time after shocks in West Sumatra [PDE](#), Seismic cycle before the main earthquake and the end of time after shocks in West Sumatra

012036

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Analysis of the mentawai region fault field based on earthquake relocation data using the modified joint hypocenter determination \(MJHD\) method](#)

M Guci, S Syafriani and Y T Putri

[Open abstract](#), Analysis of the mentawai region fault field based on earthquake relocation data using the modified joint hypocenter determination (MJHD) method [View article](#), Analysis of the mentawai region fault field based on earthquake relocation data using the modified joint hypocenter determination (MJHD) method [PDE](#), Analysis of the mentawai region fault field based on earthquake relocation data using the modified joint hypocenter determination (MJHD) method

012037

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Study of dynamically catalytic system on humic acid phototransformator](#)

Yuni Aulia Djasli, Devi Purnamasari and Rahadian Zainul

[Open abstract](#), Study of dynamically catalytic system on humic acid phototransformator [View article](#), Study of dynamically catalytic system on humic acid phototransformator [PDE](#), Study of dynamically catalytic system on humic acid phototransformator

012038

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Chatalytic activity of nano ZnO/Cu for degradation humic acid under illumination outdoor light](#)

Sitiwi Mandar, Devi Purnamasari and Rahadian Zainul

[Open abstract](#), Chatalytic activity of nano ZnO/Cu for degradation humic acid under illumination outdoor light [View article](#), Chatalytic activity of nano ZnO/Cu for degradation humic acid under illumination outdoor light [PDE](#), Chatalytic activity of nano ZnO/Cu for degradation humic acid under illumination outdoor light

012039

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Design of rotary photoreactor using nano Cu/TiO<sub>2</sub> for degradation humic acid in outdoor visible light](#)

R Zilla, D Purnamasari and R Zainul

[Open abstract](#), Design of rotary photoreactor using nano Cu/TiO<sub>2</sub> for degradation humic acid in outdoor visible light [View article](#), Design of rotary photoreactor using nano Cu/TiO<sub>2</sub> for degradation humic acid in outdoor visible light [PDE](#), Design of rotary photoreactor using nano Cu/TiO<sub>2</sub> for degradation humic acid in outdoor visible light

012040

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Optimization of complex NH<sub>3</sub> with Cu<sup>2+</sup> ions to determine levels of ammonia by UV-Vis spectrophotometer](#)

Desy Guspita and Alizar Ulianas

[Open abstract](#), Optimization of complex NH<sub>3</sub> with Cu<sup>2+</sup> ions to determine levels of ammonia by UV-Vis spectrophotometer [View article](#), Optimization of complex NH<sub>3</sub> with Cu<sup>2+</sup> ions to determine levels of ammonia by UV-Vis spectrophotometer [PDF](#), Optimization of complex NH<sub>3</sub> with Cu<sup>2+</sup> ions to determine levels of ammonia by UV-Vis spectrophotometer

---

## Physics Learning

012041

### THE FOLLOWING ARTICLE IS OPEN ACCESS

[Preliminary research in the development of physics teaching materials that integrate new literacy and disaster literacy](#)

F Mufit, Asrizal, S A Hanum and A Fadhilah

[Open abstract](#), Preliminary research in the development of physics teaching materials that integrate new literacy and disaster literacy [View article](#), Preliminary research in the development of physics teaching materials that integrate new literacy and disaster literacy [PDF](#), Preliminary research in the development of physics teaching materials that integrate new literacy and disaster literacy

012042

### THE FOLLOWING ARTICLE IS OPEN ACCESS

[Development of connected massive open online course \(cMOOCs\) based on multimedia for thermodynamics subject to improve students' self-directed learning outcomes](#)

Vina Serevina, Raihanati, Wawan Andriana, Dewi Maynastiti and Virgiana Tinura

[Open abstract](#), Development of connected massive open online course (cMOOCs) based on multimedia for thermodynamics subject to improve students' self-directed learning outcomes [View article](#), Development of connected massive open online course (cMOOCs) based on multimedia for thermodynamics subject to improve students' self-directed learning outcomes [PDF](#), Development of connected massive open online course (cMOOCs) based on multimedia for thermodynamics subject to improve students' self-directed learning outcomes

012043

### THE FOLLOWING ARTICLE IS OPEN ACCESS

[Preliminary analysis of physics lab textbooks using project based learning model to improve the scientific skills of high school students](#)

Yosi Dwi Anggreni and Yohandri

[Open abstract](#), Preliminary analysis of physics lab textbooks using project based learning model to improve the scientific skills of high school students [View article](#), Preliminary analysis of physics lab textbooks using project based learning model to improve the scientific skills of high school students [PDF](#), Preliminary analysis of physics lab textbooks using project based learning model to improve the scientific skills of high school students

012044

### THE FOLLOWING ARTICLE IS OPEN ACCESS

[Analysis of student response to earthquake disaster in high school physics learning](#)

Fitrah Ayu and Ahmad Fauzi

[Open abstract](#), Analysis of student response to earthquake disaster in high school physics learning [View article](#), Analysis of student response to earthquake disaster in high school physics learning [PDF](#), Analysis of student response to earthquake disaster in high school physics learning

012045



### **THE FOLLOWING ARTICLE IS OPEN ACCESS**

[An analysis of development of student's worksheets with the theme integrated science energy in life by using integrated type of integrated learning in 21<sup>st</sup> century](#)

Dian Arima Gusti and Ratnawulan

[Open abstract](#), An analysis of development of student's worksheets with the theme integrated science energy in life by using integrated type of integrated learning in 21<sup>st</sup> century [View article](#), An analysis of development of student's worksheets with the theme integrated science energy in life by using integrated type of integrated learning in 21<sup>st</sup> century [PDF](#), An analysis of development of student's worksheets with the theme integrated science energy in life by using integrated type of integrated learning in 21<sup>st</sup> century

012046

### **THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Analysis of Students Worksheet \(LKPD\) integrated science with the theme of the motion in life using integrated connected type 21<sup>st</sup> century learning](#)

Joviana Marshel and Ratnawulan

[Open abstract](#), Analysis of Students Worksheet (LKPD) integrated science with the theme of the motion in life using integrated connected type 21<sup>st</sup> century learning [View article](#), Analysis of Students Worksheet (LKPD) integrated science with the theme of the motion in life using integrated connected type 21<sup>st</sup> century learning [PDF](#), Analysis of Students Worksheet (LKPD) integrated science with the theme of the motion in life using integrated connected type 21<sup>st</sup> century learning

012047

### **THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Preliminary analysis of Edupark Sarasah Kajai Waterfall, Indonesia as a learning resources of works and energy](#)

Rika Arni Yunita and Hamdi Rifai

[Open abstract](#), Preliminary analysis of Edupark Sarasah Kajai Waterfall, Indonesia as a learning resources of works and energy [View article](#), Preliminary analysis of Edupark Sarasah Kajai Waterfall, Indonesia as a learning resources of works and energy [PDF](#), Preliminary analysis of Edupark Sarasah Kajai Waterfall, Indonesia as a learning resources of works and energy

012048

### **THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Analysis of interactive media integrated natural science with energy themes in the life of using integrated types that integrate of learning for the 21<sup>st</sup> century](#)

Rizka Ariani and Ratnawulan

[Open abstract](#), Analysis of interactive media integrated natural science with energy themes in the life of using integrated types that integrate of learning for the 21<sup>st</sup> century [View article](#), Analysis of interactive media integrated natural science with energy themes in the life of using integrated types that integrate of learning for the 21<sup>st</sup> century [PDF](#), Analysis of interactive media integrated natural science with energy themes in the life of using integrated types that integrate of learning for the 21<sup>st</sup> century

012049

### **THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Preliminary analysis of Bukik Chinangkiek edupark's potential as a learning resource for physics in senior high school at X Koto Singkarak Solok, Indonesia](#)

Nila Virgo Lestari and Hamdi Rifai

[Open abstract](#), Preliminary analysis of Bukik Chinangkiek edupark's potential as a learning resource for physics in senior high school at X Koto Singkarak Solok, Indonesia [View article](#), Preliminary analysis of

Bukik Chinangkiek edupark's potential as a learning resource for physics in senior high school at X Koto Singkarak Solok, Indonesia [PDE](#), Preliminary analysis of Bukik Chinangkiek edupark's potential as a learning resource for physics in senior high school at X Koto Singkarak Solok, Indonesia

012050

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Analysis of student preparedness levels in facing flood disasters for development of high school physics digital books \(e-books\) with flood theme](#)

Gema Eferko Putri and Ahmad Fauzi

[Open abstract](#), Analysis of student preparedness levels in facing flood disasters for development of high school physics digital books (e-books) with flood theme [View article](#), Analysis of student preparedness levels in facing flood disasters for development of high school physics digital books (e-books) with flood theme [PDE](#), Analysis of student preparedness levels in facing flood disasters for development of high school physics digital books (e-books) with flood theme

012051

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Analysis of interactive media integrated natural science by the motion themes in life using integrated connected type 21<sup>st</sup> century learning](#)

Annisa Kurniawati and Ratnawulan

[Open abstract](#), Analysis of interactive media integrated natural science by the motion themes in life using integrated connected type 21<sup>st</sup> century learning [View article](#), Analysis of interactive media integrated natural science by the motion themes in life using integrated connected type 21<sup>st</sup> century learning [PDE](#), Analysis of interactive media integrated natural science by the motion themes in life using integrated connected type 21<sup>st</sup> century learning

012052

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Meta-analysis of authentic assessment instrument development to measure learning outcomes of learners SMA/MA](#)

Imelda Afriana and Festiyed

[Open abstract](#), Meta-analysis of authentic assessment instrument development to measure learning outcomes of learners SMA/MA [View article](#), Meta-analysis of authentic assessment instrument development to measure learning outcomes of learners SMA/MA [PDE](#), Meta-analysis of authentic assessment instrument development to measure learning outcomes of learners SMA/MA

012053

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Analysis of interactive media development of VIII grade integrated science with simple machine themes on human muscular and skeleton system using connected types integrated 21<sup>st</sup> century learning](#)

