UNS
UNIVERSITAS SEBELAS MARET

CERTIFICATE

Number: 07/Pan.ICoSMEE/I/2021

is awarded to

Dr. Astuti Muh. Amin, M.Pd

as

Presenter

entitled

The Understanding of Metacognitive Skills Among Biology Teacher and Lecturers in Makassar, South Sulawesi, Indonesia.

in The 3rd ICoSMEE (International Conference on Science, Mathematics, Environment and Education) 'Faculty of Teacher Training and Education', Sebelas Maret University

Surakarta, 27-28 July 2021

Dean,

Dr. Mardiyana, M.Si.

Chair,

Dr.Sri Budiawanti, M.Si.

International Conference on Science, Mathematics, Environment and Education
Secretariat: Science Education Department, Faculty of Teacher Training and Education,
Universitas Sebelas Maret
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Email: icosmee.uns@gmail.com Web: https://icosmee-uns.org/,

LETTER OF ACCEPTANCE

Dear Ms Astuti Muh Amin, et al

Congratulations! your abstract titled:

"The Understanding Of Metacognitive Skills Among Biology Teachers And Lecturers In Makassar, South Sulawesi, Indonesia."

has been accepted to be continue to the next step (full paper submission) at t International Conference on Science, Mathematics, Environment and Education (THE 3rd ICoSMEE) 2021 which is being held on July, 27 - 28 2021 at Surakarta.

For educational fields, please add some analysis about the concept which are related to your fields.
Thank you and looking forward to your participation in this event.

Kind regards,
THE 3rd ICoSMEE 2021 Committee
Website : https://icosmee-uns.org/
Email : icosmee.uns@gmail.com

BOOK OF ABSTRACT

ICoSMEE

The 3rd International Conference on Science, Mathematics, Environment, and Education

27-28 July 2021

Faculty of Teacher Training and Education
Universitas Sebelas Maret
Indonesia

ABSTRACT BOOK

International Conference On Science, Matemathics, Enviroment, and Education (ICoSMEE)

"Flexibility in Research and Innovation on Science, Mathematics, Environment, and Education for Sustainable Development"

Surakarta, July 27th -28th 2021

Organizers
Science and Math Education Department
Faculty of Teacher Training and Education
Sebelas Maret University
Jl. Ir. Sutami 36 A Kentingan Surakarta - Jawa Tengah 57126
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ABSTRACT BOOK

International Conference On Science, Matemathics, Enviroment, and Education (ICoSMEE)

"Flexibility in Research and Innovation on Science, Mathematics, Environment, and Education for Sustainable Development"

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CHAIRMAN WELCOME SPEAKS AND REPORT

Assalamu'alaikum Wr. Wb.
Good morning, ladies and gentlemen. Peace be upon us all.
The honorable rector of Universitas Sebelas Maret, Prof. Dr. Jamal Wiwoho,S.H, M.Hum.,
The honorable dean of Facultyof Teacher Training and Education, Universitas Sebelas Maret. Dr. Mardiyana, M. Si
The honorable keynote speakers,
The honorable parallel speakers,
The honorable organizing committee members,
And all distinguished guests, participants of The 3rd International Conference on Science, Mathematics, Environment and Education (ICoSMEE) 2021

It is such a great pleasure to welcome you all to the third International Conference on Science, Mathematics, Environment and Education (ICoSMEE) . On behalf of the organizing committee of the conference, allow me to deliver several points of report as follows.

The conference was initiated on 2017 by Faculty of Teacher Training and Education, Universitas Sebelas Maret. The theme The 3rd International Conference on Science, Mathematics, Environment and Education (ICoSMEE) 2021 is Flexibility in Research and Innovation on Science, Mathematics, Environment, and education for sustainable development the conference was held online via Video Conference/online on 27 Juli 2021. I would like to express my deepest gratitude to everybody taking a part in this conference: participants, parallel presenters, keynote speakers, organizing committee, steering committee, the university, and also everyone else. Even though we, the committee, have tried our best efforts to make a better conference this year, I believe that there remains some inconvenience. For that,

we do apologize.

That would be the end of my report. One more time, deep from the place of caring inside, thank you very much.
Wassalamu'alaikum Wr. Wb.

Chair,

Dr. Sri Budiawanti

RECTOR SPEAKS

Good Morning

Assalamu'alaikum warahmatullahi wabarakatuh. May peace and God's blessings be upon us

Welcome to the 3rd ICoSMEE organized by Department of Mathematics and Science Education, Faculty of Teacher Training and Education, Universitas Sebelas Maret, Indonesia.

It is a great pleasure to welcome you all to our third conference, the **INTERNATIONAL CONFERENCE ON SCIENCE, MATHEMATICS, ENVIRONMENT AND EDUCATION (ICoSMEE)**. On behalf of Universitas Sebelas Maret (UNS) and the committee, let me express my warmest greetings and appreciation to all speakers and participants (from abroad and within Indonesia) for joining this conference to share experiences and works related to sciences, mathematics, environment and its education. It is an honor for this university to have the opportunity to organize this important conference.

I am Jamal Wiwoho as the Rector Universitas Sebelas Maret would love to give a brief introduction to UNS. This March was our 45th anniversary. According to the Ministry of Education and Culture, UNS currently belongs to cluster 1 or one of the best 11 universities in Indonesia. We also rank 451-500 in the world based on QS AUR. If you have a chance to visit UNS, we would be pleased to take you around our green campus as we rank 7 in Indonesia and 96 in the world in UI Green matric World University Ranking. We strive to be better every year by developing research, learning system, publication, and the opportunity to collaborate with many sectors as we are now going to be an independent university.

This third conference, the **INTERNATIONAL CONFERENCE ON SCIENCE, MATHEMATICS, ENVIRONMENT AND** EDUCATION **(ICoSMEE)** aims at bringing together researchers, educators, scientists, and scholar students to exchange and share their experiences, ideas, and findings and to discuss Flexibility in Research and Innovation on Science, Mathematics, Environment, and education for sustainable development. It is expected that this conference will reach its declared objectives successfully. Let me wish you all a fruitful discussion during the conference.

Thank you very much.

Wassalamu'alaikum warrahmatullah wabarakatuh. May peace and God's blessings be upon you all

Surakarta, 27 July 2021

Rector

Prof. Dr. Jamal Wiwoho, S.H., M.Hum.

ORGANIZING COMMITTEE

ORGANIZING COMMITTEE

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		Azizah Nurul I
		Hayu Diah Cahyani
		Sri Lestari
		Shofi Nurtaqia

Paper and Proceeding	:	Dr.paed. Nurma Yunita Indriyanti, M.Si., M.Sc. Dewanto Harjunowibowo, S.Si., M.Sc. Meida Wulan Sari, M.Pd. Dr. Farida Nurhasanah, M.Pd. Dr. Umi Fatmawati, S.Pd., M.Si. Murni Ramli, S.P., M.Si., Ed.D. Dr.rer.nat. Sri Mulyani, M.Si. Annisa Widyastuti Ellis Octavia M. Ahsanul Taqwim Siti Nur Afifah Tyas Dwi
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Webinar Management	:	Dr. Bowo Sugiharto, S.Pd., M.Pd. Bayu Antrakusuma, M.Pd. Alanindra Saputra, S.Pd., M.Sc.

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PROGRAMME

Date	Time	Agenda			Room	PIC
27 July 2021	08:00 – 08:30	Opening Ceremony			Main Room	Webinar Management + MC
	08:30 – 10:00	**Plenary Speaker 1:** Prof. Gillam Roehrig University of Minnesota, USA.				Moderator: Dr. paed. Nurma Yunita Indriyanti, M.Si., M.Sc. Webinar Management
	10:00 – 11:30	**Plenary Speaker 2:** Prof. Shiang Yao-Liu National Taiwan University, Taiwan.				Moderator: Murni Ramli, S.P., M.Si., Ed.D Webinar Management
	11:30-13:00	---*Break*---				Program
	13:00 – 14:30	**Plenary Speaker 3:** Dr. Allison Clark Wilson University College London, United Kingdom			Main Room	Moderator: Dr. Farida Nurhasanah, M.Pd Webinar Management
	14:30 – 14:40	Parallel Breakout Room Preparation				Webinar Management
	Parallel Session (Breakout Room)					
	14:40 – 17:00	Room 1 Maths (M)	Room 2 Math Edu (ME)	Room 3 Environment & Biology (B)	Room 4 Biology Education (BE)	Room 5 Chemistry (C)
		Room 6 Chemistry Education (CE) **Invited Speaker:** **Dr.M.Masykuri**	Room 7 Physics (P)	Room 8 Physics Education **Invited Speaker:** **Prof. Dr. Widha Sunarno**	Room 9 Science Education (SE) **Invited Speaker: Prof. Dr. Suciati**	

Date	Time	Agenda	Room	PIC
28 July 2021	-08:00	Opening	Main Room	Webinar Management + MC
	08:00 – 09:30	**Plenary Speaker 4:** Associate Prof. Rhyoichi Otomo, Ph.D Hokaido University, Japan	Main Room	Moderator: Lina Mahardiani, S.T., M.Sc., Ph.D. Webinar Management
	09:30 – 11:00	**Plenary Speaker 5:** Bagus Putra Muljadi, Ph.D The University of Nottingham, United Kingdom	Main Room	Moderator: Dewanto Harjunowibowo., S.Si., M.Sc., Ph.D Webinar Management
	11:00 – 12.00	**Plenary Speaker 6:** Puguh Karyanto, M.Si., Ph.D Sebelas Maret University, Indonesia	Main Room	Moderator: Alanindra Saputra., S.Pd., M.Sc Webinar Management
	12.00 -13:00	BREAK & Parallel Breakout Room Preparation		Webinar Management
	Parallel Session			
	13:00 - End	Room 1 Maths (M)	Room 2 Math Edu (ME) **Invited Speaker:** **Dr. Farida Nurhasanah, M.Pd.**	Room 3 Environment & Biology (B)
		Room 4 Biology Education (BE)	Room 5 Chemistry (CE)	
		Room 7 Physics (P)	Room 8 Science Education (SE)	Room 9 Science Education (SE) & Chemistry Education (CE)

Day 1

Mathematics

SCHEDULE FOR THE PARALLEL SESSION

Room: Room 1		Mathematics	Moderator: Ario Wiraya, M.Sc.
TIME	**CODE**	**AUTHORS**	**TITLE**
14.40 –14.50	M- 13	A A Abdullah, R Richardo, T Rochmadi, A Wijaya, and Nurkhamid	Ethnomathematics: Exploration in Cultural Heritage Buildings in Yogyakarta based on geometry perspective
14.50 – 15.00	M-29	E. E. Misengo, D. D. Prastyo, and H. Kuswanto	Modelling and Forecasting Monthly Tourist Arrivals to the United States and Indonesia Using ARIMA Hybrids of Multilayer Perceptron Models
15.00 – 15.10	M-33	Munazilla Nina, Farikhin, Sunarsih	A Modified of The Generalized Fuzzy Logical Relationship Method With High Order Fuzzy Time Series Based on Frequency Density Partition
15.10 – 15.20	M-35	Nazmi Soraya, Santi Wulan Purnami, Jerry Dwi Trijoyo P, and Edi Syukur	Multiple Period Logit Model Using The Maximum Likelihood and Bayesian Approach on Data of Breast Cancer Patients In C-Tech Laboratories Tangerang
15.20 – 15.30	M-40	Nadhira Karima and Ikha Magdalena	Finite Difference Methods for Investigating Wave Propagation over a Hump using Linearized Boussinesq-type Model
15.30-15.50		BREAK	
15.50 – 16.00	M-43	Ardiana Fatma Dewi, I Nyoman Budiantara, Vita Ratnasari	Mixture Model of Spline Truncated, Kernel, and Fourier Series in Semiparametric Regression
16.00 – 16.10	M-44	I Gusti Bagus Ngurah Diksa, Heri Kuswanto, Kartika Fithriasari	Forecasting Indonesia Inflation Using Long Short Term Memory Method
16.10 – 16.20	M-45	Raditya Novidianto, Kartika Fithriasari, Heri Kuswanto	Prediction of Rice Growth Phases with Multitemporal Landsat-8 Data Using Rotation Forest Multiclass Method
16.20 – 16.30	M-51	Natasya Titania Ramadhanti, Cucuk Wawan Budiyanto, Rosihan Ari Yuana	The Use of Heuristic Evaluation on UI/UX Design: A Review to Anticipate Web-app's Usability
16.30 – 16.40	M-53	Muhammad Robby Fadhillah, Cucuk Wawan Budiyanto, Puspanda Hatta	The Influence of Block-based Programming to Computational Thinking Skills: A Systematic Review

SCHEDULE FOR THE PARALLEL SESSION

Room: Room 1		Mathematics	Moderator: Ario Wiraya, M.Sc.
TIME	**CODE**	**AUTHORS**	**TITLE**
16.40 – 16.50	M- 54	Puling Tang, Apriliani, Rokhmati	Estimation Parameters of Unemployment (Case Study in East Java Province)
16.50 – 17.00	M-56	Andy Rezky Pratama Syam, Vita Ratnasari, I Nyoman Budiantara	Modeling and Simultaneous Hypothesis Testing in Nonparametric Regression with mixture model of Kernel and Fourier Series

Mathematics Education

SCHEDULE FOR THE PARALLEL SESSION

Room: Room 2		Mathematics Education	Moderator: Riki A, M.Pd.
TIME	**CODE**	**AUTHORS**	**TITLE**
14.40 – 14.50	ME-5	Ahmad Hafiz Muhammad, Mazlini Adnan	Chess Transformation Game as Teaching Aids in Isometric Transformation Topics
14.50 – 15.00	ME-6	Nur Azmeera Supian, Mazlini Adnan	Development of Smart Triankit as Teaching Aids on the Topic of Solution of Triangles in Additional Mathematics Form 4
15.00 – 15.10	ME-7	Salsabila Mohd Amran Amarasena, Mazlini Adnan	Development of Bom Translasi Game as Teaching Aid on the Topic of Transformation in Mathematics Form Two
15.10 – 15.20	ME-8	Nabila Wahida Mohd Apandi, Mazlini Adnan	Development of Peri-Calcup Board Kit as a Form One Teaching Aids for Perimeter Topics
15.20 – 15.30	ME-12	Tri Rochmadi, Rino Richardo, Ahmad Anis Abdullah, Ariyadi Wijaya, Nurkhamid	Design Android-Based Learning Media Using Augmented Reality Technology to Support Ethnomathematics Materials at Junior High School
15.30-15.50		BREAK	
15.50 – 16.00	ME-58	Zetra Hainul Putra, Yesi Martha Afrillia, Eddy Noviana, Neni Hermita	Prospective elementary teachers' difficulties in solving conceptual tasks on representation of addition and subtraction of fractions
16.00 – 16.10	ME-62	Szilárd Svite	Strategies and Tools Used by Students to Solve an OpenEnded Problem – Case Study
16.10 – 16.20	ME-65	Siti Mamluatun Nikmah, Abd Qohar	Development of GeoGebra-Assisted Mathematics Learning Media Based on Guided Discovery on Triangle Topic
16.20 – 16.30	ME-66	Yanti Marasabessy, Abd Qohar	Students' Mathematical Communication in TAI (Team Assisted Individualization) Type Cooperative Learning on The Quadratic Equations and Functions Topic
16.30 – 16.40	ME-69	Hanifah Nabila Hendral, Kana Hidayati	The Relationship Between Students' Self-Efficacy And Mathematics Anxiety: Meta-Analysis Investigation

SCHEDULE FOR THE PARALLEL SESSION

Room: **Room 2**		**Mathematics Education**	**Moderator:** Riki A, M.Pd.
TIME	**CODE**	**AUTHORS**	**TITLE**
16.40 – 16.50	ME-83	Yustika I. Maharani, Cucuk W. Budiyanto, Rosihan A. Yuana	The Art of Computational Thinking through Visual Programming: A Literature Review
16.50 – 17.00	ME-149	Yetti Widiarti, Saleh Haji, Yumiati	Improving Students' Ability in Solving Story Questions Through A Scientific Approach with Zoom Media

Environment & Biologi

SCHEDULE FOR THE PARALLEL SESSION

Room: Room 3		Environment & Biologi	Moderator: Febriani Sarwendah, M.Pd.
TIME	**CODE**	**AUTHORS**	**TITLE**
14.40 – 14.50	EE-25	Anang Risgiyanto, Suharso, Buhani, Tugiyono, Agung Abadi Kiswandono, Anisa Rahmawati, Sangaji Ilham Prasetyo, Syah Wulan Sumekar Rengganis Wardani	Study of Water Quality of Way Umpu River, Way Kanan Regency, Lampung Province, Indonesia, Based on Differences of TSS, DO, BOD, COD, and Phosphate Levels in Mining Locations
14.50 – 15.00	EE-34	Tri Yastuti Laksanahati, Widowati, Sapto Purnomo Putro, Satriyo Adhy	Mathematical Analysis of the Nitrogen and Phosphate to Phytoplankton, Macrobenthos, and Sediment in Aquaculture System
15.00 – 15.10	EE-63	Reinhart Gunadi, Ahmad Afif Aulia Hariz, Ikha Magdalena	A Mathematical Model on the Effects of Tourism on Coral Reef Ecosystems
15.10 – 15.20	EE-111	Rizky Nanda Noverianto, Agus Suharsono, Dedy Dwi Prastyo	Estimation of Value at Risk with ARMAX and GARCHX Variation during COVID-19 Pandemic Period (Case Study: IDX30 Stock Data in Banking sub-sector on Indonesia Stock Exchange)
15.20 – 15.30	EE-120	Nur'Im, Setyawan	Prototype Design of Clean Water Distribution System on Residential Scale Using Arduino Mega Microcontroller
15.30-15.50		BREAK	
15.50 – 16.00	EE-159	Wida Herlina, Topik Hidayat	ECOLOGY BASED CURRICULUM AS INNOVATION
16.00 – 16.10	EE-171	Andri Saputra, Pani Satwika Nitya, Baskoro Ajie, Erlita Pramitaningrum	Comparative Life Cycle Assessment of Plastic Jerry Cans: A Case Study Production in Plastic Workshop of Politeknik ATK Yogyakarta
16.10 – 16.20	EE-250	Lina Mahardiani, Pingki Wahyu Septianing, Pundung Setia Lesana, Sulistyo Saputro, Sunu Pranolo	Nanofiber Fabrication from Palm Fiber Waste for Sustainable Water Remediation
16.20 – 16.30	EE-267	Ahmad Najmi Faris, Adi Susilo, A T Sutan Haji, Lailatul Maghfiroh	Identification and Analysis of Geotourism Potential in Purwodadi Village, Malang Regency as Support for Geopark Areas in East Java

SCHEDULE FOR THE PARALLEL SESSION

Room: **Room 3**		**Environment & Biologi**	**Moderator:** Febriani Sarwendah, M.Pd.
TIME	**CODE**	**AUTHORS**	**TITLE**
16.30 – 16.40	EE-270	Nur Aini Gama Lestari, Sukir Maryanto, Didik Rahadi Santoso	Derivative Analysis for Estimating Subsurface Structures in the Kawi-Songgoriti Geothermal Area
16.40 – 16.50	EE-273	Dewi Puspo Rini,Tien Aminatun	Development of E-Module Based on Socio-Scientific Issues of Environmental Change Topic
16.50 – 17.00	EE-295	Indra Darmawan, Achmad Ridwan, Riyadi, Riyan Arthur	The Role of the Learning Environment in Developing Student Character (a Systematic Review)

Biology Education

SCHEDULE FOR THE PARALLEL SESSION

Room: Room 4		Biology Education	Moderator: Candra A, M.Pd.
TIME	**CODE**	**AUTHORS**	**TITLE**
14.40 – 14.50	BE-18	Ervin Setyantoko, Jan Hendriek Nunaki, Jeni Jeni, Insar Damopolii	Effectiveness of Human Digestive System E-Modules During Pandemic Era to Enhance Students' Learning Outcomes
14.50 – 15.00	BE-74	Ni Wayan Ekayanti, Gusti Ayu Dewi Setiawati	The Exploration of Environmental Care Attitude through Photovoice on Elementary And Junior High School Student
15.00 – 15.10	BE-75	Astri Yuliawati, Mar`atus Sholikha, Mila Listiawati	Earth Hour Popularity Among Biology Education Students UIN Sunan Gunung Djati Bandung.
15.10 – 15.20	BE-76	Yuni Wibowo, Agung Wijaya, Rio Christy Handziko, Atik Kurniawati	Implementation of Scientific Social Issues-based Biology Learning to Improve Scientific Literacy of High School Students
15.20 – 15.30	BE-103	Risky Agustina Maria Sibarani, Afandi, Andi Besse Tenriawaru, Eka Bilantid	Comparison of Instrument Analysis Result of Test of Scientific Literacy Skills for Biology (TOSLS-B) Using Iteman and Rasch Model
15.30-15.50		BREAK	
15.50 – 16.00	BE-106	Anggi Dwi Pratiwi, Afandi, Eko Sri Wahyuni, Refka Darmayanthi Putri Mahisad	Analysis Of Argumentation Skills In Biology Learning At Senior High School Pontianak
16.00 – 16.10	BE-119	Papin Citra Resti Rustanto, Suciati, Baskoro Adi Prayitno	Developing Complex Multiple-Choice Test to Empower Students Higher Order Thinking Skill about Excression System
16.10 – 16.20	BE-128	Astuti Muh. Amin	The Understanding of Metacognitive Skills Among Biology Teachers and Lecturers in Makassar, South Sulawesi, Indonesia.
16.20 – 16.30	BE-134	Diah Ayu Fatmawatia, Murni Ramli, Baskoro Adi Prayitno	Analysis of Gaming Learning Needs for High School Students
16.30 – 16.40	BE-142	Ayu Rahma Ulufa Nuri, Sajidan, Murni Ramli	Do We Need Critical Thinking Progression?

SCHEDULE FOR THE PARALLEL SESSION

Room: Room 4		Biologi Education	Moderator: Chandra A, M.Pd.
TIME	**CODE**	**AUTHORS**	**TITLE**
16.40 – 16.50	BE-161	Wardayani Solihah, Ida Kaniawati	Parents As First Teachers: Active Knowledge Sharing With Parents Method In Reproductive System Learning
16.50 - 17.00	BE-162	Anwari Adi Nugroho, Yokhebed, Luvia Ranggi Nastiti, Suranto	The Changes of Biology Learning Activities in Higher Education During the COVID-19 Pandemic

Chemistry

SCHEDULE FOR THE PARALLEL SESSION

Room: Room 5		Chemistry	Moderator: Dimas Gilang Ramadhani, M.Pd.
TIME	**CODE**	**AUTHORS**	**TITLE**
14.40 – 14.50	C-80	Wisnu Wardhana, Bambang Soegijono	Prediction Of Hysteresis Curves for Li-Doped ZnO Ferroelectric Materials Using Preisach Model and Deep Neural Networks
14.50 – 15.00	C-84	Imam Samodra, Fajar Rakhman Wibowo, Sri Mulyani	Molecular Docking Study on COVID-19 Drug Activity of Quercetin Derivatives with Glucose Groups as Potential Main Protease Inhibitor
15.00 – 15.10	C-88	Zakkiyyah Hidayatul Muhaiminah, Suprapto, Yatim Lailun Ni'mah	Synthesis of Silica Nanoparticles from Sugarcane Bagasse by Sol-Gel Method
15.10 – 15.20	C-90	Trivena Tualaka, Irmina Kris Murwani	The Fluorination Of Zn Metoxide And Cu Metoxide Mixture
15.20 – 15.30	C-99	Tiany, Herlina Krise, Harmami Harmami, Suprapto Suprapto, Ulfin, Ita, Ni'mah ,Yatim Lailun	Synthesis of Hard Capsule From Water Soluble Chitosan With Addition of Carrageenan and Starch White Sweet Potato
15.30-15.50		BREAK	
15.50 – 16.00	C-147	Dewi Yunia, Yulia Sukmawardani, Cucu ZS	Utilization of water Hyacinth Assisted Biofilter to reduce Ammonia Levels In Tofu Liquid Waste
16.00 – 16.10	C-173	Widiastuti Agustina E.S., Yana Maolana Syah, Ihsanawati, Anita Alni	Chemical Transformation of Pyrazine Derivatives
16.10 – 16.20	C-175	Lizma Febrina, Nizar Happyana, Yana Maolana Syah	Identifying Metabolites in Complex Extract of Sigararutang Coffee Beans with NMR Spectroscopy Method
16.20 – 16.30	C-179	Desi Budi Ariani, Mahmud Sudibandriyo	Volume Estimation of Sour Natural Gas Using Volume Translation Peng-Robinson with The Translation Equation as a Function of Molecular Weight and Acentric Factor
16.30 – 16.40	C-200	Windi Zamrudy, Heny Dewajani, Anang Takwanto, Erwan Yulianto	Effect of Na2SiO3 (Sodium Silicat) As A Corrosion Inhibitor on Decreasing The Corrosion Rate in Service Water Piping in Electric Steam Power Plant
16.40 – 16.50	C-207	Imelda fajriati, Taufiq Aji, Priyagung Dhemi, Dian Aruni, Ria Puspitaningrum	Purification of used cooking oil of shredded chicken using activated carbon from coconut shell

SCHEDULE FOR THE PARALLEL SESSION

Room: **Room 5**		**Chemistry**	**Moderator:** Dimas Gilang Ramadhani, M.Pd.
TIME	**CODE**	**AUTHORS**	**TITLE**
16.50 – 17.00	C-213	Dyah Ayu, Titisari Eko Santoso, Mardi Santoso	Synthesis of 3,3-di(1-(2-phenylbenzyl)indole-3-yl)- 5-bromoindoline-2-one

Chemistry Education

SCHEDULE FOR THE PARALLEL SESSION

Room: Room 6		Chemistry Education	Moderator: Bayu Antrakusuma, M.Pd.
TIME	**CODE**	**AUTHORS**	**TITLE**
14.40 – 15.00		Dr.M.Masykuri	Hands-on Science Teaching (HOST) to Improve Students Critical and Creative Thinking Skills
15.00 –15.10	CE-15	Muhammad Aripin, Mukhamad Nurhadi, Muh Amir, Usman	Developing It-Based Learning Media Of The Aufbau Electron Configuration Principle In Constructivism-Oriented Chemistry Learning To Improve Mastery Of Concepts And Problem Solving Skills
15.10 –15.20	CE-31	Oka Irmade, Mohamad Syarif Sumantri, Etin Solihatin	Project-based Learning Research Trends In Indonesia: Bibliometric Analysis
15.20 –15.30	CE-146	N Harefa, L S L Purba, N I Simatupang, E Sormin	Students' Performance and Interest on Chemistry in Online Learning During The Covid-19 Pandemic
15.30-15.50	CE-202	Budi Utami	The Implementation Of Learning Strategies Through Innovative Learning Models To Improve Students' Affective Ability And Social Interaction
15.50 –16.00	CE-249	Aruf Rofi Zaini, Tuszie Widhiyanti, Wiji	Analysis of Mastery Concepts and Student Self-Efficacy in Chemistry Learning
16.00 – 16.10		BREAK	
16.20 – 16.30	CE-306	Yuli Rahmawati, Elisabeth Taylor, Peter Charles Taylor, Alin Mardiah	Environmental Sustainability in Education: Integration of Dilemma Stories into a STEAM project in Chemistry Learning
16.30 – 16.40	CE-309	Yuli Rahmawati, M Jihad Akbar, Setia Budi, Achmad Ridwan	Exploring Value-based Learning Environment for Sustainable Development in Education: Integration of Socio-scientific Issues in Chemistry Learning
16.40 – 16.50	CE-313	Meida Wulan Sari, Sri Poedjiastoeti, and Titik Taufikurohmah	Implementation of IDEAL Problem Solving Model to Improve Students Creative Thinking Skills on Solubility and Solubility Product
16.50 – 17.00	CE-331	Cartika Candra Ledoh, Sentot Budi Raharjo, Sulistyo Saputro	The Development of Guided Inquiry-Based Electronic Module to Improve Students' Critical Thinking Skill

Physics

SCHEDULE FOR THE PARALLEL SESSION

Room: Room 7		Physics	Moderator: Fairusy V H, M.Pd.
TIME	**CODE**	**AUTHORS**	**TITLE**
14.40 – 14.50	P- 26	L Yuliantini, M B Sari, M Djamal, K Boonin, P Yasaka, and J Kaewkhao	Physical Properties of Gd3+ ion Doped Fluorotellurite Glass and Their Radiation Shielding Parameter
14.50 – 15.00	P- 28	Serliana Yulianti, Hanung Aulia Rahman Budi, Tuswan Tuswan, Eli Novita Sari, Abdi Ismail, Ahmad Ilham Ramadhani, Siti Duratun Nasiqiati Rosady	Conceptual Design of a Pelton Turbine to Supply the Electricity Need in Selur Village, Ponorogo
15.00 – 15.10	P- 46	Lintang P. Wiyartiningtyas, Fairusy F. Haryani	The Effect of the Magnetic Field of Household Electronic Appliances on the Human Body
15.10 – 15.20	P- 97	M. R. Habibi, Mohammad Isa Irawan, Budi Setiyono	Distance Estimation Between Moving Objects Using Monocular Camera
15.20 – 15.30	P- 113	R A Andyani, Setiawan , V Ratnasari	Estimation of Random Effect Probit Panel Parameter Using Adaptive Gauss Hermite Quadrature Integration
15.30-15.50		BREAK	
15.50 – 16.00	P- 169	Agus Herawan, M.Mukhayadi, Rinto Andri Wiendiarto and Supia	Development Autotracking Control Antenna Software Using Stepper Motor Hybrid 2 Phase
16.00 – 16.10	P- 183	Lailatul Maghfiroh, Adi Susilo, Wiyono and Ahmad Najmi Faris	Magnetic Mineral Characterization of Iron Sand Deposits in Bambang Beach Lumajang, East Java, Indonesia
16.10 – 16.20	P- 187	A K Lebang, A Arifin and B Abdullah	Enhance Sensitivity of Glass Optical Fiber with Various Configuration for Displacement and Force Sensor
16.20 – 16.30	P- 248	Agus Sudarmanto, Muhammad Ardhi Khalif, Andika Khoirul Huda	Detection of Building Slope and Land Subsidence Using Ultrasonic HC-SR04 Sensors Based Arduino Uno R3 and Blynk
16.30 – 16.40	P- 262	Rifqiyatun Saidah, Nandang Mufti, Eny Latifah, M Tommy Hasan	Purification of SWCNT by Acid Treatment for Carbon/Silicone Solar Cell

SCHEDULE FOR THE PARALLEL SESSION

Room: Room 7		Physics	Moderator: Fairusy V H, M.Pd.
TIME	**CODE**	**AUTHORS**	**TITLE**
16.40 – 16.50	P- 291	Irma Safira, Ali Khumaenia	Atomic Emission Characteristics of Helium from Helium Discharge Lamp Using Optical Multichannel Analyzer
16.50– 17.00	P-292	Nafaul Mubarokah, Ali Khumaenia	Atomic Emission Characteristics of Hydrogen from Hydrogen Discharge Lamp Using Optical Multichannel Analyzer

Physics Education

SCHEDULE FOR THE PARALLEL SESSION

Room: Room 8		Physics Education	Moderator: Dr. Yuli
TIME	**CODE**	**AUTHORS**	**TITLE**
14.40 – 15.00		Prof. Dr. Widha Sunarno	Learning Science Model Based on Indonesia Partnership for 21 Century Skills Standart (IP21CSS) in the 21TH Century
15.00 –15.10	PE- 86	Dewi Hikmah Marisda, Rahmawati, Ma'ruf, Hartono Bancong	Preliminary Research on The Development of Digital Hypercontent Modules in Mathematical Physics Subjects
15.10 –15.20	PE-158	Nurlaili Wisda Agustin, Sarwanto, Agus Supriyanto	Enhancement of Critical Thinking Skill in Physics through Experimental Method: Is It Effective?
15.20 –15.30	PE-167	Ratih Niela Wulandari1, Sentot Kusairi, Endang Purwaningsih	The Comparison of Learning Style on Thermodynamic Learning Outcomes of Public High School and Islamic Boarding School
15.30-15.50		BREAK	
15.50 –16.00	PE-240	Aprilia Tri Utami1,Elvin Yusliana Ekawati, Ahmad Fauzi	Development of Learning Media Based Assessment for Learning with Adobe Flash Professional CS6 Program
16.00 – 16.10	PE-254	Erna Solikah, Budi Utami, Sukarmin, Febriani S A Nugraheni	The Correlation of Self Efficacy to Student's Critical Thinking Skill on the Material of Motion and Force
16.20 – 16.30	PE-264	Bakhrul Rizky Kurniawan, Sahal Fawaiz, Cahyani Intan Ramadani, Yessi Affriyenni	What Do Teachers Need to Teach Free-Body Diagrams Effectively? : A Need Analysis In Development Country
16.30 – 16.40	PE-192	"Dyah Masithoh, Soeparmi, Maridi, Masykuri"	The Prospective Science Teachers' Metacognition Profile In The Basic Physics Course
16.40 – 16.50	PE-176	Hellmy Nur Pratama Annuari Putri, Siti Farida Wadlikh, Sentot Kusairi, and Arif Hidayat	The Effect of Simulation Based Formative Assessment on Student Problem Solving Skill in Learning Newton Law

Science Education

SCHEDULE FOR THE PARALLEL SESSION

Room: Room 9		Science Education	Moderator: Meida Wulan Sari, M.Pd.
TIME	**CODE**	**AUTHORS**	**TITLE**
14.40 – 15.00		Prof. Dr. Suciati	INTEGRATED SCIENCE TEACHING: Perceptions and Problems of Pre-service Science Teachers
15.00 –15.10	SE-38	Nia Dewi Laksono, Budi Utami, Murni Ramli	Learning Science In The Pandemic: The Design And Feasibility Of STEM@Home Aquaponics
15.10 –15.20	SE-47	Ediyanto, Areej Talea Almutairi, Muchamad Irvan, Sinta Yuni Susilawati	Learning Model and Media in the Science Learning for Student with Deaf and Hard of Hearing
15.20 –15.30	SE-48	Ediyanto, Sokunrith Pov, Umi Safiul Ummah, Rizqi Fajar Pradipta	The Science Learning Model for Students with Visual Impairment
15.30-15.50		BREAK	
15.50 –16.00	SE-49	Purwanti, Widha Sunarno, Sukarmin, Novita Ratnasari	Junior High School Students' Creative Thinking Skills: A Gender-based in The Era of A Covid-19 Pandemic
16.00 – 16.10	SE-50	Retno Wilis, Baskoro Adi Prayitno, Widha Sunarno, Novita Ratnasari	Students' Metacognitive Abilities and Creative Thinking Skills: A Gender-based in The Era of Covid-19 Pandemic
16.20 – 16.30	SE-52	Dimas Galang Ramadhan, Cucuk Wawan Budiyanto, Rosihan Ari Yuana	The Role of Game-Based Learning in Developing Students Computational Thinking Skills: A Review of the Literature
16.30 – 16.40	SE-70	Juniar Fauziatul Azizah, Muzzazinah, Elfi Susanti	The Analysis Results of National Examination on Human Digestive System Materials in SMPN 6 Ngawi
16.40 – 16.50	SE-78	Riyan Arthur, Salma Maharani, Arris Maulana, Ahmad Marzuq	Vocational Literacy: A New Paradigm Of Vocational Education And Training (VET) In Indonesia
16.50 – 17.00	SE-79	Riyan Arthur, Muhammad Jova Alviandrico, Ahmad Marzuq, Kinanti Kidung P	Does The Scientific Literacy of Vocational High School Students (SMK) Competency Of Building Skills Low?