Nurhafifah and Ratnawulan

[Open abstract](#), Analysis of interactive media development of VIII grade integrated science with simple machine themes on human muscular and skeleton system using connected types integrated 21<sup>st</sup> century learning [View article](#), Analysis of interactive media development of VIII grade integrated science with simple machine themes on human muscular and skeleton system using connected types integrated 21<sup>st</sup> century learning [PDE](#), Analysis of interactive media development of VIII grade integrated science with simple machine themes on human muscular and skeleton system using connected types integrated 21<sup>st</sup> century learning

012054



**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Needs analysis in development of physics handout based on STEM approach for 11<sup>th</sup> grade of senior high school](#)

Sri Rahma Yulia, Yulia Pratiwi and Ramli Ramli

[Open abstract](#), Needs analysis in development of physics handout based on STEM approach for 11th grade of senior high school [View article](#), Needs analysis in development of physics handout based on STEM approach for 11th grade of senior high school [PDF](#), Needs analysis in development of physics handout based on STEM approach for 11th grade of senior high school

012055

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[The analysis of senior high school student's prior knowledge in coastal area to the abrasion](#)

Y Azmanita and A Fauzi

[Open abstract](#), The analysis of senior high school student's prior knowledge in coastal area to the abrasion [View article](#), The analysis of senior high school student's prior knowledge in coastal area to the abrasion [PDF](#), The analysis of senior high school student's prior knowledge in coastal area to the abrasion

012056

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[The preliminary study in the development of e-Physics module integrated ethnosience](#)

Cici Dwi Tisa Haspen and Syafriani

[Open abstract](#), The preliminary study in the development of e-Physics module integrated ethnosience [View article](#), The preliminary study in the development of e-Physics module integrated ethnosience [PDF](#), The preliminary study in the development of e-Physics module integrated ethnosience

012057

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Preliminary analysis to develop student worksheet based on inquiry based learning model for 21<sup>st</sup> century physics learning](#)

Muhammad Havid, Yulkifli and Tri Septiani

[Open abstract](#), Preliminary analysis to develop student worksheet based on inquiry based learning model for 21st century physics learning [View article](#), Preliminary analysis to develop student worksheet based on inquiry based learning model for 21st century physics learning [PDF](#), Preliminary analysis to develop student worksheet based on inquiry based learning model for 21st century physics learning

012058

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Need analysis in development of student books based on STEM approach](#)

Daniel Hizhar and Ramli Ramli

[Open abstract](#), Need analysis in development of student books based on STEM approach [View article](#), Need analysis in development of student books based on STEM approach [PDF](#), Need analysis in development of student books based on STEM approach

012059

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Analysis of learning media in the development of flood-themed teaching materials for high school students](#)

Robika Alkadri and Ahmad Fauzi

[Open abstract](#), Analysis of learning media in the development of flood-themed teaching materials for high school students [View article](#), Analysis of learning media in the development of flood-themed teaching materials for high school students [PDF](#), Analysis of learning media in the development of flood-themed teaching materials for high school students

012060

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Analysis of physics e-modules based on guided inquiry integrated with Quran knowledge](#)

Prisma Dona and S Syafriani

[Open abstract](#), Analysis of physics e-modules based on guided inquiry integrated with Quran knowledge [View article](#), Analysis of physics e-modules based on guided inquiry integrated with Quran knowledge [PDF](#), Analysis of physics e-modules based on guided inquiry integrated with Quran knowledge

012061

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[How is the student worksheet design \(LAPD\) based on project based learning \(PjBL\) models in Senior High School Physics X learning? Literature review](#)

Bahagia Maharani and Yohandri

[Open abstract](#), How is the student worksheet design (LAPD) based on project based learning (PjBL) models in Senior High School Physics X learning? Literature review [View article](#), How is the student worksheet design (LAPD) based on project based learning (PjBL) models in Senior High School Physics X learning? Literature review [PDF](#), How is the student worksheet design (LAPD) based on project based learning (PjBL) models in Senior High School Physics X learning? Literature review

012062

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Media analysis in the development of e-module based guidance inquiry integrated with ethnoscience in learning physics at senior high school](#)

R Kurniawan and S Syafriani

[Open abstract](#), Media analysis in the development of e-module based guidance inquiry integrated with ethnoscience in learning physics at senior high school [View article](#), Media analysis in the development of e-module based guidance inquiry integrated with ethnoscience in learning physics at senior high school [PDF](#), Media analysis in the development of e-module based guidance inquiry integrated with ethnoscience in learning physics at senior high school

012063

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Analysis development of guided inquiry based physics e-module to improve critical thinking ability of students high school](#)

Sri Ramadela Putri and S Syafriani

[Open abstract](#), Analysis development of guided inquiry based physics e-module to improve critical thinking ability of students high school [View article](#), Analysis development of guided inquiry based physics e-module to improve critical thinking ability of students high school [PDF](#), Analysis development of guided inquiry based physics e-module to improve critical thinking ability of students high school

012064

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[A meta-analysis study of the use of worksheet \(LKS\) based on research-based learning models](#)

Zaka Putra Utama and Festiyed

[Open abstract](#), A meta-analysis study of the use of worksheet (LKS) based on research-based learning models [View article](#), A meta-analysis study of the use of worksheet (LKS) based on research-based learning models [PDF](#), A meta-analysis study of the use of worksheet (LKS) based on research-based learning models

012065

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Preliminary analysis learning media based on edupark science with scientific methods in the national geopark of Ranah Minang Silokek of Sijunjung](#)

K Ummah and Hamdi Rifai

[Open abstract](#), Preliminary analysis learning media based on edupark science with scientific methods in the national geopark of Ranah Minang Silokek of Sijunjung [View article](#), Preliminary analysis learning media based on edupark science with scientific methods in the national geopark of Ranah Minang Silokek of Sijunjung [PDF](#), Preliminary analysis learning media based on edupark science with scientific methods in the national geopark of Ranah Minang Silokek of Sijunjung

012066

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Needs analysis in development of physics student books based on STEM approach for 11<sup>th</sup> grade senior high school](#)

Yulia Pratiwi, Sri Rahma Yulia and Ramli Ramli

[Open abstract](#), Needs analysis in development of physics student books based on STEM approach for 11th grade senior high school [View article](#), Needs analysis in development of physics student books based on STEM approach for 11th grade senior high school [PDF](#), Needs analysis in development of physics student books based on STEM approach for 11th grade senior high school

012067

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Meta analysis the use of e-modules based on research based learning models](#)

Andrye Hadiano and Festiyed

[Open abstract](#), Meta analysis the use of e-modules based on research based learning models [View article](#), Meta analysis the use of e-modules based on research based learning models [PDF](#), Meta analysis the use of e-modules based on research based learning models

012068

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Preliminary study for development of teacher's Books oriented research-based learning on science lesson in Junior High School](#)

Intan Fadilla and Usmeldi

[Open abstract](#), Preliminary study for development of teacher's Books oriented research-based learning on science lesson in Junior High School [View article](#), Preliminary study for development of teacher's Books oriented research-based learning on science lesson in Junior High School [PDF](#), Preliminary study for development of teacher's Books oriented research-based learning on science lesson in Junior High School

012069

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Preliminary study of development of students worksheet using creative problem based learning model in physics learning on senior high school](#)

Novelia Prima and Usmeldi

[Open abstract](#), Preliminary study of development of students worksheet using creative problem based learning model in physics learning on senior high school [View article](#), Preliminary study of development of students worksheet using creative problem based learning model in physics learning on senior high school [PDF](#), Preliminary study of development of students worksheet using creative problem based learning model in physics learning on senior high school

012070

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Preliminary analysis of development electronic module using inquiry based learning model for 21<sup>st</sup> century](#)

Fitri Nisak and Yulkifli Yulkifli

[Open abstract](#), Preliminary analysis of development electronic module using inquiry based learning model for 21<sup>st</sup> century [View article](#), Preliminary analysis of development electronic module using inquiry based learning model for 21<sup>st</sup> century [PDF](#), Preliminary analysis of development electronic module using inquiry based learning model for 21<sup>st</sup> century

012071

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Preliminary analysis of student worksheets development with multi-representation approach on 21<sup>st</sup> century physics learning](#)

T Septiani, Yulikifli and M Havid

[Open abstract](#), Preliminary analysis of student worksheets development with multi-representation approach on 21<sup>st</sup> century physics learning [View article](#), Preliminary analysis of student worksheets development with multi-representation approach on 21<sup>st</sup> century physics learning [PDF](#), Preliminary analysis of student worksheets development with multi-representation approach on 21<sup>st</sup> century physics learning

012072

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Preliminary analysis of interactive student worksheets development using the science process skill approaching the 21<sup>st</sup> century physics learning](#)

Rahmi Agustia Widestra, Yulkifli Yulkifli and Elmi Yanto Adhar Samudra

[Open abstract](#), Preliminary analysis of interactive student worksheets development using the science process skill approaching the 21<sup>st</sup> century physics learning [View article](#), Preliminary analysis of interactive student worksheets development using the science process skill approaching the 21<sup>st</sup> century physics learning [PDF](#), Preliminary analysis of interactive student worksheets development using the science process skill approaching the 21<sup>st</sup> century physics learning

012073

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Preliminary analysis development of interactive student worksheets using inquiry based learning model for 10<sup>th</sup> grade senior high school](#)

Elmi Yanto Adhar Samudra, Yulkifli Yulkifli and Rahmi Agustia Widestra

[Open abstract](#), Preliminary analysis development of interactive student worksheets using inquiry based learning model for 10<sup>th</sup> grade senior high school [View article](#), Preliminary analysis development of interactive student worksheets using inquiry based learning model for 10<sup>th</sup> grade senior high school [PDF](#), Preliminary analysis development of interactive student worksheets using inquiry based learning model for 10<sup>th</sup> grade senior high school

012074

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Preliminary analysis of physical module practicum modelling project based learning to improve scientific skills of high school students](#)

Yulia Hamdani and Yohandri

[Open abstract](#), Preliminary analysis of physical module practicum modelling project based learning to improve scientific skills of high school students [View article](#), Preliminary analysis of physical module practicum modelling project based learning to improve scientific skills of high school students [PDF](#), Preliminary analysis of physical module practicum modelling project based learning to improve scientific skills of high school students