Day 2

Mathematics

SCHEDULE FOR THE PARALLEL SESSION

Room: Room 1		Mathematics	Moderator: Ario Wiraya, M.Sc.
TIME	**CODE**	**AUTHORS**	**TITLE**
13.00 – 13.10	M-61	Ingka MarisAgustina Pradjaningsih and Kiswara Agung Santoso	Application of Combined GSA&sCSO Algorithm to Modified Bounded Knapsack with Multiple Constraints Problem against Uncertain Coefficient
13.10-13.20	M-71	Shindi Shella May Wara, Dedy Dwi Prastyo, Heri Kuswanto	Value at Risk Estimation with Hybrid-SVR-GARCH-KDE Model for LQ45 Portfolio Optimization
13.20 – 13.30	M-72	Hana Mutia Dewi, Widowati, Ratna Herdiana, Priyo S. Sasongko	Stability Analysis of Coronavirus Disease Spread Model in Central Java Province, Indonesia
13.30 – 13.40	M-77	Patrica Pungky Gabrela, Jerry Dwi Trijoyo Purnomo, I Nyoman Budiantara	Mixed Spline Truncated, Kernel, and Fourier Series, Estimator in Biresponse Nonparametric Regression
13.40 – 13.50	M-81	Ludia Ni'matuzzahroh, Jerry Dwi Trijoyo Purnomo, I Nyoman Budiantara	Mixed Estimators Spline Truncated, Kernel, and Fourier Series in Nonparametric Regression for Longitudinal Data
13.50 – 14.00	M-87	Calvin Mikhailouzna Gibran, Cucuk Wawan Budiyanto, Rosihan Ariyuana	Application of the Delone and McLean Information System Success Model to evaluate the Success of Web-Based System Adoption - A Literature Review
14.00 – 14.10	M-95	Ario Wiraya, Mardiyana, Laila Fitriana, Triyanto, Muhammad Baharuddin D. S, Salma Febri S.	Mathematical Model for Inflammatory Response to Coronavirus Infection with Anti-Inflammatory Treatment Intervention
14.10 – 14.20	M-110	F S Cahyaningrum, M Mashuri, M Ahsan	Max-XStn Control Chart for Monitoring Mean and variability Process
14.20 – 14.30	M-127	P Jeyalakshmi, K Karuppasamy	Domination Number of A Complement of Signed Graph
14.30 – 14.40	M-157	Muhammad Alifian Nuriman,, Muhammad Mashuri, Muhammad Ahsan,	Generally Weighted Moving Coefficient of Variation (GWMCV) Control Chart Using Three Parametric Log-Normal Transformations

SCHEDULE FOR THE PARALLEL SESSION

Room: Room 1		Mathematics	Moderator: Ario Wiraya, M.Sc.
TIME	**CODE**	**AUTHORS**	**TITLE**
14.40 – 14.50	M-199	Maulidatus Solehaa, Purwantob, Desi Rahmadani	Some Snake Graphs are Edge Odd Graceful
14.50 – 15.00	M-201	Zicky Lukman, Mahmud Yunus	Characterization of F-bounded on Fuzzy -Metric Space
15.00-15.20		BREAK	
15.20-15.30	M-203	Ezra Putranda Setiawan, Dhoriva Urwatul Wutsqa, Agus Maman Abadi, Elsa Kusuma	Pricing Indonesian Earthquake Catastrophe Bond based on Depth and Magnitude
15.30-15.40	M-205	Eko Budiatmodjo, Agnes Tuti Rumiati, Dedy Dwi Prastyo	Benchmarking Hierarchical Bayesian Small Area Estimators in The Percentage of Poverty at Sub-districts Level in Central Java
15.40-15.50	M-211	Nurun Nahdliyaha, Setiawan, Santi Puteri Rahayu	MGSTARX Model for Forecasting Space-Time Data with
15.50-16.00	M-215	Hanifah Aisyah, Ratna Herdiana, Bayu Surarso	Portfolio Optimization with Mean Absolute Deviation Models using Particle Swarm Optimization Algorithm: A Case Study in Indonesia During Covid-19 Pandemic
16.00-16.10	M-227	Rizqiyanti Ramadany, Bambang Widjanarko Otok, Purhadi	Parameter Estimation and Hypothesis Testing of Multivariate Adaptive Bivariate Generalized Poisson Regression Spline
16.10-16.20	M-242	Linda Nurmasari, Budiyono, Joko Nurkamto, Murni Ramli,	Mathematical Literacy in Primary Schools: A Systematic Literature Review
16.20-16.30	M-280	Igar Calveria Aviantholib, Purhadi Purhadi, Vita Ratnasari	Bivariate Binary Logistics Regression
16.30-16.40	M-311	Supriyadi Wibowo, Soeparmi, Christiana Rini Indrati, Cari	The Relationship between $\overline{Lip_F^{\alpha}([a,b])}$ and $BV_F^{\alpha.p}([a,b])$

Mathematics Education

SCHEDULE FOR THE PARALLEL SESSION

Room: Room 2		Mathematics Education	Moderator: Riki A, M.Pd.
TIME	**CODE**	**AUTHORS**	**TITLE**
13.00 – 13.20		Dr. Farida Nurhasanah, M.Pd.	Designing a Family Board Games for Teaching Fractions Based on Theory of Mathematical Abstraction and Multiple Representation
13.20 – 13.30	ME-152	Dessy Anggreni, Saleh Haji , Yumiati	Improving Critical Thinking Skills Through Asychronus Learning with Scientific Approach in The Seminar Courses of S1 Mathematics Education Study Program, FKIP University Of Bengkulu
13.30 – 13.40	ME-160	Afiqah Bari'ah Haji Emran, Masitah Shahrill, Nurul Hafizah Haji Alias, Ani Afifah Haji Mosli, Nur Fatin Haji Ismail, Mohd Khairul Azam Hj Ali Mashod, Dalilah Syazwi	Reflective Experiences in the Development of AUTHOR : Learning Activities for Teaching Mathematics
13.40 – 13.50	ME-220	Rino Richardo, Ahmad Anis Abdullah, Tri Rochmadi, Ariyadi Wijaya, Nurkhamid	Indonesian Ethnomathematics for Mathematics Learning in Junior High Schools : a Scoping Review
13.50 – 14.00	ME-221	Rino Richardo, Ahmad Anis Abdullah, Tri Rochmadi, Ariyadi Wijaya, Nurkhamid	Ethnomatematics Learning Media Based On Augmented Reality For Learning Geometry : A Needs Analysis
14.00 - 14.10	ME-259	Nurul Muflikhah Bariroh, Triyanto, Laila Fitriana	Critical Thinking Ability of Students at SMPN 2 Kudus with Impulsive Cognitive Style on Two Variables Linear Equation System Material
14.10 - 14.20	ME-305	Mutia, Kartono, Dwijanto, K Wijayanti	Analogical Thinking of Student in Solving Function Problems Based on Mathematical Disposition
14.20 – 14.30	ME-319	Lala Nailah Zamnah, Kartono, Rochmad, Emi Pujiastuti	Contributions And Constraints When Using The Self-Directed Learning Model To Improve Mathematical Understanding Ability, Self-Regulated Learning and Self-Confidence

SCHEDULE FOR THE PARALLEL SESSION

Room: Room 2		Mathematics Education	Moderator: Riki A, M.Pd.
TIME	**CODE**	**AUTHORS**	**TITLE**
14.30 - 14.40	ME-321	Kimura Patar	Pre-Service Mathematics Teachers' Engagement in Geogebra Applet-based Task Design in Online Learning

Environment & Biologi

SCHEDULE FOR THE PARALLEL SESSION

Room: Room 3		Environment & Biologi	Moderator: Dr. Yuli
TIME	**CODE**	**AUTHORS**	**TITLE**
13.00 – 13.10	EE-307	Widia Eka Rhamdani, Hera Widyastuti	The Analysis of Quality Service Suroboyo Bus based on Passenger's Perception
14.50 – 15.00	B-210	Puguh Karyanto, Tri Setia Kurnia Nuri, Adifa Risa Bagasta, Arif Setiawan, Jarot Wahyudi, Muhammad Fajrur Rifqi, Badrul Munir Md. Zain	Ventral Pelage Variation of the Endangered Colobine Monkey, Javan Fuscous Langur Presbytis comata fredericae Sody, 1930
15.00 – 15.10	B-212	Alanindra Saputra, Nurmiyati, Umroh Fudolla, Gamal Rindarjono, Puguh Karyanto	Overstory Community Analysis of the Habitat of Fuscous Javan Langur in Mount Merbabu with Implication for the Management Plan for the Langur's Conservation Strategy
15.10 – 15.20	B-219	Nurmiyati, Alanindra Saputra, Puguh Karyanto, Rahmi Alifah Iswanti Dewi	Lower Crop Community Structure and its Implication on the Availability of Food Substrate for the Javan Fuscous Langur

Biology Education

SCHEDULE FOR THE PARALLEL SESSION

Room: Room 4		Biology Education	Moderator: Chandra A, M.Pd.
TIME	**CODE**	**AUTHORS**	**TITLE**
13.00 – 13.10	BE-189	Zakia Yolanda, Murni Ramli, Dewi Puspita Sari	Development and Feasibility Test Of The Educational Card Game "RECAME" Based On Scientific Literacy In The 11st Grade Students
13.10-13.20	BE-191	Akhmad Sukri, Septiana Dwi Utami, Zurlina, Agus Ramdani, Jamaluddin	The Effect of The Local Wisdom-Based Comic Media On Students' Conceptual Understanding Viewed From Gender
13.20 – 13.30	BE-198	Akhmad Sukri, Muhammad Arief Rizka, Hadi Gunawan Sakti, Marheny Lukitasari, Elly Purwanti	The Influence of Demographic Factors on Environmental Knowledge of University Students in Indonesia
13.30 – 13.40	BE-223	Vivin Harlupi, Bambang Subali	Analysis of Potential Learning Models To Formulate Fact-Based Concepts
13.40 – 13.50	BE-224	Evi Margiyanti and Paidi	Analysis of the Needs of Android based Mollusca Teaching Materials for The Learning of Class X High School Students
13.50 – 14.00	BE-229	N Lestariningsih, A yatusa'adah, S Swestyani	Religious Values in Biology Learning: A Need Analysis of An Islamic-Integrated Reference Book of Medicinal Plants Typical of Central Kalimantan
14.00 – 14.10	BE-238	Iin Musannadah, Bernadetta Octavia, Eka Sulistiyowati	Analysis of Potential Development of Preserved Media with Bioplastic Techniques as a Medium of Biological Learning in Indonesia
14.10 – 14.20	BE-253	Sri Septianti, Muzzazinah, Meti Indrowati	Development needs analysis of E-Modul based on POGIL (Process Oriented Guided Inquiry Learning) on Structure Material and Function of Plant Network Student Class XI
14.20 – 14.30	BE-263	Muhammad Ihsan, Sumiyati Sa'adah, Meti Maspupah	The Validity Of Markerless Augmented Reality-based Learning Media On The Concept Of Cell Organelles
14.30 – 14.40	BE-269	Wahyu Pangestuning Astuti, Suranto, Murni Ramli	Analysis of Utilization of Local Wisdom-Based Learning Media on Evolutionary Materials

SCHEDULE FOR THE PARALLEL SESSION

Room: Room 4		Biology Education	Moderator: Chandra A, M.Pd.
TIME	**CODE**	**AUTHORS**	**TITLE**
14.40 – 14.50	BE-276	Ahmad Agus Saputra, Ixora Sartika Mercuriani	Development of an Android-Based E-Module of Excretory System to Improve Interest Learning for the Senior High School Students
14.50 – 15.00	BE-285	Ihrom Rosyadi, Slamet Santosa, Umi Fatmawatia	Development of Website-Based Learning Media Using Wordpress on Virus Material to Empowered Students' Learning Motivation
15.00 – 15.20		BREAK	
15.20-15.30	BE-294	Maulinia Ceisar Aksara Aji, Sajidan Sajidan, Suranto Suranto, Sentot Budi Raharjo	Emotion Regulation for Improving Argumentation Skills
15.30-15.40	BE-296	A D Islamiyati, B Sugiharto, B A Prayitno	Profile of Critical Thinking Skill Pre-Service Biology Teachers
15.40-15.50	BE-314	Haifa Azizzah, Slamet Santosa, Yudi Rinanto	The Effect of E-Learning-Based Learners with Google Classroom and Microsoft Teams on Student's Learning Motivations Based on Economic Capabilities
15.50-16.00	BE-315	Farah Halimah, Slamet Santosa, Sri Dwiastuti	The Effect of Reading Questioning Answering Model on Critical Thinking Skills and Students Learning Motivation in E-Learning
16.00-16.10	BE-316	Novi Tri Kusumawati, Nurmiyati, Dwi Oetomo, Alanindra Saputra	Utilization of Potential TAHURA KGPAA Mangkunagoro I Through The Development of Fungi Mobile Learning Application for Grade X Students in Fungi Material
16.10-16.20	BE-323	Tika Mahesti, Alanindra Saputra, Umi Fatmawati	E-Module Development Through Kvisoft Flipbook Maker as A Teaching Material Supplement in Biotechnology Sub Chapter of Health to Enhance Student's Analytical Thinking
16.20-16.30	BE-14	Insar Damopolii, Jan H. Nunaki, Wiranto Wiranto, Fridolin F. Paiki	The Effectiveness of Human Nervous system Comics in online learning During Covid-19 to Strengthen Students' Learning Achievement
16.30-16.40	BE-228	Yuaning Tyas Ayu Murti, Bambang Subali	Analysis of 2013 Curriculum Implementation on Biology Learning Design in Potential Senior High School Yogyakarta

Chemistry

SCHEDULE FOR THE PARALLEL SESSION

Room: Room 5		Chemistry	Moderator: Dimas Gilang Ramadhani, M.Pd.
TIME	**CODE**	**AUTHORS**	**TITLE**
13.00 – 13.10	C-217	Reni Rahayu, Arif Fadlan, Mardi Santoso	Synthesis of Cycloheptylcinnamamide by Shiina Esterification
13.10-13.20	C-225	Salprima Yudha, Morina Adfa, Swadexi Istiqphara, Aswin Falahudin	Facile Synthesis of Iron Oxides-Silica by Direct Combustion of Mohr's Salt and Oil Palm Leaves Powder
13.20 – 13.30	C-239	Robi'atul Adawiyah, Arif Fadlan, Mardi Santoso	Synthesis of 5′-bromo-1,1″-bis(2-chlorobenzyl)-[3,3′:3′,3″-terindolin]-2′-one
13.30 – 13.40	C-241	Dwina Moentamaria, Zakijah Irfin, Achmad Chumaidi, Heri Septya Kusuma	Hydrophobic Support: A Phenomenon of Interface Lipase Activation In Polyurethane Foam As A Heterogeneous Biocatalyst In Natural Flavor Synthesis
13.40 – 13.50	C-243	Zakijah Irfin, Chumaidi Achmad, Moentamaria Dwina, Kusuma Heri Septya	Comparison of Bitumen Asbuton Diluents: Kerosene vs Diesel
13.50 – 14.00	C-247	Lina Mahardiani, Risma Arinda, Finly Khoirunnisa Arabbani	Effect of Calcination Temperature on Hydrotalcite for Organic Dye Waste Elimination from Aqueous Solution via Adsorption
14.00 – 14.10	C-252	Dwina Moentamaria, Yanty Maryanty, Sri Rulianah, Zakijah Irfin, Rosita Dwi Chrisnandari, Andi Nina Asriana, Ernia Novika Dewi, Konita Ayudya Salma, Tania Asri Novita	Application of Ozone Generator: The Accuracy of Ozonation Duration on the Quality of Commercial Drinking Water at Teaching Factory
14.10 – 14.20	C-257	Lina Mahardiani, Nur Laeli Azizah, Endang Susilowati, Budi Hastuti	The Sinergy Effect of Essential Oils from Traditional Herbs and Medicines as Antibacterial Materials of Edible Coating on Fresh Fruit
14.20 – 14.30	C-271	Nanda Putri Pertiwi, Budi Utami, Sri Mulyani	Characterization of Eggshell Combination with Activated Corn Cob As Ion Pb2+ Adsorbent with Batch Method
14.30 – 14.40	C-272	Khoirina Dwi Nugrahaningtyas, Mitha Fitria Kurniawati, Abu Masykur, and Nisriina 'Abidah Quratul'aini	Periodic Trends in the Character of First-Row Transition Metals-Based Catalysts Embedded on Mordenite

SCHEDULE FOR THE PARALLEL SESSION

Room: Room 5		Chemistry	Moderator: Dimas Gilang Ramadhani, M.Pd.
TIME	**CODE**	**AUTHORS**	**TITLE**
14.40 – 14.50	C-258	Dewi Agustini, Yana Syah, Ernawati Giri Rachman	Synthesis Of C7-acylamino Derivatives Of 7-Aminocephalosporanic Acid (7-ACA) with Benzoyl Chloride and Cinnamoyl Chloride
14.50 – 15.00	C-37	Suryadi Budi Utomo	The Application Of C-4-Carboxymethoxyphenyl-calix[4]resorcinarene As Antibacterial Agent
15.00 – 15.20		BREAK	
15.20-15.30	C- 112	Maria Ulfa, Zahra Ayu	Effect Of Gelatin In The Synthesis Of Nanosilica For Methylene Blue Adsorption Applications
15.30-15.40	C-20	Maria Ulfa, Ika Hasanah	The Effect Of Different Types Of Molecules Methylene Blue On The Adsorption Capacity Of Improved Nanosilica
15.40-15.50	C-118	Maria Ulfa, Sandini Istanti	The Effect Of Temperature Using 1% Fe2o3 / Nanosilica On Application For Methylene Blue Adsorption
15.50-16.00	C-92	Maria Ulfa, Ida Setiarini	Effect Of Weight Adsorbents ZnO-Silica Nanoparticle Modified Gelatin For Methylene Blue Adsorption
16.00-16.10	C-114	Hafid Afif, Maria Ulfa	Adsorption Kinetics Of Methylene Blue With 1% TiO2/SBA-15 Using Using Lagergren, Ho McKay, And Pandey Kinetic Model
16.10-16.20	C-39	Mukhamad Nurhadi, Ratna Kusumawardani, Teguh Wirawan	Carbon Obtained From Fish Bone Supported Titania As Catalyst In Styrene Oxidation With Aqueous Hydrogen Peroxide As An Oxidant
14.40 – 14.50	C-274	Budi Hastuti, Retno Kusuma, Saptono Hadi	Effect of Fermentation Time and Sugar Concentration on the Quality Characteristic of Organic Fertilizer from Cattle and Rabbit Manure Using Vinnase Media
14.50 – 15.00	C-277	Novita Ambarsari, M. Ali Zulfikar, and M. Bachri Amran	New Lead(II) Ion-imprinted Polymer Potentially for Lead Preconcentration in Airborne Particulates

SCHEDULE FOR THE PARALLEL SESSION

Room: Room 5		Chemistry	Moderator: Dimas Gilang Ramadhani, M.Pd.
TIME	**CODE**	**AUTHORS**	**TITLE**
15.00 – 15.20		BREAK	
15.20 – 15.30	C-286	Bakti Mulyani, Annisa Shafira Fuady Boru Manullang, Anita Dwi, Rahma Fitri Anisa Purwanti	Analysis of Adsorption of Adsorbent Sugarcane Bagasse Activated Charcoal In Metal Mixture Concentration Variations of Pb2+ and Cu2+
15.30 – 15.40	C-287	Nirwana Arcella Arum Kumala Hidayatullah, Yatim Lailun Ni'mah , Suprapto Suprapto, and Achmad Subhan	Recovery of Graphite From Lithium Ion Batteries Leaching Using Sulfuric Acid as Anode Materials
15.40 – 15.50	C-288	Fadhlina Tsaniyatur Rahmah, Achmad Subhan, Suprapto Suprapto, Ni'mah,Yatim Lailun	The Characterization of Spent Lithium ion Battery Anode Material Leaching Products as New Anode Material
15.50 - 16.00	C-333	Khoirina Dwi Nugrahaningtyas, Mitha Fitria Kurniawati, Abu Masykur, Nisriina 'Abidah Quratul'aini	Periodic Trends in the Character of First-Row Transition Metals-Based Catalysts

Physics

SCHEDULE FOR THE PARALLEL SESSION

Room: Room 7		Physics	Moderator: Fairusy V H, M.Pd.
TIME	**CODE**	**AUTHORS**	**TITLE**
13.00 – 13.10	P- 298	Sintia Nur 'Aini, Suparmi, Cari, Azizatuun Naafi'ah, Suci Faniandari	Solution of Klein-Gordon equation for screened ManningRosen potential combined with trigonometric Poschl-Teller and Kepler problem in hypersphere non central potential using hypergeometric method
13.10 – 13.20	P- 299	A Naafi'ah, A Suparmi, C Cari, S N 'Aini, S Faniandari	Energy Analysis of The Relativistic Klein-Gordon Equation with Hyperbolic Scarf and Gendenstein III Potentials Using Hypergeometric Method
13.20 – 13.30	P- 300	A Suparmi, C Cari, S Faniandari, Y Iriani, A Marzuki,	Non-relativistic Energy Analysis of Class of Shape Invariant Potentials Using Dong Proper Quantization and Variable Transformation in SUSY WKB
13.30 – 13.40	P- 301	C Cari, A Suparmi, S Faniandari, L K Permatahati	Optical Properties in Spherical Quantum Dots of Deng Fan Yukawa Potential Model
13.40 – 13.50	P- 302	S Faniandari, A Suparmi , C Cari, L K Permatahati, Y Iriani, A Marzuki	Thermodynamic Properties and the Superstatistics of Trigonometric Scarf Potential Analysis Using Dong Proper Quantization and Supersymmetric WKB Method
13.50 – 14.00	P- 303	A S Inggil, A Suparmi, S Faniandari	Solution of Klein-Gordon Equation Screened Hartmann Ring-Shaped Plus Kratzer Potential using Hypergeometry Method
14.00 – 14.10	P-293	Bondan Ajidewantara, Yesiana Arimurti	Development Of Attractive Learning Media 3D Pocketbook Based On Augmented Reality Of The Solar System For College Student
14.10 – 14.20	P-132	Sri Budiawanti, Suharno, Maria Naingalis	Effect Of Yttrium Doping On The Structural, Magnetic Properties, And Photocatalyst Performance Of Cobalt Ferrite Co(1-x)Y(x)Fe2O4 (x = 0; 0,02; 0,08; 0,10)

Science Education

SCHEDULE FOR THE PARALLEL SESSION

Room: Room 8		Science Education	Moderator: Dr. Yuli
TIME	**CODE**	**AUTHORS**	**TITLE**
13.00 – 13.10	SE-235	Febriani Sarwendah Asri Nugraheni, Meida Wulan Sari, Icha Kurnia Wati, Suciati, Annisa Widyastuti, Kiki Kamaliah	Indigenous Knowledge and Its Potential for Junior High School Ethno-STEM Learning
13.10 -13.20	SE-245	Icha Kurnia Wati, Febriani S A Nugraheni, Meida Wulan Sari, Suciati, Annisa Widyastuti, Kiki Kamaliah	Local Wisdom Based Science Learning To Improve Creative Thinking
13.20 – 13.30	SE-251	A Septiyanto, D Oetomo, N Y Indriyanti	Analysis of Students' Attitudes towards Engineering and Technology Viewed from School Area Differences
13.30 – 13.40	SE-255	Rizka Ayu Mujiningtyas, Maridi, Nurma Yunita Indriyanti	Enhancement of Student Critical Thinking Ability And Environmental Awareness Through E-Module Based On SETS-Edutainment: A Need Analysis
13.40 – 13.50	SE-275	Novi Rahmawati, Sudiyanto, Idam Ragil Widianto Atmojo	The Difference in the Effect of Teacher's Learning Models in TPACK Approach
13.50 – 14.00	SE-289	Ayu Nurul Amalia, Suyono, Riyan Arthur, Supriyadi	The Influence of Emotional Intelligence, Social Intelligence and Adversity Intelligence on Videography Creativity
14.00 – 14.10	SE-297	Mahatma, Riyadi, Riyan Arthur, Muchlas Suseno	Teacher Social Competency Analysis Study
14.10 – 14.20	SE-318	Sri Marmoah, Siti Istiyati, Hadiyah, Hasan Mahfud	An Analysis of Teachers' Self-Reflection Performance to Improve Teachers' Professionalism
14.20 – 14.30	SE-320	Muqorobin, Komarudin, Aip Badrujaman, Riyan Arthur	Cipp vs Kirkpatrick Model In Teacher Competency Development Program Evaluation: A Literature Study
14.30 – 14.40	SE-327	D Fatmawati, Sajidan, N Y Indriyanti	Feasibility Of Material, Language And Media Aspects In The Development Of Environmental Pollution Learning Tools

SCHEDULE FOR THE PARALLEL SESSION

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TIME	**CODE**	**AUTHORS**	**TITLE**
14.40 – 14.50	SE-332	Fa'uzobihi, Muchlas Suseno, Yetti Supriyati	Living Curriculum: A Learning Policy Evaluation Kuala Lumpur Indonesian School
14.50 – 15.00	SE-21	Meilani Safitri, Nunuk Suryani, Budiyono, Sukarmin	Computer Supported Collaborative Learning As Learning Environment During Pandemic Covid-19

SCHEDULE FOR THE PARALLEL SESSION

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13.10 -13.20	SE-101	Maria Theresia Sri Handayani, Gunawan Azis, Wida Herlina	Redesigning Online Discussion Learning Method to Improve Critical Thinking Skill and Motivation Students
13.20 – 13.30	SE-107	Annisa Rokhim, Sulistyo Saputro, Sentot Budi Rahardjo	Need Analysis for the Development of POGIL-SSI based Natural Science e-Modul to Improve Creative Thinking Ability in the Pandemic Period
13.30 – 13.40	SE-109	Annisa Rokhim, Sulistyo Saputro, Sentot Budi Rahardjo	Need Analysis of Integrated Natural Science e-Module Development Using Kvisoft Flipbook Maker
13.40 – 13.50	SE-122	Tutut Nurita, An Nuril Maulida Fauziah, Elok Sudibyo, Muhamad Arif Mahdiannur	Exploring Prospective Teachers' Science Process Skills: A Voice from Freshman to Senior of Science Education Major
13.50 – 14.00	SE-130	Linda Kusumawati, Riandi, Nurul Farach, Arizaldy	Needs Analysis of SCROLY Learning Method Design (Study Case and Role Playing) About Environmental Issues in Science Learning in the Thema of Global Warming
14.00 – 14.10	SE-139	Ida Bagus Ari Arjaya, Gusti Ayu Dewi Setiawati, Merlin Mariana Missa	Project-Based Learning Models : Effect On Student Self-Confidence And Digital Storytelling Results Using The Schoology Platform
14.10 – 14.20	SE-172	N Y Indriyanti, F S A Nugraheni, Suciati, W A Dewi	In-Service Teachers' Perception And Experience For Integrating STEM Approach In Science Learning
14.20 – 14.30	SE-204	Nofita Fajariyanti, Sarwanto, Muzzazinah	Project-Based Learning Of Short Filmmaking To Enhance Students' Creative Thinking Abilities On Environmental Pollution Concept he Literature
14.30 – 14.40	SE-218	Kartika Chrysti Suyandari, Rokhmaniyah, Wahyudi	The Effect Of Whatsapp As A Tool For Learning In Scientitic Reading Based Project (SRBP) Model To Enhance Collaborative And Critical Thinking Skill Of Teacher Candidats

SCHEDULE FOR THE PARALLEL SESSION

Room: Room 9		Science Education	Moderator: Meida Wulan Sari, M.Pd.
TIME	**CODE**	**AUTHORS**	**TITLE**
14.40 – 14.50	SE-230	Wiku Sidik Dananjaya, Yusfia Hafid Aristyagama, Cucuk Wawan Budiyanto	The Implementation of GIS as a means for Study Source of Community of Practice
14.50 – 15.00	SE-233	Santi Dewi Rahayu, Dedy Dwi Prastyo, Setiawan	Nowcasting of Daily Consumer Price Index Using Time Series Regression and Support Vector Regression
15.00 – 15.20		BREAK	
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Keynote 1

Implementation and Assessment of Integrated STEM with a Sustainability Focus

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Abstract. Central to integrated STEM is the use of real world problems as a context for learning to provide motivation and purpose for student learning. While research shows that engaging students in learning through authentic engineering design problems improves student interest in STEM, care needs to be taken that these real world problems generate interest and motivation for all students. Given the lack of diversity within many of the STEM fields, it is important that these real world problems that are personally motivating and connect STEM to students' lived experiences to increase STEM interest for students traditionally under-represented in STEM. Unfortunately, STEM activities tend to focus on the male-oriented, technical aspects of engineering, reinforcing STEM as a white male domain. Research shows that under-represented students are more motivated by projects with a communal goal orientation, focused on societal issues such as health, sustainability, and social justice as opposed to more traditional projects such as designing cars and rockets. As such, topics within sustainability education can provide an important context for real world problems that allow integrated STEM to promote more diverse interest in STEM.

Keynote 2

Teaching about Socioscientific and Environmental Issues: from Argumentation to Serious Gaming Approach

Shiang-Yao Liu, Ph.D., Professor
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Abstract. It has been advocated in the past twenty years that teaching science with socioscientific issues (SSIs) can be effective in improving students' scientific literacy since American scholars, Dana Zeidler and Troy Sadler, published a series of papers to introduce this educational movement. Meanwhile, Canadian science curriculum documents largely embraced the STSE perspective, where Canadian science educators, such as Glen Aikenhead and Erminia Pedretti, paid more attention on the environmental movement and public engagement in dealing with science-related controversies. In this presentation, I will describe how my teaching and research efforts have been inspired by these seminal studies in the "science-in-context" fields (Bencze et al., 2020). My students and I have conducted research on teaching about controversial issues of green energy development, animal welfare, invasive species control and so on. The pedagogical strategies we adopted include argumentation (debate), role play, and identification of problem situation, in attempt to develop students' abilities to make informed decisions and take environmental actions. Our recent research interests shift to the potentials of board games in teaching SSIs, which is considered an innovative instruction. I will introduce how the board game instructions can successfully engage learners in dealing with the issue of biodiversity from different perspectives including ecological, economic, cultural, and political aspects. Such game-play instructions create learning contexts with the features of problem-solving, decision-making, peer communication, collaboration, and reflective thinking. With proper design of game-play mechanism and instructor's guidance, a set of board game kits could be suitable for learners of all ages. The effectiveness of board games as teaching tools could be examined by collecting data regarding students' engagement, behavior, and conceptual knowledge during the instructional facilitation. The methods and results will be presented and discussed.

Keynote 3

Responding to Innovations Within Mathematics Education - Is It The Time to Press "Reset"

Allison Clark Wilson
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Abstract. A combination of the OECD Education vision captured in "Learning Compass 2030" alongside the acceleration in the uptake of technology in schools during the the COVID-19 pandemic have highlighted the urgency with which mathematics curricular and assessment systems around the work need to change. This keynote will argue for systemic change to both the content of the school mathematics curriculum and the means through which it is to be accessed if we are to produce mathematically literate citizens who can take lifelong full and active roles in our global society.

Keynote 4

Catalysis of Metal Oxide Materials with Less Stable Valence

Ryoichi Otomo
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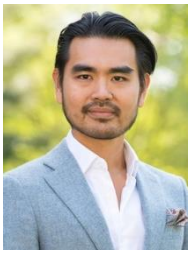
Abstract. Metal oxides have high thermal and mechanical stability, and are widely used as catalysts and catalyst supports for various chemical reactions because they exhibit acid-base and redox properties in the solid state. Among them, single metal oxides are frequently used as catalyst materials. Composite oxides consisting of two or more kinds of metals are also used by strengthening or weakening the characteristics peculiar to the central metal by the combination with other metals. Therefore, in order to synthesize various metal oxide materials and acquire various functions, it is indispensable to diversify the variation of single metal oxides, which is a key factor, and to accurately understand their characteristics. However, conventional research has focused on metal oxides with the most stable valences, and as a result, the variation of single metal oxides as catalyst materials has already been saturated. In addition, most of the knowledge accumulated so far is related to the most stable valence metal oxides. If single metal oxides with less stable valences can be easily synthesized and used, the types and functions of metal oxide catalysts can be greatly expanded, and the above situation can be overcome. In order to realize this, it is necessary to collect basic knowledge about "catalytic chemistry of metal oxides with less stable valences", which has not been cultivated until now, and develop it as a theory. Here, two kinds of examples will be shown as metal oxide catalysts with less stable valences; one is titanium suboxides with less stable Ti^{3+}, and the other is perovskite-type metal oxides with less stable Fe^{4+}.

Keynote 5



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Keynote 6

Challenges Of Conserving The Endagered Javan Fuscous Langur *Presbytis Comata Fredericae* Sody, 1830 In The Upland Fragmented Forest

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Abstract. Presbytis comata fredericae is an endemic colobine langur inhabiting few forest areas in Central Java. The distribution of this primate in central Java is geographically fragmented in the upland forest of Mount Slamet and Merbabu, and the hill forest of the western part of the Dieng Mountains. As the human primate has massively invaded the forest, the langur's entire habitat has suffered from degradation, making its population has dramatically declined. Yet, conservation efforts are needed to save the population size of this endangered primate. Since the langur is a relatively newly found species, specific research and publication focusing on it are still limitedly available. This paper presents our studies about the langur. We then describe the challenges of conservationists in conceptualizing the particular action plan to conserve the langur. Since most of our research was conducted in the upland forest of Mount Merbabu, this paper focuses on some upland ecological aspects and their impact on the langur's population and emphasizes the discussion on the importance of appropriate habitat management in creating a home for the langur. A habitat restoration-based action plan is the best way to conserve the langur in the upland. The conducted restoration efforts should address land management practices that ensure the low-disturbances habitat for the langur.

Keywords: Presbytis comata fredericae, conservation challenges

Mathematics
Day 1

Ethnomathematics: Exploration in Cultural Heritage Buildings in Yogyakarta Based on Geometry Perspective

M-13

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Abstract. This study aims to explore the ethnomatematics of cultural preservation in Yogyakarta based on a geometry perspective. This research is important to explore information relating to ethnomatematics of cultural heritage in Yogyakarta that can be used for mathematics in junior high schools. The method used in this research is ethnography. Data collection techniques use principles in ethnography such as observation, interviews, documentation, and making field notes with the original ethnographic description. Cultural heritage in Yogyakarta that is the object of research include the Sultan's Palace, the Great Mosque of Mataram, Taman Sari Water Castle, Yogyakarta Palace Train Moseum, and Ratu Boko Temple. The results of ethnomatematics exploration in the five places can be related to triangles and rectangles, circles, and flat side spaces..

Modelling and Forecasting Monthly Tourist Arrivals to the United States and Indonesia Using ARIMA Hybrids of Multilayer Perceptron Models

M-29

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Abstract. Tourism is one of the key economic sectors contributing significantly to Gross Domestic Product (GDP) values and strengthening international relations for developed and developing countries. This study devotes more to modelling and forecasting tourist arrivals to the United States and Indonesia using ARIMA hybrids of multilayer perceptron models. Regarding individual models, ARIMA model performed very well than multilayer perceptron model in forecasting monthly tourist arrivals to both United States and Indonesia basing on both RMSE and MAPE values. MLP-ARIMA hybrid models in which ARIMA acts as an auxiliary forecasting model are observed to better forecast monthly tourist arrivals to both United States and Indonesia than ARIMA-MLP hybrid models in which ARIMA acts as main forecasting model, basing on MAPE values. In this study, the MLP(6,1)-ARIMA$(0,1,1)(0,1,1)^{12}$ hybrid model (RMSE=211,837.64 & MAPE=2.79%) and MLP(12,1)-ARIMA$(0,1,1)(0,1,0)^{12}$ hybrid model (RMSE=88,636.87 & MAPE=4.92%) are selected as the best hybrid models for forecasting monthly tourist arrivals to the United States and Indonesia, respectively.

Keywords: ARIMA, Multilayer Perceptron (MLP).

A Modified of The Generalized Fuzzy Logical Relationship Method with High Order Fuzzy Time Series Based on Frequency Density Partition

M-33

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Abstract. One of step in fuzzy time series for forecasting is to build fuzzy logic relationship. Many investigators have generalized a fuzzy logic relationship. Algorithms, computational methods and grouping the Fuzzy Logical Relationship (FLR) are three methods based on advanced to build a high order fuzzy time series models. The last kind model is used to determine the forecasting decisions. To improve the fuzzy time series of the approximate model, this paper presents a high-order fuzzy time series model denoted as GTS(M,N) based on the basis of generalization fuzzy logical relationship by proposing improvements of universe of discourse, historical data variations, partition stages and weighting stages. The first, define the universe of discourse, then by using historical data variations obtained the number of intervals. Second, the primary interval is partitioned based on frequency density into several sub-intervals. Third, perform different weightings on FLR to calculate the final forecasting value. The proposed model will be implemented in time series data of coffee production in 2000-2019. Based on these our experiment we have the resulted errors value is better the existing method.

Multiple Period Logit Model Using The Maximum Likelihood and Bayesian Approach on Data of Breast Cancer Patients In C-Tech Laboratories Tangerang

M-35

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Abstract. Survival statistical analysis is a method that describes the analysis of data in the form of time, starting from the time of origin until the occurrence of a special event. In certain cases, an object has conditions that can change over time. Survival analysis that can detect any changes in time is multiple period logit. The estimates that will be used in this research are the calcic Maximum Likelihood (ML) estimation and the Bayesian estimation with prior uniform. In 2020 there were 213,546 cancer cases in Indonesia, breast cancer cases increased to 16.6% with 9.6% mortality. Currently, there is an alternative tool that is thought to be able to reduce the death of breast cancer patients, namely Electro Capacitive Cancer Therapy (ECCT). ECCT, a therapeutic tool in the form of a vest in which there is an alternating current electric field with low intensity (<30Vpp) and low frequency (<100KHz) to inhibit the growth of cancer cells. From the results of the analysis of the application of the method in this case, breast cancer patients who experienced metastases, clinical conditions, side effects and hours of use of the ECCT device were factors that influenced the death of breast cancer patients who underwent ECCT therapy at Edwar Tangerang's ctech labs in 2013-2017. The performance of the two estimates is seen from the accuracy values of 88.37% and 88.27%.

Keywords: Survival Analysis, Multiple Period Logit, Maximum Likelihood, Bayesian, Breast Cancer, and ECCT.

Finite Difference Methods for Investigating Wave Propagation over a Hump using Linearized Boussinesq-type Model

M-40

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Abstract. In this study, we present a mathematical model to investigate fluid behavior in the existence of a hump. The governing equation used here is the linearized Boussinesq-type equation. The model is solved analytically to obtain the transient and steady solution. Numerically, we apply finite-difference-based methods, namely FTCS and two-step Lax-Wendroff to solve the model. Validations are performed by comparing the numerical results with the analytical solution. We conclude that the two-step Lax-Wendroff produces a more accurate result. Further, we examine several factors that affect the transient state's duration and the maximum wave elevation, such as the type of incoming flow (subcritical or supercritical) and the hump dimension.

Mixture Model of Spline Truncated, Kernel, and Fourier Series in Semiparametric Regression

M-43

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Abstract. Regression is a statistical analysis method used to investigate the relationship between the response and predictor variables. Along with the development of increasingly complex problems, it forces researchers to involve several predictor variables. So that it is possible to have a combination of parametric and nonparametric patterns, for this reason, modeling is needed to accumulate the two combined patterns with a semiparametric regression approach. When the predictor variable relationship and the response following a changing pattern at certain subintervals can be approached with the Spline Truncated estimator, if not follow a certain pattern, it is approached with the Kernel estimator. In contrast, if it follows the tendency of the repeating pattern, it is approached by the Fourier Series estimator. Truncated Spline, Kernel, and Fourier Series Estimators are often used because they have several advantages and are more flexible. Based on these problems, modeling can be done with an additive mixed estimator, where each predictor variable in the regression model is approached with an estimator that matches the curve shape of the response variable using the Ordinary Least Square (OLS) estimation method. However, in recent years, many researchers have done modeling with only one or two estimators. So that in this study, modeling with three mixture estimators of Spline Truncated, Kernel, and Fourier Series in semiparametric regression. With this mixed estimator, it is expected that an estimate is suitable for complex modeling and representative for prediction.