012075

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[The development of E-learning media to improve students' science literacy skill in Senior High School](#)

Miranti Risniawati, Vina Serevina and Mutia Delina

[Open abstract](#), The development of E-learning media to improve students' science literacy skill in Senior High School [View article](#), The development of E-learning media to improve students' science literacy skill in Senior High School [PDF](#), The development of E-learning media to improve students' science literacy skill in Senior High School

012076

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[The development of flip book contextual teaching and learning-based to enhance students' physics problem solving skill](#)

Dewi Maynastiti, Vina Serevina and Iwan Sugihartono

[Open abstract](#), The development of flip book contextual teaching and learning-based to enhance students' physics problem solving skill [View article](#), The development of flip book contextual teaching and learning-based to enhance students' physics problem solving skill [PDF](#), The development of flip book contextual teaching and learning-based to enhance students' physics problem solving skill

012077

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[The analysis of high school student's preparedness to earthquake disaster](#)

Rahimatul Utia and Ahmad Fauzi

[Open abstract](#), The analysis of high school student's preparedness to earthquake disaster [View article](#), The analysis of high school student's preparedness to earthquake disaster [PDF](#), The analysis of high school student's preparedness to earthquake disaster

012078

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[The effect of using play-think-pair-share \(PTPS\) model to improve student learning outcomes in magnet topic for elementary school](#)

Zakirman, Lufri, Khairani and Chichi Rahayu

[Open abstract](#), The effect of using play-think-pair-share (PTPS) model to improve student learning outcomes in magnet topic for elementary school [View article](#), The effect of using play-think-pair-share (PTPS) model to improve student learning outcomes in magnet topic for elementary school [PDF](#), The effect of using play-think-pair-share (PTPS) model to improve student learning outcomes in magnet topic for elementary school

012079

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Validity and practicality of integrated science teaching materials based on Creative Problem Solving model as an efforts for the establishment of anticorruption characters](#)

Widya, Ena Suma Indrawati and Desy Eka Muliani

[Open abstract](#), Validity and practicality of integrated science teaching materials based on Creative Problem Solving model as an efforts for the establishment of anticorruption characters [View article](#), Validity and practicality of integrated science teaching materials based on Creative Problem Solving model as an efforts for the establishment of anticorruption characters [PDF](#), Validity and practicality of integrated science teaching materials based on Creative Problem Solving model as an efforts for the establishment of anticorruption characters

012080

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Validity and practicality level of structured inquiry-based reaction rate module containing macro, submicro and symbolic representation](#)

H.P Murni, M Azhar and A Ulianas

[Open abstract](#), Validity and practicality level of structured inquiry-based reaction rate module containing macro, submicro and symbolic representation [View article](#), Validity and practicality level of structured inquiry-based reaction rate module containing macro, submicro and symbolic representation [PDF](#), Validity and practicality level of structured inquiry-based reaction rate module containing macro, submicro and symbolic representation

012081

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Development of website on General Physics subject to increase analytical skills of students](#)

Vina Serevina, Raihanati and Wawan Andriana

[Open abstract](#), Development of website on General Physics subject to increase analytical skills of students [View article](#), Development of website on General Physics subject to increase analytical skills of students [PDF](#), Development of website on General Physics subject to increase analytical skills of students

012082

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Increasing students' creative thinking skills at 11th grade of mathematics and natural sciences 5, Senior High School 42 Jakarta on subject of Temperature and Heat by applying discovery learning model](#)

V Serevina, A L Sarah, M Risniawati and W Andriana

[Open abstract](#), Increasing students' creative thinking skills at 11th grade of mathematics and natural sciences 5, Senior High School 42 Jakarta on subject of Temperature and Heat by applying discovery learning model [View article](#), Increasing students' creative thinking skills at 11th grade of mathematics and natural sciences 5, Senior High School 42 Jakarta on subject of Temperature and Heat by applying discovery learning model [PDF](#), Increasing students' creative thinking skills at 11th grade of mathematics and natural sciences 5, Senior High School 42 Jakarta on subject of Temperature and Heat by applying discovery learning model

012083

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Effectiveness of student worksheets based guided inquiry on acid base material to improve students higher order thinking skill \(HOTS\)](#)

Mawardi Mawardi, Js Aisyah Fitri Rusiani and Fitra Handa Yani



[Open abstract](#), Effectiveness of student worksheets based guided inquiry on acid base material to improve students higher order thinking skill (HOTS) [View article](#), Effectiveness of student worksheets based guided inquiry on acid base material to improve students higher order thinking skill (HOTS) [PDE](#), Effectiveness of student worksheets based guided inquiry on acid base material to improve students higher order thinking skill (HOTS)

012084

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Validity and practicality of chemical equilibrium module based on structured inquiry with three levels representation for students grade XI of senior high school](#)

Nurhasanah, M Azhar and A Ulianas

[Open abstract](#), Validity and practicality of chemical equilibrium module based on structured inquiry with three levels representation for students grade XI of senior high school [View article](#), Validity and practicality of chemical equilibrium module based on structured inquiry with three levels representation for students grade XI of senior high school [PDE](#), Validity and practicality of chemical equilibrium module based on structured inquiry with three levels representation for students grade XI of senior high school

012085

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Preliminary analysis of learning resources for edupark physics in hydroponic cultivation of SMK N 2 Batusangkar, Indonesia](#)

A P Sari and H Rifai

[Open abstract](#), Preliminary analysis of learning resources for edupark physics in hydroponic cultivation of SMK N 2 Batusangkar, Indonesia [View article](#), Preliminary analysis of learning resources for edupark physics in hydroponic cultivation of SMK N 2 Batusangkar, Indonesia [PDE](#), Preliminary analysis of learning resources for edupark physics in hydroponic cultivation of SMK N 2 Batusangkar, Indonesia

012086

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Preliminary analysis of learning resources for edupark in the matter rigid equilibrium by destination Rumah Gadang Istana Rajo Balun South Solok Indonesia](#)

Sadraini and Hamdi Rifai

[Open abstract](#), Preliminary analysis of learning resources for edupark in the matter rigid equilibrium by destination Rumah Gadang Istana Rajo Balun South Solok Indonesia [View article](#), Preliminary analysis of learning resources for edupark in the matter rigid equilibrium by destination Rumah Gadang Istana Rajo Balun South Solok Indonesia [PDE](#), Preliminary analysis of learning resources for edupark in the matter rigid equilibrium by destination Rumah Gadang Istana Rajo Balun South Solok Indonesia

012087

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Preliminary analysis learning media in the form of interactive multimedia based on edupark physics Carocok beach Painan Indonesia with the scientific method](#)

N Rahmadhani and H Rifai

[Open abstract](#), Preliminary analysis learning media in the form of interactive multimedia based on edupark physics Carocok beach Painan Indonesia with the scientific method [View article](#), Preliminary analysis learning media in the form of interactive multimedia based on edupark physics Carocok beach Painan Indonesia with the scientific method [PDE](#), Preliminary analysis learning media in the form of interactive multimedia based on edupark physics Carocok beach Painan Indonesia with the scientific method

012088

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Implementation of LKPD based on problems assisted by edmodo application to improve student learning motivation in class V students of SDN 19 Nan Sabaris](#)

Sri Diana Putri, Mishbah Ulhusna and Zakirman

[Open abstract](#), Implementation of LKPD based on problems assisted by edmodo application to improve student learning motivation in class V students of SDN 19 Nan Sabaris [View article](#), Implementation of LKPD based on problems assisted by edmodo application to improve student learning motivation in class V students of SDN 19 Nan Sabaris [PDF](#), Implementation of LKPD based on problems assisted by edmodo application to improve student learning motivation in class V students of SDN 19 Nan Sabaris

012089

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Preliminary study development of student books research based learning to improve student competency in middle school science learning](#)

Suci Amalia Utami and Usmeldi

[Open abstract](#), Preliminary study development of student books research based learning to improve student competency in middle school science learning [View article](#), Preliminary study development of student books research based learning to improve student competency in middle school science learning [PDF](#), Preliminary study development of student books research based learning to improve student competency in middle school science learning

012090

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Analysis of factors affecting thesis work of physics students in digital era](#)

Yoza Fendriani and Zakirman

[Open abstract](#), Analysis of factors affecting thesis work of physics students in digital era [View article](#), Analysis of factors affecting thesis work of physics students in digital era [PDF](#), Analysis of factors affecting thesis work of physics students in digital era

012091

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Design of integrated science student book theme adaptation of the human body to change temperature integrated 21<sup>st</sup> century learning using integrated types](#)

T Supriadi, Ratnawulan, Syafriani and A Samra

[Open abstract](#), Design of integrated science student book theme adaptation of the human body to change temperature integrated 21<sup>st</sup> century learning using integrated types [View article](#), Design of integrated science student book theme adaptation of the human body to change temperature integrated 21<sup>st</sup> century learning using integrated types [PDF](#), Design of integrated science student book theme adaptation of the human body to change temperature integrated 21<sup>st</sup> century learning using integrated types

012092

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[The validity of M-Learning based physics teaching materials to improve student learning access in the digital age](#)

Shabrina Amalia and Dwitri Pilendia

[Open abstract](#), The validity of M-Learning based physics teaching materials to improve student learning access in the digital age [View article](#), The validity of M-Learning based physics teaching materials to



improve student learning access in the digital age [PDF](#), The validity of M-Learning based physics teaching materials to improve student learning access in the digital age

012093

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[A meta-analysis of the effects of using PhET interactive simulations on student's worksheets toward senior high school students learning result of physics](#)

C Chotimah and Festiyed

[Open abstract](#), A meta-analysis of the effects of using PhET interactive simulations on student's worksheets toward senior high school students learning result of physics [View article](#), A meta-analysis of the effects of using PhET interactive simulations on student's worksheets toward senior high school students learning result of physics [PDF](#), A meta-analysis of the effects of using PhET interactive simulations on student's worksheets toward senior high school students learning result of physics

012094

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Preliminary analysis learning media based on edupark physics with scientific methods on Padang beach](#)