Keyword: Fourier Series, Kernel, Spline Truncated, Semiparametric Regression

Forecasting Indonesia Inflation Using Long Short Term Memory Method

M-44

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Abstract. The case of inflation can influence monetary policy. Therefore, in assisting policy decision-making, inflation forecasts can be made. Inflation forecasting is a connecting bridge to determine the value of inflation for the coming period. Running inflation allows it to change from time to time, resulting in a nonlinear model that will provide a more accurate forecast of inflation. The neural network is a general function approach capable of mapping any nonlinear function. One part of the neural network method used in forecasting is the Long Short Term Memory (LSTM) method. This method has the advantage of storing information for a more extended period. However, the efficiency of the neural network method depends on the network structure of the number of hidden neurons and epochs in converging conditions. This study aims to obtain the best inflation forecasting model in Indonesia using the LSTM method. This method is a development network of the Recurrent Neural Network, which is composed of forget gate, input gate, cell state, and output gate. Based on the research results, the best LSTM model in predicting inflation in Indonesia has more than one hidden neuron with the optimum number of epochs. However, too many hidden neurons are used, and the not optimal use of epoch will make the root mean square error value and mean absolute error based on the sample out worse. This indicates that too many hidden neurons and epochs will lead to overfitting in Indonesia's inflation forecasting.

Keywords: Inflation, Forecasting, Nonlinear, Long Short Term Memory, Root Mean Square Error

Prediction of Rice Growth Phases with Multitemporal Landsat-8 Data Using Rotation Forest Multiclass Method

M-45

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Abstract. In 2018 the Area Sample Framework Survey (ASF) was formed, which was carried out by BPS Statistics to calculate rice harvested area and improve food crop data. The combination of satellite data and official data is an innovation that needs to be done to overcome a limitation, especially in the Sampling ASF carried out by BPS Statistics, so that the success of combining official data and big data will make suggestions for adding samples to the non-sample ASF Survey for data estimation harvest area is more accurate. Rotation Forest is a method that is often used and excels in classification with continuous data predictors. Multitemporal remote sensing using Landsat-8 satellite imagery was launched in 2013 with a recording period every 16 days. The basic features produced on the Landsat-8 satellite include bands 1 to 7, EVI, NDVI, NDWI, and NDBI indexes that can be used for prediction using the ensemble rotation forest method. The best model in making predictions can be seen by comparing the sensitivity, specificity, accuracy, MCC, and Cohen Kappa Index results. One Vs. One method is better than the One Vs. All in the case of multiclass RotFor rice growth phase detection using Landsat-8 satellite imagery.

Keyword: Landsat-8, Area Sampling Framework, Classification, Rotation Forest, Binarization

The Use of Heuristic Evaluation on UI/UX Design: A Review to Anticipate Web-app's Usability

M-51

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Abstract. To build a website or software, designing a User Interface (UI) and User Experience (UX) is necessary. UI/UX is designed to be a "bridge" between the users and the system to finish their tasks or goals. This article explores the importance of evaluating the UI/UX design of a web application or software to usability. The literature was reviewed to determine the contributing aspects of success in building a good UI/UX according to the users' needs. The review examined up to 455 articles published between 1990 – 2020 on outstanding indexing databases that were aggregated under 'Heuristic Evaluation', 'UI/UX Design', and 'UI/UX Usability' keywords. The papers were filtered exhaustively against the Systematic Literature Review framework resulting twenty prominent articles. The review indicates three competing factors influence usability namely design principles, user involvement, and evaluator's perceptions. Besides, it is also known that the Heuristic Evaluation method is quite influential in building a good UI/UX. By considering the significant factors that can improve the quality of the UI/UX and usability, the existing heuristic problems in UI/UX design will be appropriately resolved.

The Influence of Block-based Programming to Computational Thinking Skills: A Systematic Review

M-53

Muhammad Robby Fadhillah[1], Cucuk Wawan Budiyanto[1] and Puspanda Hatta[1]
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Abstract. Computational Thinking (CT) is an important skill to master in the 2nd century. There are several ways that are believed to be able to improve students' CT skills, one of which is the use of block-based programming. Block-based programming is relatively easy to teach because the interface is easier to use, uses natural language, can perform block searches and uses drag and drop interactions. This paper provides a review on 20 papers with a systematic review method, which provides evidence of the influence of block-based programming to computational thinking skills. This systematic review has adopted Chitu Okoli and Kira Schabram framework as the premise for defining and identifying the influence of block-based programming to computational thinking skills. The main findings in this paper is used of block-programming can affect some of students CT skills through several different delivery methods but there are still some different opinions about the effect on students problem-solving abilities.

Estimation Parameters of Unemployment

M-54

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Corresponding author: melkipulingtang@gmail.com

Abstract. Unemployment in an area becomes more serious if there is relatively slow employment growth and a rapid increase in the growth rate of the workforce Unemployment is a very complex problem because it affects and is influenced by many interacting factors, following a pattern that is not always easy to understood. The magnitude of the unemployment rate can be said to be very important in measuring the success of economic development in a region. This research leads to parameter estimation of the unemployment model.Estimated parameters include the rate of unemployment increase,the rate of change in the number of unemployed employed, the rate of people hired resigning or being laid off from their jobs, unemployment mortality rate, labor migration rate, the rate of reduction in job vacancies available due to lack of government funding, the level of infrastructure,and small and medium enterprises.These parameters can affect the unemployment rate , the employment rate, and job vacancies. To overcome the unemployment rate for employment (job vacancies), one of the efforts made by the government is to increase investment, especially in the infrastructure sector, revitalizing supporting facilities for the agricultural sector, and clearing new land and small and medium enterprises.

Keywords: Estimation parameters of unemployment.

Modeling and Simultaneous Hypothesis Testing in Nonparametric Regression with mixture model of Kernel and Fourier Series

M-56

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Abstract. The main objective in regression analysis is to estimate the regression curve. There are three approaches to estimating the regression curve, namely the parametric, nonparametric and semiparametric regression approaches. In parametric regression there are many assumptions that must be met, one of which is the form of the regression curve that must be known. Nonparametric regression analysis is recommended to be used If the pattern of the regression curve is unknown. Nonparametric regression approaches that often get the attention of researchers are Kernel, Spline, Fourier Series and Wavelets. In its application, not all predictor variables have the same data pattern, so a mixed estimator is needed to solve the problem of differences in data patterns between predictor variables. Among several nonparametric approaches, regression with the kernel approach and the Fourier series have been widely used to solve problems in research. As a development of previous research, parameter estimation was carried out for the nonparametric regression model of the mixture of kernels and the Fourier series using the Ordinary Least Square (OLS) method. Furthermore, simultaneous hypothesis testing is carried out on the resulting estimators. Statistical inference, especially hypothesis testing, is very important because it can be used to determine whether the predictor variables have a significant effect on the model. The test statistics used in the simultaneous hypothesis testing in the nonparametric regression of the kernel mixture and the Fourier series were obtained using the Likelihood Ratio Test (LRT) method.

Mathematics Education
Day 1

Chess Transformation Game as Teaching Aids in Isometric Transformation Topics

ME-5

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Abstract. This research aimed to develop a Chess Transformation (ChesuTI) game as teaching aids for the Isometric Transformation topic in Mathematics Form two. The ADDIE model used as a guide to develop ChesuTI. This research also wants to identify the validity of the ChesuTI by using three (3) experts consisting of two lecturers in the field of Mathematics related to the Faculty of Science and Mathematics UPSI and a lecturer in the field of education as a ChesuTI assessor. It is evaluated from the aspect of the game and the overall content provided. Data were obtained through quantitative methods to get the information. The research instrument used is an expert validity questionnaire, namely the Chess Transformation Game Evaluation Questionnaire. Findings of the content validity index of Content Validity Index (CVI) reached a satisfactory level of 1.00 and it is shows that all the experts agreed that ChesuTI is suitable to use as teaching aids. As a conclusion, ChesuTI can help students learn and master the topic of Isometric Transformation more interactively,easily and be able to make students who are more active and competitive to gain the knowledge. Finally, we can say that ChesuTI are able to provide a clear picture of understanding the topic of Isometric Transformation.

Development of Smart Triankit as Teaching Aids on the Topic of Solution of Triangles in Additional Mathematics Form 4

ME-6

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Abstract. This study aims to develop and test the usability of Smart Triankit as a teaching aid for the topic solution of triangles, Additional Mathematics Form 4. This teaching aids is develop based on the ADDIE model and focus on content, planning and learning, assessment tools, and the selection of media. The validity of Smart Triankit and the instrument will be verified by three experts. The study was conducted using survey method. The finding shows that the validity of the instrument is good and suffiecient to measure the usability of the Smart Triankit. The study also found that students can master the topic solution of triangles in Additional Mathematics Form 4 as well as can attract students by applying technology in their teaching and learning process. In conclusion, this study successfully developed a valid Smart Triankit and the level of usability towards Smart Triankit as teaching aids is satisfied . The implication is that Smart Triankit is able to guide all secondary school mathematics teachers in teaching practices for fostering high-level thingking as well as producing a knowledgeable generation as problem solvers to face current and future challenges. Keywords: teaching aid, model ADDIE, instrument, survey method, validity value, questionnaire

Development of Bom Translasi Game as Teaching Aid on the Topic of Transformation in Mathematics Form Two

ME-7

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Abstract. This study aims to develop the Bom Translasi Game as teaching aid in Transformation topic for mathematics form two. This teaching aids is develop based on the ADDIE model and focus on content, planning and learning, assessment tools, and the selection of media. There are five (5) phases in ADDIE model: analysis, design of Bom Translasi game, development of Bom Translasi game, implementation, and evaluation. There are 2 instruments used: the content validity form and reliability questionnaire. The validity of the Bom Translasi verified by three (3) experts there is one (1) Mathematics lecturer and two (2) Mathematics teachers. The reliability process of Bom Translasi consist of 15 trainee teachers. Data were analysed using Content Validity Index (CVI) and Cronbach alpha. The findings shows that the Bom Translasi game IKK is 1.00, and the game reliability index which is Cronbach's alpha value is 0.933. In conclusion, this study successfully developed a Bom Translasi game for form two students which are valid and reliable. The implication of the study is, teachers can create two-way communication between teacher and student and student-student while using this Bom Translasi game.

Development of Peri-Calcup Board Kit as a Form One Teaching Aids for Perimeter Topics

ME-8

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Abstract. This study aims to develop a Peri-Calcup board kit as a teaching aid for Perimeter's topic in Mathematics Form One. The ADDIE model was used as a guide to develop Peri-Caclup board kit. In addition, this study also aims to identify the validity of the Per-Calcup board kit by three experts consist of two lecturers in the field of Mathematics and a Mathematics teacher who has more than 10 years experience in teaching mathematics. Data were obtained through quantitative methods to obtain the required information. The research instrument used is validation questionnaire, namely the Peri-Calcup Board Assessment Kit Questionnaire. The results of the Content Validity Index (CVI) show a satisfactory level and the value is 1. It is shows that all experts agreed that Peri-Calcup board kit is suitable for as teaching aid for the topic of Perimeter for form one students. In conclusion, the development of Peri-Calcup board kit can help students learn and master the topic of Perimeter and easy to understand. In addition, the use of this Peri-Calcup board kit can also enhance more effective learning and increase students' creativity in learning mathematics.

Design Android-Based Learning Media Using Augmented Reality Technology to Support Ethnomathematics Materials at Junior High School

ME-12

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Abstract. The era of the industrial revolution 4.0 has changed human life a lot because most of them use information and communication technology. However, from the many changes that occur, augmented reality technology becomes a solution and challenge to make interactive learning media, especially those that require visual media or require visiting places that are not accessible. Augmented reality is one of the technologies that is growing rapidly in the 4.0 era where the technology can present objects as if they are real in front of us using only Android. The use of android-based learning media using augmented reality technology in addition to helping in the interactive learning process is also a means of equal distribution of education in Indonesia where many schools are still lacking in terms of learning media infrastructure and the high cost of visiting museums. The method used in designing this media uses the ADDIE approach model, namely Analysis, Design, Develop, Implement and Evaluate with limitations without evaluation. The results of the research can produce android-based ethnomathematics learning media design. This means that this android-based learning media is affordable for all people because on average all junior high school students have an android smartphone.

Prospective Elementary Teachers' Difficulties in Solving Conceptual Tasks on Representation of Addition and Subtraction of Fractions

ME-58

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Abstract. This research is motivated by prospective teachers' challenging in solving mathematical problems about fractions, including addition and subtraction of fractions. Their difficulties have been reported by several studies, but not specific on conceptual tasks based on representation of addition and subtraction of fractions. Therefore, this study aims to investigate prospective elementary teachers' difficulties in solving mathematical task on representation of addition and subtraction of fractions. To collect the data, we developed 6 mathematics tasks based on diagram representations of addition and subtraction of fractions. The participants of this study were 101 third-year prospective elementary teachers from a teacher education study program in Riau province, Indonesia. The findings show that prospective elementary teachers have difficulties in solving mathematical task on representation of addition and subtraction of fractions. More than 60% of respondents could not give appropriate answers to the given tasks. They provided unreasonable reasons to explain their incorrect answers to the given mathematical tasks on representation of addition and subtraction of fraction.

Strategies and Tools Used by Students to Solve an Open Ended Problem – Case Study

ME-62

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Abstract. Problem-solving skills and abilities are crucial not only in mathematics but in real life too. Number of researches and studies show that open-ended tasks can increase understanding problems which occur in everyday life and motivate students to approach it from a mathematical perspective. The subjects of the study were first-year students majoring in mathematics teaching. We used a qualitative case study (N = 6) as a tool for our examination. In this case study we examine the tools and strategies used by university students to solve an open-ended problem. The data was collected by solving an open-ended reality-based problem situation. The researchers describe and analyze these tools and strategies based on their usability and adequacy, along with their advantages and disadvantages in education. Furthermore the students were asked to describe and comment the steps of the solution process: how they started to solve the problem, how they found out the solution, where did the idea come from. We found out that the students solved the problem with very similar tools, but in different way. In addition to the classic solutions, the use of GeoGebra has also occurred.

Keywords: problem-solving, open-ended problem, educational research, case study

Development of GeoGebra-Assisted Mathematics Learning Media Based on Guided Discovery on Triangle Topic

ME-65

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Abstract. The development of computer-assisted mathematics learning media based on the Geogebra guided discovery on the two-dimensional triangular learning material is intended for the 7th grade junior high school students. The aim of this research is to develop a learning media on the topic of two-dimensional triangle area assisted by the GeoGebra software that can improve the students' learning outcomes. The learning media being developed is called SeGeo (triangle learning material with the help of GeoGebra software application) that includes instruction and exercise questions that are expected to be able to guide the students in finding/understanding the concept of the area of two-dimensional triangle with the approach of rectangle and square unit and students' worksheets (SW). The development of this media was carried out by using the 4-D model. The media trial was carried out by involving class VII B students of Dau Junior High School 01 in the Even Semester Academic Year of 2020/2021. The results of this research showed that the learning media being developed fulfilled the product quality requirements, namely valid, practical and effective, and able to improve students learning outcomes in the topic of area of a two-dimensional triangle.

Students' Mathematical Communication in TAI (Team Assisted Individualization) Type Cooperative Learning on The Quadratic Equations and Functions Topic

ME-66

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Abstract. Mathematical communication is an important ability for students to have. With good communication skills, students will find it easier to understand mathematical concepts and explain them to others. This research aims to see how students' mathematical communication in cooperative learning with the type of TAI (Team Assisted Individualization) in the subject of quadratic equations and functions. This research is a descriptive quantitative and qualitative study, with the aim to describe the observation results of students' mathematical communication. The subjects of this research were the first semester students of class C year 2019, with the total of 31 students in the Introduction to Algebra course material in Mathematics Education Study Program, Mathematics and Science Faculty of Universitas Negeri Malang. The learning process was done through the application of the TAI type cooperative model. The results obtained in this research show that the students' mathematical communication in TAI type cooperative learning in Introduction to Algebra course material were very good.

The Relationship Between Students' Self-Efficacy And Mathematics Anxiety: Meta-Analysis Investigation

ME-69

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Abstract. Although some researchers have been researching the correlation between self-efficacy and mathematics anxiety, they indicated various correlations. Therefore, we conducted a meta-analysis aimed at determining the strength of the actual correlation between the two variables. Data obtained from primary studies that have been published in journals, proceedings, and dissertations from 2010 to 2021. Data conducted from 46 studies (n=48447), we found a small-to-large, negative and positive, and significant correlation between self-efficacy and mathematics anxiety. Based on analysis using the random-effect model concluded that there was a significant negative relationship between self-efficacy and mathematics anxiety. This showed that the higher self-efficacy, the lower mathematics anxiety. The correlation was in the moderate category (r=-0.164) and confidence interval was on a range -0.228 to -0.101.

The Art of Computational Thinking through Visual Programming: A Literature Review

ME-83

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Abstract. Arts and programming are an interesting combination in introducing computational thinking (CT) to young people. This can be found in visual programming. The visual programming environment helps young people in the early stages of practicing their CT skills. Apart from just a form of training, Brennan and Resnick have designed a framework that can assess the development of young people's CT skills in design-based learning activities. Three dimensions are being assessed, namely CT concepts, CT practices, and CT perspective. However, only a few studies have used this framework as a reference for assessing CT progression. Most of these studies did not assess the three dimensions mentioned in the framework. The results of this paper show a review of several visual programming platforms that can be used along with what CT capabilities are assessed. In addition, this paper also provides the results of the young people's performance while practicing their CT skills based on these studies.

Improving Students' Ability in Solving Story Questions Through A Scientific Approach with Zoom Media

ME-149

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Abstract. This study aims to improve students' ability to solve story problems through aapproach scientific usingmedia zoom. This study used experimental methods and analyzed using the N-Gain test. The instrument used is a problem-solving ability test. The population in this study was class VIII semester I SMP Negeri 11 Bengkulu City for the Academic Year 2020/2021, with the research sample being class VIII.E totaling 20 people. The results showed that there was an increase in the ability to solve story problems for students who were taught using aapproach scientific throughmedia zoom with an N-gain value of 0.67. The average value of students' ability to solve story problems taught using aapproach scientific throughmedia is zoom 76.50.

Keywords: Approach Scientific, Story questions

Environment Education & Biology Day 1

Study of Water Quality of Way Umpu River, Way Kanan Regency, Lampung Province, Indonesia, Based On Differences of TSS, DO, BOD, COD, And Phosphate Levels in Mining Locations

EE-25

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Abstract. Mining activities and community activities around the Way Umpu River have the potential to be the main source of the decline in the water quality of the Way Umpu River. Therefore, to determine the level of pollution in the Way Umpu River, it is necessary to test the quality of river water using several chemical and physical parameters such as TSS (Total Suspended Solid), DO (Dissolved Oxygen), BOD (Biological Oxygen Demand), COD (Chemical Oxygen Demand), and Phosphate. The study aims to study the differences in levels of TSS, DO, BOD, COD, and phosphate in river water before and after the mining location. The research is an observational study. Samples were taken from two points, namely the upstream (before the mining location) and the downstream (after the mining location). The average result after the analysis test is then compared with the river water quality standard in accordance with the provisions of Government Regulation no. 11 of 2012 concerning class III river water quality standards. There is no significant difference before and after mining location for the average levels of TSS, DO, BOD, and Phosphate parameters (p-value > 0.05). In the COD parameter, there is a significant difference (p-value < 0.05). Overall, the average yields of TSS, DO, BOD, COD, and Phosphate after the mining location have met the quality standards set out in accordance with Government Regulation. Therefore, it can be concluded that mining activities and community activities around the Way Umpu River have not completely decreased the water quality of the Way Umpu River in the last four years.

Mathematical Analysis of the Nitrogen and Phosphate to Phytoplankton, Macrobenthos, and Sediment in Aquaculture System

EE-34

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Abstract. In aquaculture system, metabolic waste in the form of unfeed pellets and fish excretion can reduce water quality and increase both soluble organic matter in waters and organic deposition to sediments. A developed dynamical system was formed based on the interactions that occur between phytoplankton growth, macrobenthos density, and sediment in response to nitrogen and phosphate concentrations. The purpose of this research was to analize the stability of the proposed dynamical system. Furthermore, we determine the level of water quality in the aquaculture system based on the interaction between five variables, i.e. nitrogen, phosphate, abundance of phytoplankton, abundance of macrobenthos, and sediment properties. The local stability of the system equations model was determined by investigating the eigen values of the Jacobian matrix. The Lyapunov stability theory using the Krasovskii method was used to determine the global stability of the systems. In the Lyapunov method, if the value of the scalar function is definite positive and its first derivative is definite negative, then the system is globally asymptotically stable. Based on mathematical analysis and numerical results, the aquaculture dynamic system model in Jepara was globally asymptotically stable. This indicated that the quality of the waters was still considerably in normal condition.

A Mathematical Model on the Effects of Tourism on Coral Reef Ecosystems

EE-63

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Abstract. Coral reefs are the ocean's center of biodiversity and serve as an important natural resource for many countries. However, they are currently under a threat due to human interference, notably due to the increase in coastal development and tourism. Therefore, a mathematical model is needed to assess the impact of human behavior on coral reefs. We develop a dynamical model to analyze the impact of tourism on the stability of coral reef ecosystems. The model in this study is a system of differential equations which examines the interactions between corals, macroalgae, and tourists. Stability analysis is performed on one equilibrium of the system which represents the coexistence of both corals and tourists. We find that the equilibrium is stable when parameter values pertaining to the destruction of corals by visitors are below a certain threshold but may become unstable when this threshold is exceeded. Numerical simulations are then carried out to compare the solutions of our model with the analytical results. The results of this study indicate some thresholds in parameter values that may serve as guidelines to develop an effective strategy for developing a sustainable coral reef tourism.

Estimation of Value at Risk with ARMAX and GARCHX Variation during COVID-19 Pandemic Period (Case Study: IDX30 Stock Data in Banking sub-sector on Indonesia Stock Exchange)

EE-111

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Abstract. Investment is a term that has several definitions associated with finance and economics. The term is related to the accumulation of a form of asset with hope of obtaining future benefits. The GARCH model is used to design time series that have case of heteroscedasticity or variance that is not constant. The GARCHX model is a model that can be used to model time series data in the financial sector which has high volatility with the involvement of exogenous variables. Beside using GARCHX method to calculate return, there is also Value at Risk method. Value at Risk (VaR) is a market risk calculation method to determine the maximum risk of loss that can occur in a portfolio. Therefore, in this study, the ARMAX method and six GARCHX variations were proposed in the stock data on the IDX30 index in Banking sub-sector in the last six years, which were during 2015-2021. The data used in the study were from 2 January 2015 to 29 January 2021. The GARCHX variation methods used were GARCHX, EGARCHX, GJRGARCHX, APARCHX, FGARCHX, and CGARCHX. The exogenous variable used in this study was the Composite Stock Price Index (IHSG) data. Simulation study was also carried out in this study by generating data with a Normal distribution with various means and standard deviation with n as many as 1500. The data used as a reference in this simulation study were the IDX30 return data for the period of January 2015 to January 2021. The purpose of this simulation is to find out which GARCHX variation method is the best for dealing with heteroscedasticity case. Towards this study, VaR calculation result was compared to each GARCHX variation in all banking issuers, so that particular issuers having the least risk would be known and could be recommended to invest during COVID-19 pandemic period.

Prototype Design of Clean Water Distribution System on Residential Scale Using Arduino Mega Microcontroller

EE-120

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Abstract. Water is a natural resource that plays a very important role in life. Along with the rapid population growth and accompanied by the construction of residential areas, causing a clean water crisis. Bekasi is one example of a city that has a lot of settlements with a dense population but there are some settlements that are not yet guaranteed the availability of clean water. The purpose of this study is to know how the manufacture and system work, understand how to test pH sensors, turbidity, and HCSR04, and know the results of testing Prototype Clean Water Distribution System on a Residential Scale Using Arduino Mega Microcontroller. In the study there were several parameters, namely water quality parameters, namely using pH sensors and turbidity sensors, as well as for water level parameters using HCSR04 sensors. In addition, the system uses several components such as solenoid valve, pump, LCD, and Arduino Mega microcontroller. The method used to calibrate the pH sensor uses pH buffer powder at all three points, namely 4.01, 6.86, and 9.18 to become standard. The output of the pH sensor is the voltage that will be converted into a pH value using a linear equation. In the testing of turbidity sensor is done by referring a condition with 4 pieces of turbidity that is clear water, a little murky water 250 ml mixed with 1/4 tbsp soil, murky that is 250 ml of water mixed with 1/2 tbsp soil, very murky that is 250 ml of water mixed 1 tbsp soil. Then the ADC value of the 4 conditions is created limitation or range of turbidity level. HCSR04 testing uses the star as a reference for HCSR04 sensor calibration. Based on the test results on the pH sensor obtained the best error value at the point of 6.86 with a value of 0.7%. In the turbidity sensor obtained the best range in clear conditions that is at a range of more than 727. On the HCSR04 sensor obtained the best error value at the point of 18 cm by 0.05%. The results of the system test will be displayed on the LCD.

Ecology Based Curriculum As Innovation

EE-159

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Abstract. Green School is a form of educational innovation that uses nature as the main medium for students to learn by using active learning or action where students learn through direct experience. Using ecology as a basis, learning can be an interesting new innovation, according to the character of students, and gives freedom of learning to students. Student centered learning activities which are facilitated by teacher will be meaningful for students. Inviting students to wisely manage the nature and as a source of learning materials are two of many ways to introduce a Green School concept to students. One of the problems is due to limitation of time for students in extracurricular activities so that additional time is needed to get to know the environment. Towards the Green School concept, SMPN 1 Bayah includes ecology in extracurricular activities aimed at providing opportunities for students to explore their curiosity. Data was collected through interview, direct observation, and documentation. Subsequently, data was analysed using triangulation technique. Results showed that students were very enthusiastic about outdoor activities. The learning process became more meaningful, fun, and students energy was conveyed. These cause students focus was increase, social behavior and environmental awareness were getting higher.

Comparative Life Cycle Assessment of Plastic Jerry Cans: A Case Study Production in Plastic Workshop of Politeknik ATK Yogyakarta

EE-171

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Abstract. There have been various discussions concerning plastic items and their effects on the environment, with implications for business practices and public policies. However, making judgments without considering the trade-off circumstances between various plastic items may have a higher impact on other aspects of the life cycle. This study aimed to quantify the environmental impacts of various plastic jerry cans and choose which one to be used for student practice scenarios in Politeknik ATK Yogyakarta. Four different plastic jerry cans: polypropylene (PP), polyethylene terephthalate (PET), low-density polyethylene (LDPE), and high-density polyethylene (HDPE) were assessed from gate to gate approach in a comparative life cycle assessment (LCA). This study was performed using OpenLCA 1.10.3 and free European reference Life Cycle Database (ELCD) 3.2 Greendelta v2.18. The result showed that for CML-IA baseline method, LDPE jerry cans production has a better environmental performance among other plastic jerry cans in all impact categories (acidification, eutrophication, freshwater aquatic ecotoxicity, global warming, and human toxicity). It can be concluded that the practical needs of students in studying the production of plastic jerry cans are advised to use raw materials from LDPE granulates. Global warming has the highest impact result compared to other impact categories for each type of plastic. There are some improvement strategies to minimize the environmental impact, such as reducing the distance of LDPE transport, optimizing student practicum activities and ensuring the machinery operates efficiently, and substituting fossil-based plastics with eco-friendly plastics.

Nanofiber Fabrication from Palm Fiber Waste for Sustainable Water Remediation

EE-250

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Abstract. Palm fiber has the potential to be synthesized into nanofiber because it contains high enough cellulose, about 40-60%. The synthesis of nanofibers was carried out by chemo-mechanical methods. Chemical processes included delignification by alkali, acid hydrolysis, and bleaching. Meanwhile, the mechanical process consisted of grinding. Modifications were also made to the formed nanofibers, namely nano oxide coating. This study aimed to determine (1) the synthesis of nanofiber materials with palm fiber waste as adsorbent, (2) the crystallinity of the nanofiber structure, (3) the adsorption capacity of nanofiber adsorbents against Congo Red and Methylene Blue. FTIR characterization showed that the nanofiber material had been successfully synthesized, marked by specific peaks indicating the cellulose-forming functional group, namely -OH group at the peak of 3415.12 cm -1 , -CH group at the peak of 2897.21 cm -1 , -CO group at the peak of 1635.71 cm -1 , and -CH 2 at peak 1431.24 cm -1 . The crystallinity of the nanofibers reached 74.933% based on XRD results. Besides, this nanofiber had high adsorption power for cationic dyes (methylene blue) and lower adsorption power for anionic dyes (Congo red). The maximum adsorption capacity (mg/g) of Nf HCl, Nf HCl + Fe 3%, Nf HCl + Fe 5% with contact temperatures of 30 o C, 40 o C, 50 o C to methylene blue was 9.973; 9.959; 9.539; 9.924; 9.904; 9.698; 9.952; 9.931; 9.636; respectively. Meanwhile, the maximum adsorption capacity (mg/g) of Nf HCl, Nf HCl + Fe 3%, Nf HCl + Fe 5% with temperatures of 30 o C, 40 o C, 50 o C against Congo red respectively was 8.579; 9.421; 9.711; 8.184; 8.921; 9; 8.947; 8.342; 7.263.

Identification and Analysis of Geotourism Potential in Purwodadi Village, Malang Regency as Support for Geopark Areas in East Java

EE-267

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Abstract. Purwodadi is one of the villages in Malang district that has great geotourism potential. The geological condition of Purwodadi village shows traces of tertiary and ancient quarter volcanic activity from southern Java. This study aims to analyze, classify and assess the geosite as a geotourism site. This research uses literature study method, field data collection and quantitative analysis using Kubalikova's method. Kubalikova's method provides an assessment of the geosite based on the aspects of intellectual and scientific value, education, economy, conservation and added value. The results of geosite analysis in the research area include andesite, basalt, dacite, diorite, conglomerate, tuff, claystone, quartzite, iron, limestone and plant fossils. Based on the results of the quantitative analysis of the geosite assessment method, it shows that the research area has 6 geological sites with the feasibility of each of them including the Lenggoksono beach (6,.57%), Banyu Anjlok (72,97%), Bolu-bolu (64,86%), Wedi awu (56,76%), Banyu Ilang (39,19%) and Kletekan Bay (70,27%). Overall, there are 5 geosites that have the potential to be used as geological heritage sites for further review with the potential geotourism feasibility value> 50%.

Derivative Analysis for Estimating Subsurface Structures in the Kawi-Songgoriti Geothermal Area

EE-270

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Abstract. This research aimed to obtain density contact boundaries at the subsurface of the Kawi-Songgoriti geothermal complex. Kawi-Songgoriti area has a relatively rough morphology and has a fairly complex geological structure. Gravity anomalies data were obtained from secondary data from the gravity of the GGM Plus satellite image on 3150 points with the spacing up to 220 m for each point. A qualitative interpretation was conducted to the complete Bouguer anomaly. The results of the research indicated complete Bouguer anomaly values ranging from 68.8 mGal to 84.7 mGal. The residual anomaly from the contour map showed that in the same lithology there was a significant anomalous change in the northeastern part of the top of Butak wherein in the high-density lithology there was a low anomaly that dominates and the pattern corresponds to the geological structure. Estimation of the fault structure is carried out through derivative analysis in the form of first-order horizontal derivative and second-order vertical derivative to the resulting residual anomaly. Based on the derivative analysis of the Songgoriti - Kasinan manifestation area, it was found that 20 secondary structures that were suspected as faults in the study area were mapped. There are fault structures that are interpreted as part of the main fault structure. The main fault structure is thought to be caused by the morphology of the fault scarps in the form of a caldera that opens to the east. The distribution pattern indicated the existence of secondary structures and flow patterns of fluid from the reservoirs to the manifestations on the surface.

Development of E-Module Based on Socio-Scientific Issues of Environmental Change Topic

EE-273

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Abstract. Advances in information and communication technology teachers can create innovative teaching materials and make learning more efficient and effective, using e-module. By using an e-module, students can be given illustration material either with pictures or videos. Supported by the results of the needs assessment, that the majority of students already have smartphones and have good internet access, the opportunity to access e-module is very high. This study aims to develop an e-module based on the Socio-scientific issues of the subject of environmental change for class XI students. The method in this study uses research and development (R&D) with the ADDIE model (Analysis, Design, Development, Implementation and Evaluation). The e-module has been developed in the validation of environmental change material by material experts with an average score of 82.76% with Very Valid. Validation of media aspects by media experts with a score of 94.2% with Very Valid criteria. At the same time, the scores of practice tests by biology teachers and students are 80.5% and 83.3% with Very Valid criteria. From the results of the validation carried out, it can be concluded that the e-module developed is feasible to use for environmental changes discuss.

The Role of the Learning Environment in Developing Student Character (a Systematic Review)

EE-295

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Abstract. The main purpose of this study is to systematically discuss and review the results of previous research related to character development by the learning environment. Four (4) stages of work, namely identification, screening, , eligibility, and including carried out systematically are the methods of this research. Search articles using databases: Elsivier, Taylor, and Wiley during these past six years (2014-2020). International proceedings and English-language journals which are accessed in full text, are a must in collecting articles in this research. The result of study found that 650 research articles have discussed the learning environment and student character. The results of the final study after being screening by the PRISMA method and inclusion criteria found that as many as 15 research articles discussed the learning environment in student personality development. Teachers play an important role in architecture. Good relations with students, able to guide, motivate and provide relevant courses, students.

Biology Education
Day 1

Effectiveness of Human Digestive System E-Modules During Pandemic Era to Enhance Students' Learning Outcomes

BE-18

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Abstract. This research examines the human digestive system's e-modules effectiveness during the pandemic era to enhance student learning outcomes. This research and development were used the ADDIE model. Twenty multiple-choice tests were used to measure student learning outcomes. The e-module trial was conducted on 49 junior high school students. This research founded that e-module based on material experts obtained by 94.79% and media experts by 81.25%. Expert testing of e-module functional suitability is 100 functions. The trial results found that the mean of student learning outcomes was 79.69, and their response was 81.15%. The findings indicate that the e-module is valid. Student learning outcomes reach good categories. Students responded very well to the use of e-modules. This research concludes that the e-module of the human digestive system is valid and can improve student learning outcomes during the pandemic era. E-modules are a learning resource that teachers can use to strengthen student learning outcomes.

The Exploration of Environmental Care Attitude through Photovoice on Elementary And Junior High School Student

BE-74

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Abstract. The school environment cannot be separated from the food which is provided by the school canteen. Students unconsciously pollute the environment when they consume food with plastic wrap. For the student to be wiser toward waste, it is important to make efforts to grow the student's environmental care attitude. Photovoice can be used as media to fulfill it. The purpose of this study was to explore students' environmental care attitudes. This study used a qualitative method with a community action study design from 10 elementary and junior high school students. The study was conducted for four months, from January to April 2020. Data were collected using photovoice-based focus group discussions (FGD), interviews using the SHOWeD method, notes, and recordings. The data obtained were analyzed using interpretative phenomenological analysis techniques. The results of this study indicated that students were able to explore the five themes of photovoice, namely the theme of ecology, food, health, culture, and economy. The themes that appeared from the elementary school community were; ecology (65%), food (6%), health (24%), economy (6%), and culture (0%). The themes that appeared from the junior high school community were; ecology (67%), food (6%), health (6%), economy (22%), and culture (0%). This study concludes that the emergence of the ecological theme is quite high, indicating that the students' environmental care attitude is quite good, and the photovoice-based FGD is very good as a medium to explore the perceptions of elementary and junior high school students.

Keywords: Exploration, Environmental care, Photovoice theme, Students

Earth Hour Popularity Among Biology Education Students UIN Sunan Gunung Djati Bandung.

BE-75

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Abstract. Conserving the earth cannot be done by one generation, but it requires the next generation to protect the earth in a sustainable manner. Agent of change are needed to create the next environmentalists. Biology education students who are a prospective teacher potential to create a generation that loves the environment. The earth hour is a global movement that campaigns for energy savings, this movement also provide environmental education to the community. This research is a quantitative descriptive study that aims to see the popularity of earth hour movement and the perspective of biology education students of UIN Sunan Gunung Djati on these movement. The results showed that 93% of biology education students knew this movement, but only few knew more about this global movement. Even so, they are optimistic that this movement can have a positive impact on the earth. Based on these results, we can conclude that the earth hour movement is highly popular among biology education students. We hope that the popularity of the earth hour movement will open their way of thinking to understand environmental issues by taking concrete steps to make energy-saving movements that are born from the form of conscious thinking. Thus, together we are optimistic that we will be able to face the challenges of global warming that hit the earth. Biology education students with environmental awareness are at the forefront of creating a generation that is wise to the natural environment.

Implementation of Scientific Social Issues-based Biology Learning to Improve Scientific Literacy of High School Students

BE-76

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Abstract. This paper was a report of a lesson study activities. The purposes of this lesson study were: 1) developing SSI-based learning guides, 2) implementing SSI-based biology learning, 3) describing the learning process of SSI-based biology learning, 4) describing students' scientific literacy through SSI-based biology learning, and 5) increasing the collegiality of high school teachers in DIY. The implementation of this lesson study followed the Plan – Do – See pattern. The instrument used were i) an observation sheet for the implementation of SSI-based biology learning and ii) an observation sheet for student learning activities. The results of lesson study activities were: 1) SSI-based biology learning guides on biodiversity material with tubers vs wheat and blood circulation systems with cupping cases. The implementation of SSI-based biology learning was held at SMA 1 Sanden Bantul and SMA 2 Wates Kulon Progo. During the SSI-based learning process, students appeared to be actively participating in hte learning and expressing their opinions about the cases being studied. In the study with the case of tubers vs wheat at SMA 1 Sanden, the pro and con groups for the consumption of wheat-based foods were developed. The students were actively seen arguing with each other about the case. Students' opinions about wheat-based food ingredients varied greatly according to the focus studied by the group. Students can assess this case from various points of view. It appeared that students' scientific literacy can developed well. In the study of cupping cases at SMA 2 Wates, it appeared that all groups agreed on cupping therapy for health. There was no group that contradicted the practice of cupping therapy. Students had been assigned to explore the practice of cupping therapy from various perspectives (professions in society). The learning results showed that in the learning activities all groups agreed to the practice of cupping therapy. There seemed to be no students who firmly rejected the practice of cupping therapy in the community. Model teachers and observers realized the importance of lesson study activities to find various learning problems and take important values from the implemented open class.