G O Elvisa and Hamdi Rifai

[Open abstract](#), Preliminary analysis learning media based on edupark physics with scientific methods on Padang beach [View article](#), Preliminary analysis learning media based on edupark physics with scientific methods on Padang beach [PDF](#), Preliminary analysis learning media based on edupark physics with scientific methods on Padang beach

012095

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[The influence of learning science with constructivist approach towards character building of early childhood](#)

Abna Hidayati

[Open abstract](#), The influence of learning science with constructivist approach towards character building of early childhood [View article](#), The influence of learning science with constructivist approach towards character building of early childhood [PDF](#), The influence of learning science with constructivist approach towards character building of early childhood

012096

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[The effectiveness of guided inquiry student worksheet to improve high order thinking skill in buffer solution material](#)

Fitra Handa Yani, Mawardi Mawardi and Aisyah Fitri Rusiani Js

[Open abstract](#), The effectiveness of guided inquiry student worksheet to improve high order thinking skill in buffer solution material [View article](#), The effectiveness of guided inquiry student worksheet to improve high order thinking skill in buffer solution material [PDF](#), The effectiveness of guided inquiry student worksheet to improve high order thinking skill in buffer solution material

012097

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Design and manufacture of teaching edupark physics Mifan water park Padang Panjang. Indonesia with discovery learning model](#)

Dewi Puspa Sari, Hamdi Rifai, Yohandri and Wenda Emafri

[Open abstract](#), Design and manufacture of teaching edupark physics Mifan water park Padang Panjang, Indonesia with discovery learning model [View article](#), Design and manufacture of teaching edupark physics Mifan water park Padang Panjang, Indonesia with discovery learning model [PDF](#), Design and manufacture of teaching edupark physics Mifan water park Padang Panjang, Indonesia with discovery learning model

012098

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Developing Physics education sets for senior high school based on CPS models using PQ4R strategy for dynamic fluid](#)

Rio Wiharza and Ahmad Fauzi

[Open abstract](#), Developing Physics education sets for senior high school based on CPS models using PQ4R strategy for dynamic fluid [View article](#), Developing Physics education sets for senior high school based on CPS models using PQ4R strategy for dynamic fluid [PDF](#), Developing Physics education sets for senior high school based on CPS models using PQ4R strategy for dynamic fluid

012099

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Validation of Integrated Science Teacher book with the theme of the Human Body System Adaptation to Temperature Changes using Integrated Type of 21st Century Learning](#)

Aprili Samra and Ratnawulan

[Open abstract](#), Validation of Integrated Science Teacher book with the theme of the Human Body System Adaptation to Temperature Changes using Integrated Type of 21st Century Learning [View article](#), Validation of Integrated Science Teacher book with the theme of the Human Body System Adaptation to Temperature Changes using Integrated Type of 21st Century Learning [PDF](#), Validation of Integrated Science Teacher book with the theme of the Human Body System Adaptation to Temperature Changes using Integrated Type of 21st Century Learning

012100

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Design of edupark Physics book with Project Based Learning based on Ngarai Sianok National Geopark, Indonesia](#)

Wenda Emafri, Dewi Puspa Sari, Hamdi Rifai and Yohandri

[Open abstract](#), Design of edupark Physics book with Project Based Learning based on Ngarai Sianok National Geopark, Indonesia [View article](#), Design of edupark Physics book with Project Based Learning based on Ngarai Sianok National Geopark, Indonesia [PDF](#), Design of edupark Physics book with Project Based Learning based on Ngarai Sianok National Geopark, Indonesia

012101

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Development of physics student's worksheet based on inquiry training model to improve students creative thinking ability](#)

Dwi Athifah and Syafriani

[Open abstract](#), Development of physics student's worksheet based on inquiry training model to improve students creative thinking ability [View article](#), Development of physics student's worksheet based on inquiry training model to improve students creative thinking ability [PDF](#), Development of physics student's worksheet based on inquiry training model to improve students creative thinking ability

012102

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Validity of development of Physics student's worksheet based on Inquiry Training Model to improve students creative thinking ability 10<sup>th</sup> grade Senior High School](#)

Rumi Yuliska and Syafriani

[Open abstract](#), Validity of development of Physics student's worksheet based on Inquiry Training Model to improve students creative thinking ability 10<sup>th</sup> grade Senior High School [View article](#), Validity of development of Physics student's worksheet based on Inquiry Training Model to improve students creative thinking ability 10<sup>th</sup> grade Senior High School [PDF](#), Validity of development of Physics student's worksheet based on Inquiry Training Model to improve students creative thinking ability 10<sup>th</sup> grade Senior High School

012103

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Comparison of learning media using teachers of Physics Senior High School in West Sumatra with curriculum demands](#)

Desnita, Festiyed, Elfa Afradisca and Iis Purnama Sari

[Open abstract](#), Comparison of learning media using teachers of Physics Senior High School in West Sumatra with curriculum demands [View article](#), Comparison of learning media using teachers of Physics Senior High School in West Sumatra with curriculum demands [PDF](#), Comparison of learning media using teachers of Physics Senior High School in West Sumatra with curriculum demands

012104

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[The impact of STEM-based guided inquiry learning on students' scientific literacy in the topic of fluid statics](#)

Parno, L Yuliati, N Munfaridah, M Ali, N Indrasari and F U N Rosyidah

[Open abstract](#), The impact of STEM-based guided inquiry learning on students' scientific literacy in the topic of fluid statics [View article](#), The impact of STEM-based guided inquiry learning on students' scientific literacy in the topic of fluid statics [PDF](#), The impact of STEM-based guided inquiry learning on students' scientific literacy in the topic of fluid statics

012105

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Exploring the effectiveness of e-book for students on learning material: a literature review](#)

Fanny Rahmatina Rahim, Dea Stevani Suherman and Arief Muttaqin

[Open abstract](#), Exploring the effectiveness of e-book for students on learning material: a literature review [View article](#), Exploring the effectiveness of e-book for students on learning material: a literature review [PDF](#), Exploring the effectiveness of e-book for students on learning material: a literature review

012106

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Validity of integrated science teacher's book with the themes of blood fluid using integrated connected type learning in the 21<sup>st</sup> century](#)

Riza Helfira, Ratnawulan and S Syafriani

[Open abstract](#), Validity of integrated science teacher's book with the themes of blood fluid using integrated connected type learning in the 21<sup>st</sup> century [View article](#), Validity of integrated science teacher's book with the themes of blood fluid using integrated connected type learning in the 21<sup>st</sup> century [PDF](#), Validity of integrated science teacher's book with the themes of blood fluid using integrated connected type learning in the 21<sup>st</sup> century

012107

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Validity of science teaching aids based on project based learning](#)

S Y Sari, W S Dewi and Asrizal

[Open abstract](#), [Validity of science teaching aids based on project based learning](#) [View article](#), [Validity of science teaching aids based on project based learning](#) [PDF](#), [Validity of science teaching aids based on project based learning](#)

012108

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Validity of handout development of physics education statistics course using a cooperative problem solving \(CPS\) model](#)

Wahyuni Satria Dewi and Renol Afrizon

[Open abstract](#), [Validity of handout development of physics education statistics course using a cooperative problem solving \(CPS\) model](#) [View article](#), [Validity of handout development of physics education statistics course using a cooperative problem solving \(CPS\) model](#) [PDF](#), [Validity of handout development of physics education statistics course using a cooperative problem solving \(CPS\) model](#)

012109

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Analysis of physics parameters on aerophone musical instruments from Minangkabau as context meaningful learning](#)

R Afrizon, W S Dewi and L Dwiridal

[Open abstract](#), [Analysis of physics parameters on aerophone musical instruments from Minangkabau as context meaningful learning](#) [View article](#), [Analysis of physics parameters on aerophone musical instruments from Minangkabau as context meaningful learning](#) [PDF](#), [Analysis of physics parameters on aerophone musical instruments from Minangkabau as context meaningful learning](#)

012110

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Validity of integrated natural science teacher book with theme senses of sight and optical devices using connected model integrated 21st century learning](#)

Ayu Melati, Firda Weri, Ratnawulan and Syafriani

[Open abstract](#), [Validity of integrated natural science teacher book with theme senses of sight and optical devices using connected model integrated 21st century learning](#) [View article](#), [Validity of integrated natural science teacher book with theme senses of sight and optical devices using connected model integrated 21st century learning](#) [PDF](#), [Validity of integrated natural science teacher book with theme senses of sight and optical devices using connected model integrated 21st century learning](#)

012111

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Validity of student book development science integrated with blood fluid theme using integrated learning type connected integrated 21st century learning](#)

Tri Anidya Putri, Ratna Wulan and Syafriani

[Open abstract](#), [Validity of student book development science integrated with blood fluid theme using integrated learning type connected integrated 21st century learning](#) [View article](#), [Validity of student book development science integrated with blood fluid theme using integrated learning type connected integrated 21st century learning](#) [PDF](#), [Validity of student book development science integrated with blood fluid theme using integrated learning type connected integrated 21st century learning](#)

012112

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Development of spiritual intelligence values in learning materials of Physics to support reinforcement of character education](#)

Zulhendri Kamus, Asrizal and Silvi Atika Sari

[Open abstract](#), Development of spiritual intelligence values in learning materials of Physics to support reinforcement of character education [View article](#), Development of spiritual intelligence values in learning materials of Physics to support reinforcement of character education [PDF](#), Development of spiritual intelligence values in learning materials of Physics to support reinforcement of character education

012113

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Development of work based learning \(WBL\) learning model in heat transfer courses](#)

Ambiyar, Ganefri, Suryadimal, Nizwardi Jalinus, Raimon Efendi and Jeprimansyah

[Open abstract](#), Development of work based learning (WBL) learning model in heat transfer courses [View article](#), Development of work based learning (WBL) learning model in heat transfer courses [PDF](#), Development of work based learning (WBL) learning model in heat transfer courses

012114

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Need analysis development of learning model based on production in multimedia materials in higher education](#)

Ganefri, Asmar Yulastri, Ambiyar, Jeprimansyah and Suryadimal

[Open abstract](#), Need analysis development of learning model based on production in multimedia materials in higher education [View article](#), Need analysis development of learning model based on production in multimedia materials in higher education [PDF](#), Need analysis development of learning model based on production in multimedia materials in higher education

012115

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Need analysis in the development of teaching materials with problem solving-collaborative models in quantum physics courses](#)

Hidayati, Elizar and Festiyed

[Open abstract](#), Need analysis in the development of teaching materials with problem solving-collaborative models in quantum physics courses [View article](#), Need analysis in the development of teaching materials with problem solving-collaborative models in quantum physics courses [PDF](#), Need analysis in the development of teaching materials with problem solving-collaborative models in quantum physics courses

012116

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Validity of science student books with the theme of energy in life based integrated local materials using integrated models for 21<sup>st</sup> century learning](#)

Zaitul Hidayat, Rahima Syabrina Sarmi, Ratnawulan and Desnita

[Open abstract](#), Validity of science student books with the theme of energy in life based integrated local materials using integrated models for 21<sup>st</sup> century learning [View article](#), Validity of science student books with the theme of energy in life based integrated local materials using integrated models for 21<sup>st</sup> century learning [PDF](#), Validity of science student books with the theme of energy in life based integrated local materials using integrated models for 21<sup>st</sup> century learning

012117

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Validation of integrated science teacher book integrated mode with scene life energy in the regional local content based sijunjung for 21<sup>st</sup> century skills](#)

Rahima Syabrina Sarmi, Zaitul Hidayat, Ratnawulan and Desnita

[Open abstract](#), Validation of integrated science teacher book integrated mode with scene life energy in the regional local content based sijunjung for 21<sup>st</sup> century skills [View article](#), Validation of integrated science teacher book integrated mode with scene life energy in the regional local content based sijunjung for 21<sup>st</sup> century skills [PDF](#), Validation of integrated science teacher book integrated mode with scene life energy in the regional local content based sijunjung for 21<sup>st</sup> century skills

012118

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Supporting STEM and critical thinking on energy transformation topic: pre-study of digital reality book](#)

A Muttaqin, R E Putri, M P Sari, L Lufri and F R Rahim

[Open abstract](#), Supporting STEM and critical thinking on energy transformation topic: pre-study of digital reality book [View article](#), Supporting STEM and critical thinking on energy transformation topic: pre-study of digital reality book [PDF](#), Supporting STEM and critical thinking on energy transformation topic: pre-study of digital reality book

012119

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Availability of learning resources for enrichment learning at senior high school in West Sumatra](#)

Festiyed, Desnita, Elfa Afradisca and Iis Purnama Sari

[Open abstract](#), Availability of learning resources for enrichment learning at senior high school in West Sumatra [View article](#), Availability of learning resources for enrichment learning at senior high school in West Sumatra [PDF](#), Availability of learning resources for enrichment learning at senior high school in West Sumatra

012120

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[The development of physics learning tools in vocational high school based constructivism approach using learning cycle 5E model](#)

Im Fatimah

[Open abstract](#), The development of physics learning tools in vocational high school based constructivism approach using learning cycle 5E model [View article](#), The development of physics learning tools in vocational high school based constructivism approach using learning cycle 5E model [PDF](#), The development of physics learning tools in vocational high school based constructivism approach using learning cycle 5E model

012121

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Preliminary analysis of integrated science teaching based on edupark of Anai Land](#)

Meri Delvi and Hamdi Rifai

[Open abstract](#), Preliminary analysis of integrated science teaching based on edupark of Anai Land [View article](#), Preliminary analysis of integrated science teaching based on edupark of Anai Land [PDF](#), Preliminary analysis of integrated science teaching based on edupark of Anai Land



012122

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Need analysis to develop science learning material based on thematic teaching by integrating the new literacy](#)

Yurnetti, Asrizal and Murtiani

[Open abstract](#), [Need analysis to develop science learning material based on thematic teaching by integrating the new literacy](#) [View article](#), [Need analysis to develop science learning material based on thematic teaching by integrating the new literacy](#) [PDF](#), [Need analysis to develop science learning material based on thematic teaching by integrating the new literacy](#)

012123

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Need analysis to develop electronic enrichment book of Physics based on contextual teaching and environmental potential](#)

Asrizal, Desnita and Yenni Darvina

[Open abstract](#), [Need analysis to develop electronic enrichment book of Physics based on contextual teaching and environmental potential](#) [View article](#), [Need analysis to develop electronic enrichment book of Physics based on contextual teaching and environmental potential](#) [PDE](#), [Need analysis to develop electronic enrichment book of Physics based on contextual teaching and environmental potential](#)

012124

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Analysis of basic electronics 2 textbook reviewed from the aspects of creative thinking in the Physics Department of FMIPA UNP Padang](#)

Hufri, Silvi, Yulia Sari, Frima Triani, Filda Syahrani, Hening Ceria and Fadhlina Noer

[Open abstract](#), [Analysis of basic electronics 2 textbook reviewed from the aspects of creative thinking in the Physics Department of FMIPA UNP Padang](#) [View article](#), [Analysis of basic electronics 2 textbook reviewed from the aspects of creative thinking in the Physics Department of FMIPA UNP Padang](#) [PDF](#), [Analysis of basic electronics 2 textbook reviewed from the aspects of creative thinking in the Physics Department of FMIPA UNP Padang](#)

012125

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Validity of student worksheets based on inquiry based learning models assisted by tracker application](#)

Rizki Fadilah, Yohandri and Yulkifli

[Open abstract](#), [Validity of student worksheets based on inquiry based learning models assisted by tracker application](#) [View article](#), [Validity of student worksheets based on inquiry based learning models assisted by tracker application](#) [PDF](#), [Validity of student worksheets based on inquiry based learning models assisted by tracker application](#)

012126

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Validity of student worksheet based on project based learning models assisted by tracker application for simple harmonic motion experiment](#)

Lusiana and Yohandri

[Open abstract](#), [Validity of student worksheet based on project based learning models assisted by tracker application for simple harmonic motion experiment](#) [View article](#), [Validity of student worksheet based on project based learning models assisted by tracker application for simple harmonic motion](#)

experiment [PDF](#), Validity of student worksheet based on project based learning models assisted by tracker application for simple harmonic motion experiment

012127

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Validity of student's worksheets based on project based learning assisted tracker application](#)

Susri Lismidarni and Yohandri

[Open abstract](#), Validity of student's worksheets based on project based learning assisted tracker application [View article](#), Validity of student's worksheets based on project based learning assisted tracker application [PDF](#), Validity of student's worksheets based on project based learning assisted tracker application

012128

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Validity of integrated science teacher's book on junior high school based on character with the theme of cohesion and adhesion on living with shared model](#)

Tarinta Annisa Kendedes and Ratnawulan

[Open abstract](#), Validity of integrated science teacher's book on junior high school based on character with the theme of cohesion and adhesion on living with shared model [View article](#), Validity of integrated science teacher's book on junior high school based on character with the theme of cohesion and adhesion on living with shared model [PDF](#), Validity of integrated science teacher's book on junior high school based on character with the theme of cohesion and adhesion on living with shared model

012129

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Senior high school mathematics learning device development based on guided discovery to improve students' reasoning ability \(preliminary research\)](#)

A Faizasari, Yerizon and D Permana

[Open abstract](#), Senior high school mathematics learning device development based on guided discovery to improve students' reasoning ability (preliminary research) [View article](#), Senior high school mathematics learning device development based on guided discovery to improve students' reasoning ability (preliminary research) [PDF](#), Senior high school mathematics learning device development based on guided discovery to improve students' reasoning ability (preliminary research)

012130

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Development of mathematics learning device based on guided discovery of program of international student assessment model orientation \(preliminary research\)](#)

C Afrilia, Yerizon, D Permana and Armiati

[Open abstract](#), Development of mathematics learning device based on guided discovery of program of international student assessment model orientation (preliminary research) [View article](#), Development of mathematics learning device based on guided discovery of program of international student assessment model orientation (preliminary research) [PDF](#), Development of mathematics learning device based on guided discovery of program of international student assessment model orientation (preliminary research)

012131

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Effectiveness e-authentic assessment in computer network course](#)



Ambiyar, Raimon Efendi, Yuyun Irawati, Waskito and Suryadimal  
[Open abstract](#), Effectiveness e-authentic assessment in computer network course [View article](#), Effectiveness e-authentic assessment in computer network course [PDF](#), Effectiveness e-authentic assessment in computer network course

012132

### **THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Integration conceptual scaffolding in the group investigation: its influence on students' critical thinking skills](#)

S Koes-H, S D S Pradana and P Suwasono

[Open abstract](#), Integration conceptual scaffolding in the group investigation: its influence on students' critical thinking skills [View article](#), Integration conceptual scaffolding in the group investigation: its influence on students' critical thinking skills [PDF](#), Integration conceptual scaffolding in the group investigation: its influence on students' critical thinking skills

012133

### **THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Improving the problem-solving skills through the development of teaching materials with STEM-PjBL \(science, technology, engineering, and mathematics-project based learning\) model integrated with TPACK \(technological pedagogical content knowledge\)](#)

Endang Purwaningsih, Annisa Maya Sari, Lia Yuliati, Kadim Masjkur, Bahrul Rizky Kurniawan and Megat Aman Zahiri

[Open abstract](#), Improving the problem-solving skills through the development of teaching materials with STEM-PjBL (science, technology, engineering, and mathematics-project based learning) model integrated with TPACK (technological pedagogical content knowledge) [View article](#), Improving the problem-solving skills through the development of teaching materials with STEM-PjBL (science, technology, engineering, and mathematics-project based learning) model integrated with TPACK (technological pedagogical content knowledge) [PDF](#), Improving the problem-solving skills through the development of teaching materials with STEM-PjBL (science, technology, engineering, and mathematics-project based learning) model integrated with TPACK (technological pedagogical content knowledge)

012134

### **THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Analysis of student's understanding about Newton's laws, in terms of perceptions to learning in senior high school](#)

A Putra and Heriyanto

[Open abstract](#), Analysis of student's understanding about Newton's laws, in terms of perceptions to learning in senior high school [View article](#), Analysis of student's understanding about Newton's laws, in terms of perceptions to learning in senior high school [PDF](#), Analysis of student's understanding about Newton's laws, in terms of perceptions to learning in senior high school