Keywords: lesson study, SSI-based biology learning, scientific literacy

Comparison of Instrument Analysis Result of Test of Scientific Literacy Skills for Biology (TOSLS-B) Using Iteman and Rasch Model

BE-103

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Abstract. This study aims to compare the analysis result of a scientific literacy instrument that applied quantitative approach. The data was collected from a modified assessment instrument of Gormally scientific literacy test and applied according to biology materials in high school. It consists of 25 multiple-choice test items with 9 scientific literacy indicators, which will be assessed. 58 eleventh-grade students of high school majoring in science participated in this study. The data analysis was conducted with Iteman version 3.0 and Winstep version 4.8.0. The method used to analyze the data was the Iteman classic test method and the modern classic test with Rasch model. The result with Iteman model acquired an Alpha Cronbach value of 0.708, which shows a moderate level of reliability of this instrument and the level of difficulty with a range of 0.138-0.897, as well as a discrimination value = 0.093-0.499. On the other hand, with the Rasch model, Alpha Cronbach value of the instrument is 0.72 for person reliability and 0.95 for item reliability, which means that this instrument can be used to assess scientific literacy. The separation value of this instrument is 3.33 and this shows that the test item has a good distribution of response. From both instrument analyses, it is suggested that test items 5, 7, and 11 should be revised. Above all, this instrument is applicable for future studies.

Keywords: Scientific Literacy, Instrument, Iteman, Rasch Model

Analysis Of Argumentation Skills In Biology Learning At Senior High School Pontianak

BE-106

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Abstract. Argumentation skill is the ability to identify a claim and premise in making a decision based on available information and facts. To assess argumentation skills, a measurement method is used based on Toulmin's argumentation pattern - consisting of six aspects, namely statements, data, reasons, support, qualifications, and rebuttals. The purpose of this study is to reveal the profile of students' argumentation skills in learning biology at SMA Negeri 3 Pontianak. This research uses a descriptive quantitative method. A total of 63 students of class X IPA at SMAN 3 Pontianak were used as samples in this study. The results showed that the students' argumentative skills were in the low category. It can be seen from the average of each aspect of argumentation, the aspect of claim is in the sufficient category (62.5%), the data aspect is in the sufficient category (50.3%), the warrant aspect is in a good category (72.6%), the backing aspect is in the moderate category (54.3%), and the rebuttal aspect is in a low category (23.4%).

Keywords: Analysis, Argumentation Skills, TAP (Toulmin's Argument Pattern)

Developing Complex Multiple-choice Test to Empower Students Higher Order Thinking Skill about Excression System

BE-119

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Abstract. Higher Order Thinking Skills (HOTS) is crucial for students to face the challenges of the 21st century. However, students' HOTS is often under-optimized. This study was to develop a complex multiple-choice test to empower students' HOTS when learning about the Excretion System. The participants were selected from Eleventh-grade students of SMA Kristen 1 Surakarta (Surakarta First Christian High School). The research was conducted in the first half (second semester) of the 2020/2021 Academic Year. Data were collected using the complex multiple-choice test. Data were analyzed using Anates V4 software. The results showed that of 25 questions, all have good validity, high reliability, and difficulty levels. The questions were 23% easy, 59% moderate-difficulty, and 18% high difficulty, have sufficient distinguishing power with minimal interpretation and have a good level of practicality. The results showed that complex multiple-choice questions were a suitable tool to empower higher-order thinking skills.

Keywords: HOTS, Assessment Instruments, Multiple Choice Questions

The Understanding of Metacognitive Skills Among Biology Teachers and Lecturers in Makassar, South Sulawesi, Indonesia.

BE-128

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Abstract. Teachers and lecturer must be able to comprehend the nature of metacognition and how it can be implemented in the learning process. This study aimed to investigate to what extent Biology teachers and lecturers understand metacognitive skills. A survey with a descriptive quantitative approach was employed in this study. The data of this study were gathered using a questionnaire and an interview. The population of this study consisted of all Biology lecturers who were teaching at the Department of Biology Education and Biology school teachers from Makassar, South Sulawesi, Indonesia. The research samples were selected from the population by using a purposive sampling technique. The samples were 46 Biology lecturers and 48 Biology school teachers. The results of the study showed that the participants had an issue in comprehending metacognitive skills; only a few of them understood what metacognition was. In fact, the majority of the lecturers and teachers had not integrated the skills into the learning process. It is expected that the findings of this study can be contemplated as an insight to the development of the learning quality in the 21st century era.

Keywords: Biology teachers and lecturers, understanding of metacognitive skills.

Analysis of Gaming Learning Needs for High School Students

BE-134

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Abstract. Immune system material is one of the biological materials considered problematic by students and has challenges for teachers in conveying immune system material in online learning. Gaming learning is one of the innovations that teachers can use to answer learning challenges during the Covid-19 pandemic. The purpose of the study was to determine the learning process of the immune system during the Covid-19 pandemic, assess teacher perceptions of gaming learning, and analyze student needs for gaming learning media on immune system materials. The research method is interviews and surveys. The data analysis technique is descriptive qualitative. The research results show that: 1) The online learning process causes students to get bored quickly; one of the reasons is the learning media used during monotonous learning. 2) Teachers must have innovated to developing media in learning. 3) Teachers' perception of gaming learning is that it can be used to help students learn the concept of the immune system. 4) Students are ready to accept learning media innovations in the form of gaming learning. 5) The type of adventure game is the type of game that students like the most. 6) Students have adequate learning facilities to learn with gaming learning.

Do We Need Critical Thinking Progression?

BE-142

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Abstract. Critical Thinking Skill (CTS) is higher-order thinking skills needed to face challenges in the 21st century. There is a big challenge to nurture the CTS of students. One should we consider is designing the learning process that supports the progression of CTS from naive to expert through learning progression. The aims of this study were to; 1) measuring and analysing the students' CTS, 2) finding factors influencing CTS, and 3) mapping the biology students and teachers' perceptions regarding the critical thinking progression. This research is a mixed-method by the explanatory sequential design. Students of grade XI math-science (N=186), biology teachers (N=19), and vice principals (N=2) of public high schools in Surakarta were selected purposively as respondents. The instrument of CTS was adopted from Heard with nine aspects. The results showed that the score of tests and monitors implementation (53.58%) was sufficient, while other aspects, i.e., identifies gaps in knowledge (35.13%), discriminates amongst information (31.18%), identifies patterns and makes connections (37.81%), applies logic (28.14%), identifies assumptions and motivations (28.49%), justifies arguments (39.43%), identifies criteria for decision-making (35.30%), dan evaluates options (32.26%) were less critical. These results indicate that students' CTS are low and should be improved through critical thinking progression.

Keywords: critical thinking skill, critical thinking progression, learning progression, biology learning

Parents As First Teachers: Active Knowledge Sharing With Parents Method In Reproductive System Learning

BE-161

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Abstract. Parents has an important role in children education, learning carried out at home is an effort in strengthening the family relationship between parents and children. Teachers collaborate with parents to contribute effective learning activities to help students in construct science concepts to improve student's learning outcomes. Innovative learning methods needed to solve this problem, with using active knowledge sharing with parents method that emphasizes students and parents to exchange ideas actively can help students solve problems and understand the learning concept that will be learned by students. This study aims to elaborate on innovative learning method and its relation to improve learning outcomes. This study used literature study methods by collecting some journals related to science learning based on active knowledge sharing with parents method. The result based on literature analysis from some relevant journals, after the implementation of active knowledge sharing learning method, obtained by the average value of 13.0 categorized as high in the range of 4-16 and gained an average of 75.4 student's learning outcomes. Active knowledge sharing with parents method practice effective to improve student's learning outcomes. In education parent has an important role (1) parents become a companion and motivator (2) Parents can be a bond between the school and students in helping to provide information about the concept to be studied.

Keyword : Innovative method, role of parents, reproductive system

The Changes of Biology Learning Activities in Higher Education During the COVID-19 Pandemic

BE-162

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Abstract. Biology learning in higher education during the Covid-19 pandemic was carried out by online learning. Online learning in biology learning causes changes in student learning activities. This study aimed to determine the effect of the COVID-19 pandemic on students activities in biology learning. This study was a quantitative descriptive through a survey of biology education student's at 4 universities. The survey was conducted by giving a questionnaire to 55 students.. The questionnaire consisted of 50 statement items that included indicators of learning activities for learning before and during the COVID-19 pandemic. The results showed that the percentage of achievement in students' biology learning activities before the pandemic was 79.06% and during the pandemic was 70.97%. Student's activities in learning biology such as group discussions, collaborative work in problem solving, discipline in learning, focus during learning and presentations with online learning during a pandemic have decreased compared to learning activities before the pandemic. The results of this study indicate that student learning activities in learning biology have changed during the Covid-19 pandemic. Online biology learning needs to be well developed so that it has a good impact on learning activities

Chemistry
Day 1

Prediction Of Hysteresis Curves for Li-Doped ZnO Ferroelectric Materials Using Preisach Model and Deep Neural Networks

C-80

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Abstract. The classical Preisach model is used to model the hysteresis loop of ferroelectric materials. The Derivate-Arc-Tangent (DAT) equation will be used to model the Preisach distribution. Changes in the parameters of this Preisach function can produce different forms of hysteresis loops. Identification of the Preisach function parameters was identified using a trained neural network from the hysteresis loop dataset of various variations of the Preisach function parameters. The training dataset results are then used to identify the Preisach function parameters of ZnO and Li-doped ZnO ferroelectric materials with Li-doped of 1%, 3%, and 6%. From this data, a comparison between each parameter of the Preisach function is made against various variations in the percentage of Li in the Li-doped ZnO material. Then the results are used to predict the hysteresis loop of the ZnO-Li material for a certain Li-doped.

Molecular Docking Study on COVID-19 Drug Activity of Quercetin Derivatives with Glucose Groups as Potential Main Protease Inhibitor

C-84

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Abstract. Although vaccine development is being carried out quickly, no effective antiviral drug for the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) causes COVID-19. Therefore, this study explores the possibilities offered by quercetin derivatives with glucose groups found in the okra plant as a prospective antiviral drug to fight viruses. Previous research showed that okra plants containing Quercetin derivative compounds with glucose groups are an alternative treatment for diabetes mellitus. On the one hand, patients with COVID-19 sickness who have comorbidities, for example, hypertension or diabetes mellitus, are bound to foster a more thoughtful course and movement of the illness. A total of 10 quercetin derivative compounds with glucose groups were tested through molecular docking against SARS-CoV-2 Main Protease (Mpro) using AutoDock Vina. The result of our study showed that quercetin 3-O-diglucoside had the lowest binding free energy of -9.5 kcal/mol, followed by quercetin 3-O-Routoside, quercetin 3-galactoside were -9.1 and -8.9 kcal/mol, respectively. Both screened compounds had lower binding free energy than the positive controls, which valued -8.2 kcal/mol (Lopinavir) and -7.8 kcal/mol (Ritonavir). The potential inhibitor of SARS-CoV-2 Mpro by the three compounds from this research can be a starting point in the process of developing COVID-19 therapeutic drugs from natural compounds. However, further exploration in research is vital to examine their possible restorative use.

Keywords: COVID-19, Mpro, 6LU7, Quercetin Derivatives With Sugar Groups, Docking

Synthesis of Silica Nanoparticles from Sugarcane Bagasse by Sol-Gel Method

C-88

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Abstract. The silica nanoparticles have been successfully synthesized from sugarcane bagasse using the sol-gel method. Sugarcane bagasse contains abundant silica, so it can be used as an alternative source of silica nanoparticles. Sugarcane bagasse was calcined at 650 ^{o}C for 2 hours, then it was extracted using NaOH to obtain sodium silicate solution. The solution was titrated with HCl for gelling process. The synthesized of silica nanoparticles from sugarcane bagasse were characterized using FTIR and XRD. Based on the XRD characterization, the results showed that the silica had an amorphous phase, and the FTIR spectra has siloxane and silanol groups. The synthesized silica nanoparticles have an average size of 53 nm which was calculated using Scherrer Formula. From the data obtained, sugarcane bagasse can be used as a source of silica nanoparticles.

The Fluorination Of Zn Metoxide And Cu Metoxide Mixture

C-90

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Abstract. The fluorinated solid of the mixture of zinc methoxide and copper methoxide in the form of Zn_1-xCuxF_2 has been carried out. The value of x = 0; 0.025; 0.050; 0.075; 0.100 and, 0.150 are using in the synthesis. The fluorination reaction was based on the synthesis of the sol-gel method. The solids resulting from fluorination were characterized by XRD, IR and the surface area was measured by nitrogen adsorption-desorption. XRD pattern showed typical peaks of zinc hydroxide fluoride and zinc oxide. The results of characterization with IR showed the presence of Zn-F, Zn-O bonds in the fluorinated solid. The surface area of the fluorinated solid was obtained in ranged from 8,542-26,666 m^2/g.

Keywords : Fluorinated solid, doping, and sol-gel methods

Synthesis of Hard Capsule from Water Soluble Chitosan with Addition of Carrageenan and Starch White Sweet Potato

C-99

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Abstract. Hard capsules have been successfully synthesized from water soluble chitosan (WSC), carrageenan and white sweet potato starch. The WSC was synthesized from crab chitosan by depolimerization reaction. The WSC used are 1, 2, 3, 4 grams while carrageenan and starch used are 1.5 gram and 1 gram. Based on FTIR spectra showed that the obtained film capsule shell had vibration from its constituent molecules, ie chitosan, carrageenan and starch. Based on the uniformity test, it showed that all capsules have a difference of weight under 10%. Degradation test data in water showed the greatest value in capsule film with Variation 3:1.5:1 (WSC: Carageenan:Starch) is 54.6% and the capsule can be degraded (broken) in 10th minutes. Based on research data obtained that the capsule with Variation 3:1.5:1 (WSC: Carageenan:Starch) that most appropriate with a commercial capsule.

Utilization of water Hyacinth Assisted Biofilter to Reduce Ammonia Levels In Tofu Liquid Waste

C-147

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Abstract. The Purpose of this research is to reduce the ammonia levels in tofu liquid waste by utilizing water hyacinth plants as phytoremediation and the use of wasp nest biofilter for the use of grade substitutes. Tofu liquid waste treatment using biofilter and phytoremediation process is carried out with a variety of residence times. Ammonia content analysis in this study used the kjeldahl method consisting of three layers such as destruction, distillation, and titration. The type of titration used in this method is acid-base titration. The result of waste treatment using phytoremediation assisted by biofilter and analyzed using the kjeldahl method showed that variations in residence time for 8 days were more effective in reducting ammonia levels to reach a percentage above 87%. This show that the use of water hyacinth and biofilter is effective in reducing ammonium levels in tofu liquid waste.

Chemical Transformation of Pyrazine Derivatives

C-173

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Abstract. Pyrazine is a group of *N*-containing heterocycle compounds that is found both in nature and synthetic drugs. In fact, the presence of the pyrazine ring as a basic framework in many drug compounds indicating that these compounds are important in drug development/design. Pyrazine compounds as medicinal compounds contain amine or amide groups. Based on these considerations, various chemical transformations, consisting of nitration, acetylation, esterification, bromination, and amidation have been carried out on available pyrazine starting materials containing amine or amide groups. Those chemical transformation resulting in seven pyrazine derivatives, namely 3-hydroxy-6-nitropyrazine-2-carboxamide **(1)**, 3-(acetylcarbamoyl)-5-bromopyrazine-2-yl acetate **(2)**, methyl 3-aminopyrazine-2-carboxylate **(3)**, 3-amino-*N*-phenylpyrazine-2-carboxamide **(4)**, 3-amino-*N*-methylpyrazine-2-carboxamide **(5)**, methyl 3-amino-6- bromopyrazine-2-carboxylate **(6)**, and 3-amino-6-bromopyrazine-2-carbonyl bromide **(7)**. The molecular structures of these compounds were confirmed based on the ^{1}H NMR, ^{13}C NMR and MS spectra.

Identifying Metabolites in Complex Extract of Sigararutang Coffee Beans with NMR Spectroscopy Method

C-175

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Abstract. The sigararutang is a superior variety of arabica coffee fruiting continuously and has an exquisite taste. However, the chemical information of sigararutang coffee is still limited in the literature. In this paper, metabolites of sigararutang coffee were analyzed with the ^{1}H NMR spectroscopy and then further verified by 2D NMR techniques, including COSY, TOCSY, and J-Resolved. The coffee samples used in this work were green beans of sigararutang coffee obtained from Malabar Mountain, Bandung, West Java, Indonesia. In total, 17 metabolites were successfully identified in the extracts of sigararutang coffee, including sucrose, caffeine, trigonelline, 5-caffeoylquinic acid (5- CQA), 4-caffeoylquinic acid (4-CQA), 3-caffeoylquinic acid (3-CQA), quinic acid, citric acid, malic acid, lactic acid, alanine, choline, myo-inositol, γ-aminobutyric acid (GABA), formic acid, lipids, and asparagine in the single-step analysis. This study demonstrated the ability of NMR techniques for identifying metabolites in the extracts of sigararutang coffee without any prior separation.

Keywords: *Coffea arabica* var. sigararutang, metabolite, ^{1}H NMR.

Volume Estimation of Sour Natural Gas Using Volume Translation Peng-Robinson with The Translation Equation as A Function of Molecular Weight and Acentric Factor

C-179

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Abstract. Research and development to improve sour natural gas volume estimation accuracy are continuously done to upgrade the technological capabilities of industrial sectors. The accurate volume of sour natural gas is necessary for engineering calculation. The most accurate way to obtain the real volume is by performing experiments. However, it's expensive and requires a lot of time to obtain sour natural gas volume with a wide variety of compositions and conditions. The volume estimation accuracy can be achieved by applying both chemistry and mathematics simultaneously. Natural gas volume in a specific composition, temperature, and pressure can be estimated by equation of state. Peng-Robinson (PR) equation of state which is usually used to estimate natural gas volume in the industry has some drawback in calculating volume accurately. In this paper, Volume Translation Peng-Robinson (VTPR) is applied by adding a translation equation to modified PR in Tr=0.8–1.08 and P=12.38–30.38 MPa based on well P. To simplify the volume estimation for various compounds, VTPR is composed of general translation equations in which parameters depend on each compound characteristic. Previous researches had formulated translation equations as the function of two compound characteristics which are molecular weight and acentric factor. However, H_2S and CO_2 haven't been involved yet. In this study, three VTPR will be formulated with translation equation as the function of molecular weight, acentric factor, and both to estimate the volume of sour natural gas accurately. Parameters are optimized using regression to get the translation equation so that the calculated volume can approach the real volume. The result is that three VTPR have lower Average Absolute Deviation percentage (%AAD) than PR to estimate pure compound volume in sour natural gas which are 2.07%, 1.05%, and 1.47% respectively. Applied to sour natural gas mixture, %AAD obtained are 0.03618%, 0.00097%, 0.00825%, respectively.