012135

### **THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Development of high school physics class XI book, based on concept map to enhance the high-level thinking skills \(HOTS\)](#)

G Gusnedi, R Ratnawulan and A Putra

[Open abstract](#), Development of high school physics class XI book, based on concept map to enhance the high-level thinking skills (HOTS) [View article](#), Development of high school physics class XI book, based on concept map to enhance the high-level thinking skills (HOTS) [PDF](#), Development of high school physics class XI book, based on concept map to enhance the high-level thinking skills (HOTS)

012136

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Integration of environmental education in elementary schools](#)

E Sukma, S Ramadhan and V Indriyani

[Open abstract](#), [Integration of environmental education in elementary schools](#) [View article](#), [Integration of environmental education in elementary schools](#) [PDF](#), [Integration of environmental education in elementary schools](#)

012137

**THE FOLLOWING ARTICLE IS OPEN ACCESS**

[Knowledge analysis of students in disaster mitigation mount erupts](#)

Rizki Kurnia and Ahmad Fauzi

[Open abstract](#), [Knowledge analysis of students in disaster mitigation mount erupts](#) [View article](#), [Knowledge analysis of students in disaster mitigation mount erupts](#) [PDF](#), [Knowledge analysis of students in disaster mitigation mount erupts](#)

PAPER • OPEN ACCESS

## Effectiveness e-authentic assessment in computer network course

To cite this article: Ambiyar *et al* 2020 *J. Phys.: Conf. Ser.* **1481** 012131

View the [article online](#) for updates and enhancements.



**IOP | ebooks™**

Bringing together innovative digital publishing with leading authors from the global scientific community.

Start exploring the collection—download the first chapter of every title for free.

# Effectiveness e-authentic assessment in computer network course

**Ambiyar<sup>1,\*</sup>, Raimon Efendi<sup>2</sup>, Yuyun Irawati<sup>1</sup>, Waskito<sup>1</sup> and Suryadimal<sup>1</sup>**

<sup>1</sup>Technical and Vocational Education, Universitas Negeri Padang, Jalan Prof Hamka, Padang, 25131, Indonesia

<sup>2</sup>Computer Science Faculty, Universitas Dharmas Indonesia, Dharmasraya, Indonesia

\* ambiyar@ft.unp.ac.id

**Abstract.** This study aims to identify the quality and effectiveness of the application of authentic web-based assessments in computer network learning on wireless material, and to identify profiles of students' skills and knowledge competencies in learning computer networks on wireless material. The trial was conducted at the Faculty of Computer Science, University of Dharmas Indonesia. This research uses a descriptive method. The population in this study were students of the Informatics Engineering Study Program. Sampling is done using the purposive sampling method. Based on the results of the study, the quality of authentic assessments showed validity for assessment of performance of 0.94 (high) and reliability of 0.93 (very high), while the validity for the description question was 0.97 (very high) and reliability was 0.98 (very high). Based on observations on the effectiveness of the implementation of authentic assessments and student questionnaires, the level of application of authentic assessments is in categories both at the stage of assessment preparation, implementation of assessment and reflection. The skills competency profile of most students is in very good category, while the knowledge competencies of most students fall into sufficient categories for each indicator of the problem.

## 1. Introduction

Lecturers have the role to carry out learning based on the curriculum to students in accordance with the prescribed syllabus. One of the learning models used is problem based learning. It is expected that Problem Based Learning changes the learning conditions that are passively active and creative, from teacher oriented to student oriented [1]. This is also in accordance with the results of the research conducted [2]. which shows that learning with the PBL method is more effective in improving student learning. Savin Baden and Major [3] state a problem based learning model involves students working cooperatively in class. The main characteristic of PBL is that students focus on solving problems. Boud and Feletti [4] states that problem based learning is a learning approach that contains confrontation with students with practical problems, in the form of ill-structured, or open ended through stimulus in learning. Learning Model experts, Walker et.al[5] states that problem based learning is a learning model that involves students to solve a problem through the stages of the scientific method so that students can learn the knowledge related to the problem and simultaneously have the skills to solve problem.

The curriculum used in informatics engineering study programs applies authentic assessments to assess student learning progress which includes attitudes, knowledge, and skills. Authentic assessment teaches students about meaningful learning and can also be used to hone students' skills. This is according to what was written by Mueller [6] stating that authentic assessment is a form of assessment



where students are asked to perform real-world tasks that show meaningful applications of knowledge and skills. This research was only conducted on wireless material. The wireless ber concept is closely related to the use of internet technology in daily life, and can be taught through practical activities. The model of problem based learning is suitable to be applied to wireless material. This is because learning with problem based learning can increase students' active involvement in learning, motivate students to generate curiosity and achieve a deep understanding of the subject matter.

This is in line with the opinion of experts who stated that the application of Problem Based Learning in professional learning and training has been investigated in the past 20 years[7]–[13]. the application of the Problem Based Learning (PBL) model is important to be used to overcome the problem of low student learning achievement, this is supported by the results of research by Yusof et.al [14], which suggests that the implementation of PBL at tHE University of Technology Malaysia positive influence on students from aspects of student learning achievement and thinking skills. Suryawati et.al, student experience in PBL, generally shows that students are more satisfied and happy to learn from PBL compared to conventional learning. This study aims to identify the quality and effectiveness of authentic assessment applications used, and identify the profile of students' skills and knowledge abilities in learning problem based learning in wireless material.

## **2. Method**

The research method used in this research is descriptive research method. In this study researchers only identified the effectiveness of authentic assessments used in learning computer networks on wireless material. The subjects in this study were students of Informatics Engineering Study Program, Faculty of Computer Science, University of Dharmas Indonesia who were studying wireless material. The technique of selecting the subject of this study is purposive sampling, namely by selecting classes that have not or are studying wireless material on computer network courses. To analyze the data in this study used various methods as follows:

### *2.1. Quality of Assessment Tools*

To see the validity and reliability used Giving validity values with the formula from Aiken`s V [15]. High validity can be due to the determination of a score or a clear assessment rubric in assessing student student competence regarding wireless network material. Determination of the score used is by identifying the suitability of the student's answer with the specified answer criteria. The device used is a computer based test (CBT) which is available in e-learning.

### *2.2. Analysis of the Observation Sheet on the Effectiveness of the Application of Authentic Assessment*

The data processing on the observation sheet on the effectiveness of the assessment application is done by calculating the frequency of occurrence of the effectiveness indicators for the assessment of each observer. The data obtained in the form of a checklist on the observation sheet is calculated, then devised. The percentage results were then adjusted to the category of implementation of the assessment according to Azwar [15].

### *2.3. Student Questionnaire Analysis*

The first step in analyzing student questionnaires is to tabulate questionnaire answers from all students. Next, calculate the percentage of student answers for each aspect asked. Interpretation of the answer questionnaire refers to Arikunto[16].

### *2.4. Analysis of Student Ability Profile Data*

It starts with giving students scores, then changes the raw score into the percentage values, followed by calculating the percentage of students in each category. For the performance capability category refers to Purwanto[17], while the knowledge category refers to Arikunto dkk.[16].

## **3. Result and Discussion**

3.1. *Quality of Authentic Assessment Tools in Learning Computer Networks in Wireless Materials.*

Authentic assessment online has several advantages and disadvantages. The advantages of learning evaluation include learning evaluation wherever and whenever, web-based evaluation also provides convenience in its assessment, because it has been integrated automatically with programming applications, and can make students motivated to learn computer networks while learning information technology and communication. In this study web-based assessment tools (e-assessment) for performance appraisal look like Figure 1.



**Figure 1.** Interface Performance Assessment

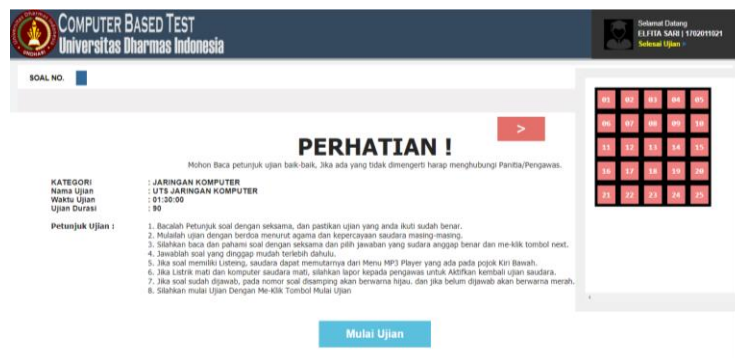
In this study the quality of e-authentic assessment tools is seen from empirical validity and reliability. The results of the validity and reliability analysis are listed in table 1.

**Table 1.** Validity and Reability of Autentic Asesment.

Assesment Quality	Type of Authentic Assessment	
	Performance	Description Tes
Validity	0.93	0.94
Interpretation	High	High
Reliability	0.98	0.97
Interpretation	Very High	Very High

The high validity figures show that the performance appraisal used in the research is able to perform the function of the measuring appropriately, namely measuring the competency of students' skills in carrying out problem-based learning based on wireless material, from the practicum preparation stage, paying attention to work harmony, teamwork and individuals in workmanship and practical skills .

Student cognitive assessment is done by using computer based facilities. The Online Examination Menu on Competency Based Learning based e-learning was developed to minimize cheating or leakage of questions that often occur during exams, prevent the limitations of the problem, damage the questions so that the results are not released after being examined. The CBT system will also reduce implementation costs because of course there is no need to print questions and answer sheets with paper. In addition to the CBT system exam, it is more practical, easier and makes the exam participants more focused. There is a time feature on the screen like Figure 4.10 so that you can maximize the time available. The more effective the problem is, the more questions can be answered, so the possibility of graduating is also getting bigger.

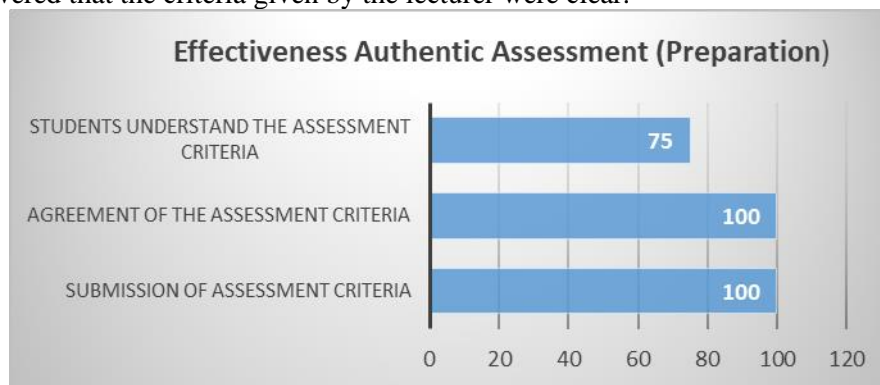


**Figure 2.** Main Menu Computer Based Test (CBT)

The results of computer based test not only show the total value obtained by students, but also have described the competency based they get according to the competencies they get. The competency analysis obtained by students looked like Figure 2.

### 3.2. Effectiveness Implementation of Assessment

**3.2.1. Preparation of Assessment.** The lecturer informs the assessment criteria the day before the learning activities take place, this can be seen from the results of observations in Figure 3 above which show 100% implementation or included in the excellent category. In addition students also agreed on the assessment criteria given by the lecturer, this can be seen from the results of observations in Figure 3 which showed that implementation was in a very good category (100%) and supported by the results of student questionnaire answers, almost all students (97%) answered that the lecturer has informed the assessment criteria and is accompanied by a 75 graduation score limit. The results of student responses regarding the clarity of the assessment criteria submitted by the lecturer, namely almost all (97%) students answered that the criteria given by the lecturer were clear.



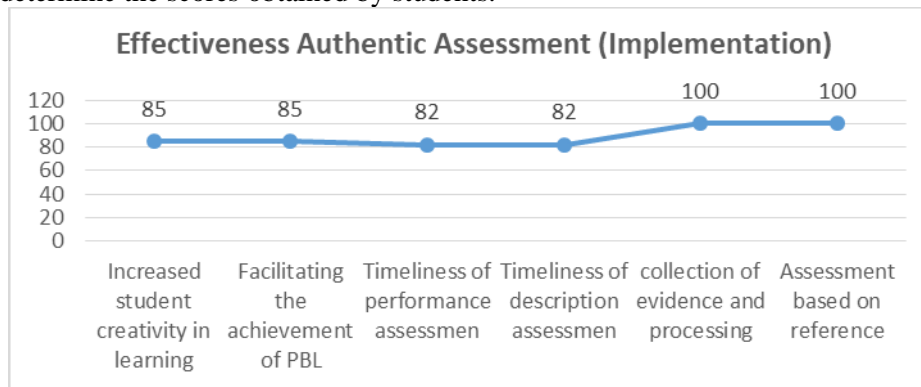
**Figure 3.** Observation on the Effectiveness Authentic Assessment (Preparation)

Students' understanding of assessment criteria is important in the learning process, so students are motivated in carrying out learning. In addition, transparency regarding assessment criteria can spur students to prepare themselves before carrying out learning. Transparency of assessment criteria to students is important so students know the competencies that will be assessed by the lecturer, so students are motivated to give the best effort during learning.

**3.2.2. Implementation of Assessment.** The level of implementation in the second indicator only reached 84%. But the level of implementation is quite good. The level of implementation in the fifth indicator reaches 100%, this means that evidence of student learning outcomes is collected and processed through various relevant assessment techniques. The sixth indicator reaches 100%, this means that student



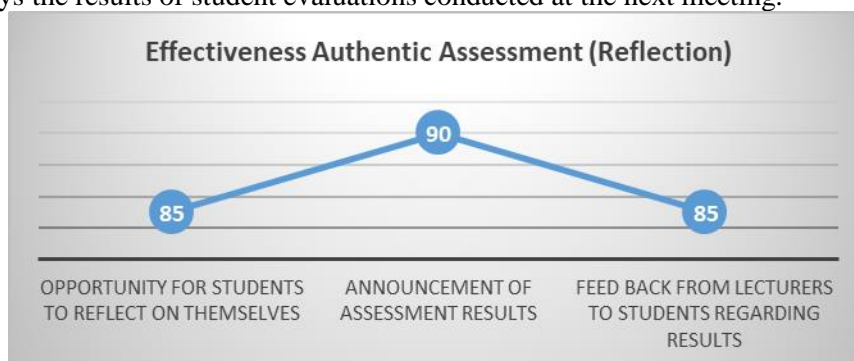
performance is assessed based on a predetermined reference. After obtaining proof of learning outcomes, the lecturer performs the processing of values. The assessment results are processed from various sources and then categorized based on the type of competency. In processing the results of student performance the lecturer uses a reference in the form of a predetermined rubric. The use of the assessment rubric is intended so that the assessment is carried out objectively and makes it easier for the lecturer to determine the scores obtained by students.



**Figure 4.** Observation on the Effectiveness Assessment (Implementation)

### 3.3. Reflection

The implementation of the first indicator belongs to the good category, which is equal to 85%. Assessment by students is intended to train their ability to assess the results of their performance. Giving students the opportunity to evaluate their own work is one effort to improve their learning, so students are able to be motivated to plan the business they will do to develop their abilities. One important aspect of implementing effective assessments is providing feedback to students. Before giving feedback, the lecturer conveys the results of student evaluations conducted at the next meeting.



**Figure 5.** Observation on the Effectiveness Authentic Assessment (Reflection)

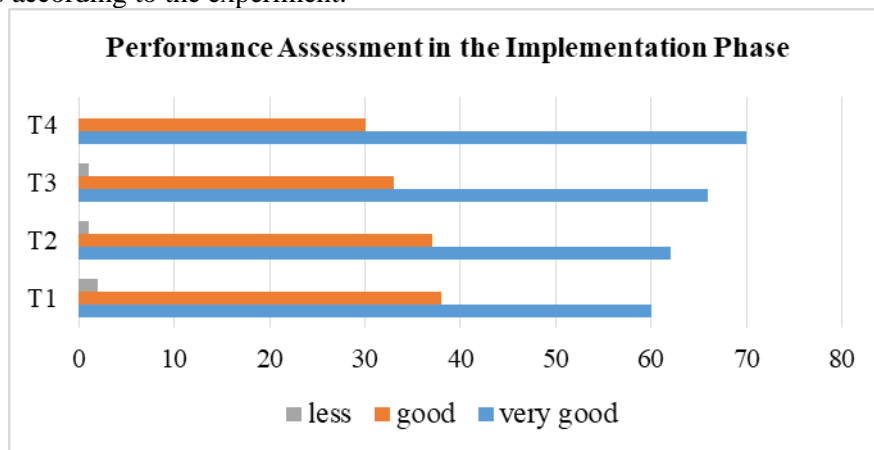
Transparency of assessment results is done so students know the abilities they have and are motivated to improve their abilities. This is supported by the answers of the student questionnaire, namely all students (100%) stated that the lecturer informed the results of the assessment that had been carried out and the results of observations on the effectiveness of the assessment (figure 5) showed that the second indicator reached 100% (very good). The level of implementation in the third indicator belongs to the good category, which is 85%. This is supported by the answers to student questionnaires, that is, almost all students (92%) agreed that the lecturer had provided suggestions on how to improve the results of the assessment. This shows there is feedback from the lecturer to students regarding the results of the assessment.



### 3.4. Profile of Students' Ability to Problem Based Learning in Wireless material

#### 3.4.1. Results of Performance Assessment in the Implementation Phase

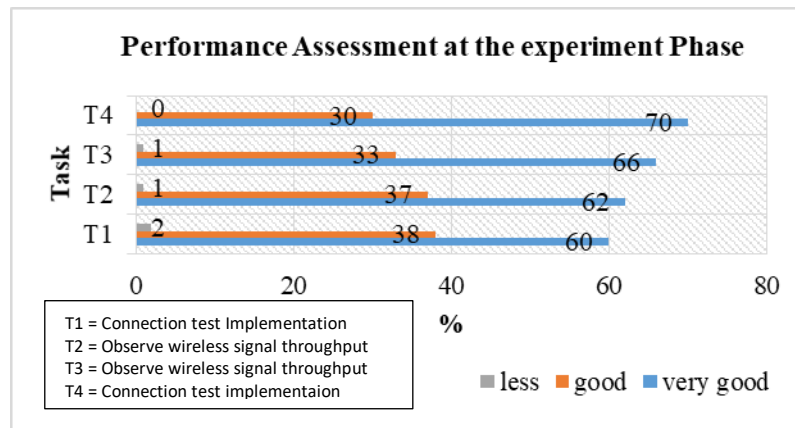
**3.4.1.1. Student Performance at the Phase of Designing Experiments.** In task 1 there are some students included in the excellent category in formulating the problem correctly. In task 2, there are a small number of students who are included in the excellent category, but most of the students fall into the good category because they make the experimental hypothesis by only mentioning the relationship between the experiments that have been done. In task 3 there are a small number of students who are included in the category very well in determining the experimental variable. However, most students include independent variables incorrectly. In task 4, most students are categorized as very good in determining the tools and materials used in the experiment. This is because in the jobsheet there is a choice of tools and materials to be used, making it easier for students to determine wireless devices and their numbers according to the experiment.



**Figure 6.** Results of Student Performance Assessment on the Designing Stage

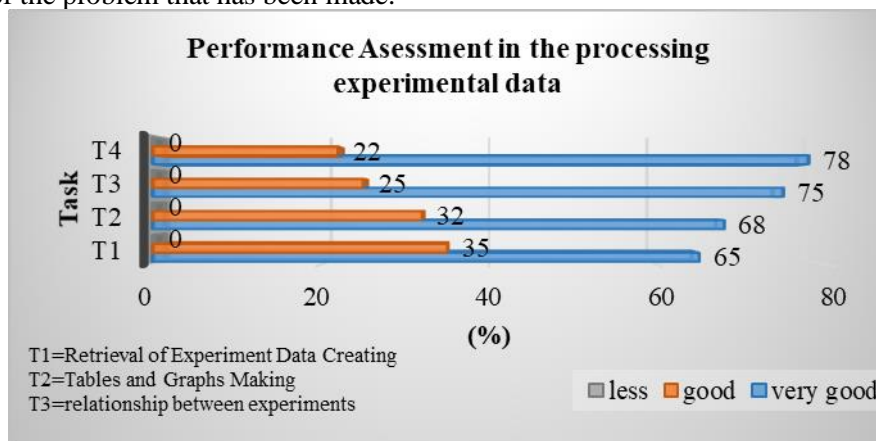
In task 5 almost all students have been able to arrange the experimental steps according to the experimental and systematic goals. This is because lecturers provide guidance questions that guide students in determining the experimental steps. However, students who belong to the excellent category use clear command sentences, while students who fall into the good category use obscure command sentences.

**3.4.1.2. Students Performance at the wireless experiment.** In task 1 there are most students able to install wireless devices correctly, but there are still some students who cannot install wireless equipment. This is because students rarely carry out lab work and have never seen and tried equipment. In task 2, most students are able to use the device and are good at configuring properly and correctly. In task 3 most students are able to observe the data input very well. However, it has not been able to overcome troubleshooting. In task 4, most students fall into the very good category in carrying out this performance, and only a small percentage of students fall into the good category, namely some students carry out less skilled experiments



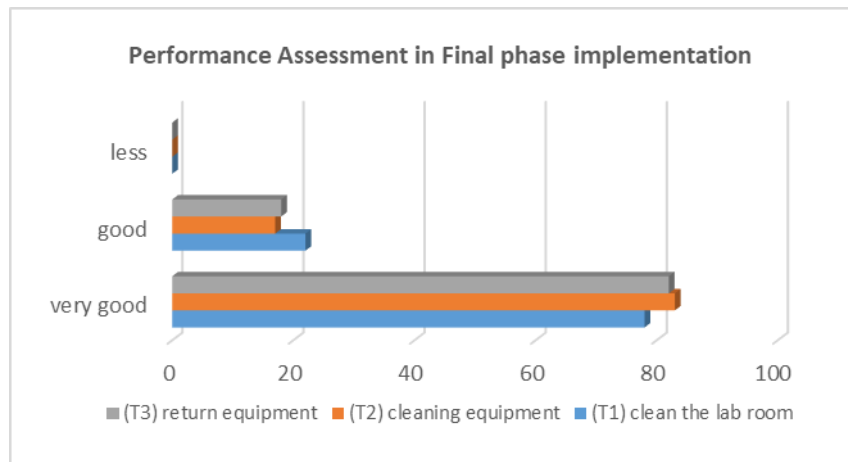
**Figure 7.** Results of Performance Assessment at the experime

3.4.1.3. *Students Performance at the processing experimental data.* In task 1 and task 2 almost all students belong to a very good category, this is because students are able to process experimental data into tables and can display experimental results in graphical form correctly along with the data in accordance with the experimental results. While students belonging to the good category are students who do not include table and graph titles. In task 3, most students have excellent performance in making relationships between variables according to the experiment. A small number of students did not give a detailed explanation of the relationship between experimental variables. As shown in figure 6, In task 4, most students have very good performance in making conclusions, namely conclusions that are made according to the results of the experiment, linking with experimental analogies, and conclusions made answer the problem statement. But there are some conclusions made by students not to answer the formulation of the problem that has been made.



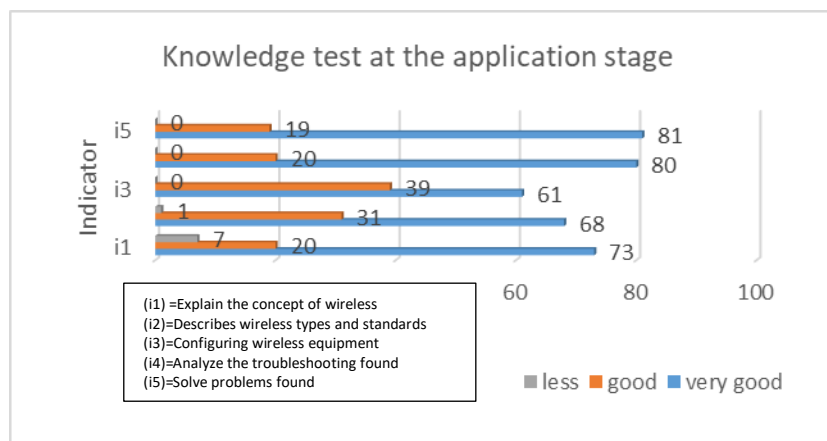
**Figure 8.** Results of Performance Assessment in the Processing Experiment Data

3.4.1.4. *Students Performance at the practicum completion process.* In task 1 most students are included in the excellent category. But some students still leave some equipment scattered in the laboratory or not clean the laboratory. This is due to the lack of cooperation in the group which only relies on a few friends to tidy up the laboratory. As shown in Figure 8, the task 2 shows that most students are included in the excellent category of cleaning and tidying up the laboratory room. In task 3 most students are able to carry out this performance very well. However, there are some students who do not double-check and count the number of devices that have been used, and immediately put the tool that has been used to its original place. This is due to the limited time the students have, so they are in a hurry to complete the practicum so they can take part in class presentations and discussions.



**Figure 9.** The result of performance assesment in final phase implementation

3.4.1.5. *Results of Description test in the Implementation Authentic Assessment.* Based on Figure 10, most of the students' knowledge on wireless material is in a sufficient category for each problem indicator. In the first indicator, most students are in the good category. This is because many students are theoretically capable of the concept of frequency and wireless channel usage, but students have difficulty applying how to implement good frequency settings when interference occurs. In the second indicator, the number of students in the sufficient category does not differ too far in either category. This is because some students are unable to distinguish between the frequency and width of the channel. This can be seen from the answers of the students who answered the two questions with the same answer. In the third indicator, most students are in the sufficient category, because some students are not able to explain completely the use of frequency. Some students only explain the results of experiments that have been carried out and do not associate them with the process of decreasing throughput resulting from interference interference.



**Figure 10.** The result of performance assesment in final phase implementation

In the fifth indicator most students are included in the sufficient category. This is because most students have been able to provide an explanation of the relationship between frequency use and the need for data transfer. In this indicator most students are included in a sufficient category to describe interference interference in conditions that are dense using wireless networks. This can be seen from some students who have been able to hypothesize wireless network disturbances which are characterized by declining characteristics of the equipment in transferring large data described in the problem. In addition, some students have been able to explain the effect of frequency and data width settings.

#### 4. Conclusion

Performance assessment tools and description tests are of good quality with high levels of validity and reliability. The level of implementation of authentic assessments falls into the category both at the stage of assessment preparation, implementation of assessment and reflection. Based on the results of observations assessing the competency performance of students' skills during the implementation of problem-based learning practice in wireless material, most students are in the good category at the experimental planning stage, and very well at the stage of conducting experiments, processing experimental data, and the final stages of the experiment. Based on the results of the test description, the competency of students' knowledge regarding wireless material, most of the students belong to enough categories for each indicator of the problem.

#### References

- [1] DIKTI 2018 *Panduan Penyusunan Kurikulum Pendidikan Tinggi di Era Industri 4.0*, 3rd ed. (Jakarta: Kementerian Riset Teknologi dan Pendidikan Tinggi)
- [2] Efendi A Y R 2019 Effectiveness of Collaborative Problem Based Learning Model of Learning Computer Network Courses BT - *5th UPI International Conference on Technical and Vocational Education and Training (ICTVET 2018)*
- [3] Savin-Baden M and Major C H 2004 *Foundations of Problem-Based Learning*. (Society for Research into Higher Education & Open University Press)
- [4] Boud D and Feletti G 2013 *The Challenge of Problem-based Learning*. (Taylor & Francis)
- [5] Walker A E, Leary H, Hmelo-Silver C E and Ertmer P A 2015 *Essential Readings in Problem-based Learning* (Purdue University Press)
- [6] Mueller J 2016 The Authentic Assessment Toolbox : Enhancing Student Learning through Online Faculty Development *Merlot J. Online Learn. Teach.*, **vol. 1**, no. 1, p. 7
- [7] Albanese S M. A. and Mitchell 1993 *Problem-based learning: A review of literature on its outcomes and implementation issues*
- [8] Niwa M, Saiki T, Fujisaki K, Suzuki Y and Evans P 2016 The Effects of Problem-Based-Learning on the Academic Achievements of Medical Students in One Japanese Medical School, Over a Twenty-Year Period *Heal. Prof. Educ.*, **vol. 2**, no. 1, pp. 3–9, 2016.
- [9] Savin baden M 200 *Problem-based Learning in Higher Education* (Untold Stories)
- [10] McPhee A D 2002 Problem-based learning in initial teacher education: taking the agenda forward *J. Educ. Enq.*, **vol. 3**, no. 1, pp. 60–78
- [11] Gibson S E 2002 Using a problem based , multimedia enhanced approach in learning about teaching **vol. 18**, no. 3, pp. 394–409, 2002.
- [12] Pedersen S and Liu M 2002 The Transfer of Problem-Solving Skills from a Problem-Based Learning Environment *J. Res. Technol. Educ.*, **vol. 35**, no. 2, pp. 303–320
- [13] Erdogan T and Senemoglu N 2014 Problem-based Learning in Teacher Education: Its Promises and Challenges,” *Procedia - Soc. Behav. Sci.*, **vol. 116**, pp. 459–463
- [14] Yusof K M, Hassan S H A S, Jamaludin M Z and Harun N F 2012 Cooperative Problem-based Learning (CPBL): Framework for Integrating Cooperative Learning and Problem-based Learning,” *Procedia - Soc. Behav. Sci.*, **vol. 56**, no. 1, pp. 223–232
- [15] Azwar S 2015 *Reliabilitas dan Validitas*. (Yogyakarta: Pustaka Belajar)
- [16] Arikunto S, Safruddin A J, and Cepi 2014 *Evaluasi Program Pendidikan*. (Jakarta: PT. Bumi Aksara)
- [17] Purwanto 2009 *Evaluasi Hasil Belajar* (Jakarta: Pustaka Pelajar)