Keywords: sour natural gas, volume translation peng-robinsons, molecular weight, acentric factor.

Effect Of Na_2SiO_3 (Sodium Silicat) As A Corrosion Inhibitor On Decreasing The Corrosion Rate In Service Water Piping In Electric Steam Power Plant

C-200

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Abstract. The electric steam power plant uses water (service water) which comes from the seawater desalination process with reverse osmosis membrane technology. Because it comes from seawater, this service water has relatively high corrosive properties, so it is necessary to condition using corrosion inhibitors to keep the corrosion rate from exceeding the expected value limits. The types of specimens used for the corrosion test were copper and mildsteel with varying concentrations of sodium silicate inhibitor. Determination of the rate of corrosion using the weight loss coupon method and the simulation is carried out at the corrosion rack. From the results can be concluded that sodium silicate inhibitor works very effectively when applied to service water systems with a concentration of 30 ppm. This concentration is also effective in reducing the corrosion rate of mild steel and copper metals. Sodium silicat inhibitor can reduce the corrosion rate of mild steel and copper metals, namely: 0.00073 & 0.00004 mpy, respectively

Keywords: service water, corrosion rate, sodium silicate, mild steel, copper

Purification of Used Cooking Oil of Shredded Chicken Using Activated Carbon from Coconut Shell

C-207

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Abstract. The purification of used cooking oil of shredded chicken using activated carbon from coconut shells has been carried out. This study aims to determine and analyze purified cooking oil's chemical properties such as FFA (Free fatty Acid), peroxide value, acid value, saponification value, and iodine value. Fourier Transform Infra-Red (FTIR) spectroscopy was applied to confirm to changes in the chemical properties the purified cooking oil's mainly its chemical structure. Purification is carried out by filtering using Whatman # 41, followed by an adsorption process using 5% (g/v) and 10% (g/v) activated carbon from coconut shells. The purified oil results were then analyzed for chemical properties using the standard procedure (AOAC., 1990). The results showed that the purification of used cooking oil of sredded chicken with 5% and 10% activated carbon was able to reduce FFA (%, as linolenic acid), peroxide number (mek/Kg), iodine number, and acid number (mg KOH/g). The saponification value was relatively constant at 200.79-217.08. The spectra of FTIR Spectroscopy confirmed the decreasing of carboxylic group absorption intensity at wavenumbers 3649 cm^{-1} was associated with reducing of free fatty acid.

Keyword: Used cooking oil of shredded chicken, activated carbon from coconut shells, FTIR Spectroscopy

Synthesis of 3,3-di(1-(2-phenylbenzyl)indole-3-yl)-5-bromoindoline-2-one

C-213

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Abstract. 3,3-Di(indol-3-yl)indoline-2-one **(1a)** was firstly isolated from the culture of a bacterium of *Vibrio* sp., which was separated from marine sponge *Hyrtios altum*. This natural microbial product exhibited various bioactivities. Herewith we report synthesis of 3,3-di(1-(2-phenylbenzyl)indol-3-yl)-5-bromoindoline-2-one **(3)** as a new analogue of 3,3-di(indol-3-yl)indoline-2-one **(1a)**. *N*-Alkylation of indole gave 1-(2-phenylbenzyl)indole **(4)**, which on treatment with 5-bromoisatin under acidic condition afforded 3,3'-di(1-(2-phenylbenzyl)indol-3-yl)-5-bromoindoline-2-one **(3)**. Structure of compound **(3)** was estabished by NMR and high resolution mass spectroscopies.

Keywords: synthesis, 3,3-di(indol-3-yl)indoline-2-one, analogue

Chemistry Education
Day 1

Invited Speaker

Hands-on Science Teaching (Host) To Improve Students' Critical And Creative Thinking Skills

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Abstract. The fact that science learning occurs in the classroom shows students who are bored and lose interest in learning science. This is because learning is rarely done in the form of practical (hands-on practical activities). Students are not involved in testing ideas and building their own understanding. Even though the science learning program absolutely contains the principle of "students doing science experiences". An alternative solution to overcome this is strengthening hands-on skills. In this paper, Hands-on Science Teaching (HOST) is introduced to improve students' critical and creative thinking skills. HOST in science learning includes all activities and direct experiences of students with natural phenomena. From the results of the observation study, the advantages of HOST are: 1) it can increase motivation to learn, 2) it can improve Hands-on Skills, 3) it can improve your own way of thinking and make your own decisions based on direct findings and experiments, and 4) can improve critical thinking skills, creative and perception. HOST is also in line with The Next Generation Science Standards (NGSS) policy, because it can be implemented in three dimensions in the NGSS concept: 1) Science and Engineering Practices: specific skills, 2) Crosscutting Concepts: pattern of linkages between Content and Practices, and 3) Core Ideas: science field.

Keywords: Hands-on science teaching, critical thinking skills, creative thinking skills.

Developing It-Based Learning Media Of The Aufbau Electron Configuration Principle In Constructivism-Oriented Chemistry Learning To Improve Mastery Of Concepts And Problem Solving Skills

CE-15

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Abstract. The development of IT-based Aufbau electron configuration principle media has been conducted. This study aims to identify the validity, practicality and effectiveness of the use of the media to improve students' mastery of concepts and problem-solving skills. This study utilized R&D design which consists of problem analysis, data and information collection, product design, product validation, product revision, field trials (small scale), revision from trial results, field trials (large scale), data analysis and reporting. The validity from the validator evaluations obtained a percentage of 88.46% with the very good category. The practicality from student responses acquired a percentage on a small scale of 83.65% and on a large scale of 88.01% with the very good category. The subjects of the study were 30 students. The result of the study revealed that the media effectively increased the mastery of concepts and problem-solving skills. It could be observed from the average N-Gain scores on a small scale of 0.72 and on a large scale of 0.78 with the very effective category. Based on the evaluation results, the product was suitable for use in the learning process on electron configuration material.

Keywords : Flash media, electron configuration, mastery of concepts, problem solving skills

Project-based Learning Research Trends In Indonesia: Bibliometric Analysis

CE-31

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Abstract. Project-based learning (PjBL) is one of the topics of education that is often discussed and has become a trend in itself. The purpose of this study was to analyze PjBL articles and see the extent of the research in Indonesia from 2015 to 2021. The data analyzed came from the SCOPUS database source. 601 documents were taken from the metadata. VOSviewer is used to customize it. The results of the study used standard bibliometric measures such as documents by author, subject area, affiliation and citation analysis. The results of the study of this article are expected to provide an overview and enrich input for further researchers to study PjBL related topics in more depth in the subject areas of mathematics and chemistry so that they can have a positive impact on the development of PjBL.

Keywords : *Project-based Learning, Indonesia, Bibliometric Analysis*

Students' Performance and Interest on Chemistry in Online Learning During The Covid-19 Pandemic

CE-146

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Abstract. The Covid-19 pandemic is changing the order of learning activities. One of the efforts to reduce the spread of the virus is the absence of face-to-face learning method in classrooms. The solution taken to deal with this problem is the application of online learning. Therefore, indicators are needed to analyze the impact of the implementation of online learning, one of which is students' performance and interest. In this study, students' performance and interest in online learning during the Covid-19 pandemic were described by using Microsoft Teams as an LMS on basic chemistry materials. The research sample was 42 students who were given a questionnaire as a research instrument. Data analysis was developed using quantitative descriptive methods. Based on data analysis, the average student performance score was 78.65 in the medium category. And, the average student interest score was 69.72 in the interested category.

The Implementation Of Learning Strategies Through Innovative Learning Models To Improve Students' Affective Ability And Social Interaction

CE-202

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Abstract. The purpose of this study was to determine the effect of implementing appropriate learning strategies through innovative learning models to improve students' affective abilities and social interactions in chemistry learning. This study used an experimental method comparing the experimental class that applies an innovative learning model and the control class with the lecture method. The study population consisted of three high schools in Surakarta, Central Java. Data includes affective values and social interactions obtained through questionnaires and observations. The results showed that the application of an innovative learning model could provide better affective and social interaction abilities than the control class in learning Chemistry.

Keywords: innovative learning model, affective ability, social interaction.

Analysis of Mastery Concepts and Student Self-Efficacy in Chemistry Learning

CE-249

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Abstract. This study aims to determine how to analyze the conceptual mastery and self-efficacy of students in learning chemistry. Prior to the analysis, empirical validation was carried out on the conceptual mastery instrument and the student self-efficacy questionnaire to be used. The validated concept mastery test instrument is a test instrument on the topic of acids and bases consisting of 16 two-tier multiple choice questions developed by Amelia Desiria, while the student self-efficacy questionnaire is a questionnaire developed by Lin and Tsai which consists of 28 statements with a range of answers values 1 to 10. This study uses a quantitative descriptive method with a sample of 40 students in class XI who have studied acids and bases. The results of empirical validation showed that out of 16 questions on concept mastery, 1 question was found to be invalid, while for the self-efficacy questionnaire all questions were declared valid. Then from the results of the instrument test, an analysis of the mastery of concepts and self-efficacy was carried out based on only valid questions. The results can be concluded that the students 'mastery of concepts on the topic of acids and bases is in the low category and the students' self-efficacy in learning chemistry is in the moderate category.

Keywords: *acid and base, mastery of concepts, self-efficacy.*

Environmental Sustainability in Education: Integration of Dilemma Stories into a STEAM project in Chemistry Learning

CE-306

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Abstract. This paper reports an innovative approach in secondary schools in Jakarta that employed ethical dilemma story pedagogy (EDSP) in an integrated Science, Technology, Engineering, Arts, and Mathematics (STEAM) project designed to engage chemistry students in ethical values learning. The study investigated how students explored their own values by attempting to resolve ethical dilemmas about environmental problems in an Indonesia context. Ethical dilemmas comprised everyday socio-scientific issues related to chemistry concepts in the high school curriculum, including pros and cons of using artificial fertilizers and disposal of used cooking oil. This qualitative research was conducted in the chemistry classes of two high school teachers. The research employed multiple data collection methods of semi-structured interviews, reflective journals, and classroom observations. The results illustrate students' successful engagement in chemistry learning, critical thinking skills, chemical literacy, ethical values, awareness of environmental problems, and envisioning of education for sustainability. The results also illustrate (i) students' enhanced awareness of their values and their agency in practicing environmental sustainability and (ii) teachers' realization that they can empower students in education for sustainability through ethical dilemma story pedagogy. The study is significant in revealing that education can play an important role in empowering the young generation in education for sustainability through an ethical values approach to their learning. The paper also addresses challenges faced by the researchers in designing chemistry-based ethical dilemma stories, integrating them into a STEAM project, empowering students, and managing time resources.

Exploring Value-based Learning Environment for Sustainable Development in Education: Integration of Socio-scientific Issues in Chemistry Learning

CE-309

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Abstract. This study analyzed the value-based learning environment by applying Socio-scientific Issues (SSI) designed to promote sustainable development in education. The study explored how students perceive when dealing with environmental problems which further develops the value of environmental awareness within them. The issues used are related to the concept of acid and base topics in the high school chemistry curriculum. Qualitative methodology was employed through multiple data collections of semi-structured interviews, reflection journals, observations, and worksheets with the 36 students of year 11 at a public senior high school in Jakarta. The study results showed that students were successful in being actively engaged in learning due to the support of their positive relationship with the teacher, thereby creating an interest that made their learning more meaningful. The integration of SSI in chemistry learning has enhanced students' communication and collaboration skills through the decision-making on problem-solving activities. Students also engaged in developing their environmental sustainability awareness and higher order thinking skills. As a result, the study revealed that SSI has a positive impact on developing a value-based learning environment in chemistry learning.

Implementation of IDEAL Problem Solving Model to Improve Students Creative Thinking Skills on Solubility and Solubility Product

CE-313

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Abstract. The purpose of this study was to determine the effectiveness of the implementation of IDEAL problem solving model to improve students creative thinking skills on solubility and solubility product. The research design used was One-Group Pretest-Posttest. The subjects in this study were 25 students of class XI IPA 1 as 1st replication class and 25 students of class XI IPA 2 as 2nd replication class at SMA Negeri 4 Sidoarjo. The research instrument is a test sheet consisting of 10 description questions. Data analysis of creative thinking skills was carried out by students answers on the creative thinking skills instrument which contained four indicators, namely fluency, flexibility, originality, and elaboration. Differences in the value of creative thinking ability of students when pre-test and post-test scores were analyzed using N-gain. The results showed that each component of students creative thinking skills experienced an increase between the pre-test and post-test scores. There are 36% students get an N-gain score in the high category while the remaining 64% students are included in the medium category in the 1st replication class and there are 24% students get an N-gain score in the high category while the remaining 76% students are included in the medium category in the 2nd replication class. Based on the results of the study, it was concluded that the IDEAL problem solving model applied could improve students creative thinking skills.

Keywords: *Problem Solving, Creative Thinking Skill, Solubility and Solubility Product*

The Development of Guided Inquiry-Based Electronic Module to Improve Students' Critical Thinking Skill

CE-331

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Abstract. This is a Research and Development of Borg & Gall with the aim to figure out whether the application of guided inquiry-based electronic module can improve students' critical thinking skills in learning reaction rates material or not. The subjects of this research were students of Senior High School of 1 East Rote. The instruments used were questionnaires, interview, electronic module validation sheet, and pretest and posttest. The analysis used was one way T-test on the students' critical thinking skill with the score 82.23 for experimental class 76.53 for the control class with a significant level of 5%, so it can be concluded that the use of guided inquiry-based electronic module in the experimental class and control class is different where the experimental class is higher than the control class. The results of the pretest and posttest analysis showed an improvement of students'critical thinking skills with N-gain classically for the experimental class 0.75 in the lower category and 0.69 in the control class in the moderate category. Based on this analysis, it can be concluded that developing electronic module based on guided inquiry can improve students' critical thinking skills. It was developed in very good criteria obtained from the validation.

Keywords: *Electronic module, guided inquiry, critical thinking skills*

Physics
Day 1

Physical Properties of Gd^{3+} ion Doped Fluorotellurite Glass and Their Radiation Shielding Parameter

P-26

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Abstract. Currently, the utilization of X-ray and Gamma-ray have been widely increased due to their applications such as in the medical (Roentgen, PET, MRI, etc.), industrial and scientific field. As we know, they have high energy and the exposure of X-ray and Gamma-ray will be dangerous for human body. People who work in the radiation field need a protection. In the present work, we have developed glass material for radiation protection. The glass composition was $(90-x)TeO_2+10ZnF_2+xGd_2O_3$ where x is 2, 4, 6, 8, and 10 mol%. The glasses were fabricated using conventional melt and quenching technique. The mix material was melted at T = 1050 ^{0}C for 1.5 hours and annealed at T = 500 ^{0}C for 1.5 hours. Afterwards, they can be treated in the room temperature for characterizations including physical, optical, and the simulation of radiation shielding properties. The physical properties of glass consist of density and molar volume. The glass density laid between 4.15 to 4.75 g/cm^3 where the glass density increased by increasing Gd_2O_3 concentration in the glass system. Meanwhile the molar volume of glass was found between 36.69 to 38.07 cm^3/mol where the molar volume decreased with increasing of Gd_2O_3 content. The radiation shielding parameter such as mass attenuation coefficient (μ_m) and effective atomic number (Z_{eff}) have been simulated using Photon Shielding and Dosimetry (PSD) software that is available at https://phy-x.net/PSD. The response of glass material in the energy range of 0.28 – 0.66 MeV has been studied to understand their radiation shielding properties.

Conceptual Design of a Pelton Turbine to Supply the Electricity Need in Selur Village, Ponorogo

P-28

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Abstract. Selur Village has a waterfall named Sunggah Waterfall. Sunggah Waterfall has a height of up to 40 meters. In 2020, LPPM Brawijaya University has built a Micro Hydro Power Plant or PLTMH Selur Village, Ngrayun District, Ponorogo. The type of turbine used in the MHP of Selur Village is a crossflow type that can generate 20.392 kW of electricity generated from Sunggah Waterfall. One of the efforts by using a kind of turbine that can produce maximum power from a waterfall into electrical energy to apply a Pelton turbine. In this research, the design results obtained specifications where the 30 kW Pelton turbine uses a rotation speed of 400 rpm, turbine efficiency of 0.61, where the fluid flow rate (V) is 123.332 m^3/s, the specific speed is 8.9 rpm. Pelton turbine diameter (D) is 615.28 mm, the jet of water diameter (d) is 76 mm, bucket length (L) is 173.28 mm, bucket width (B) is 21.28 mm, notch width (M) of 85.12 mm, notch depth (S) of 33.44 mm, bucket depth (E) of 60.8 mm, and bucket height (A) of 133 mm.

The Effect of the Magnetic Field of Household Electronic Appliances on the Human Body

P-46

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Abstract. Today's modern human life cannot be separated from the existence of gadgets, tv and various other household electronic appliance. Household electronic appliance, especially household appliances, produce the magnetic fields as a result of flowing electric current. Exposure to magnetic fields caused by household appliances has a variety of effects on humans. Moreover, the Covid-19 pandemic makes people work from home and increase the online activities. The closer the distance between theobject and the magnetic field, the greater the magnetic field absorbed by the object. Compared to open space, closed space has greater impact. However, research on the impact caused by magnetic fields in household electronic appliances on the human body is still controversial until now.

Distance Estimation Between Moving Objects Using Monocular Camera

P-97

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Abstract. Distance estimation between two or more objects is a crucial task in the computer vision research area. Moreover, in the era of COVID-19, it becomnes an urgent issue as it can enable social distance preserved. Distance estimation could be done using stereo vision (stereoscopic photogammetry) but requires more complexity. In this paper, researchers show distance estimation is possible using only monocular vision. We propose a deep-learning based method, Mobilenet Single Shot Detector (MSSD), combined with Camera Calibration to detect objects and estimate the distance between them in the setting of monocular vision. To verify the robustness of the proposes method, we created a dataset video using a monocular camera. The experimental results showed the performance of the proposed method could estimate the distance properly using the recorded dataset.

Estimation of Random Effect Probit Panel Parameter Using Adaptive Gauss Hermite Quadrature Integration

P-113

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Abstract. In this paper, we conduct a theoretical study in the form of random effect panel probit parameter estimation using Adaptive Gauss Hermite Quadrature integration. Panel probit regression is a model regression with categorical dependent variables applied in panel data. Maximum Likelihood Estimation (MLE) is a general estimation method for binary panel data. The MLE method is more efficient and consistent than other methods of estimating. The random effect in panel data probit provides a consistent estimate and can accommodate heterogeneity compared to the fixed effect. Probit panel random effect contains latent variables. Latent variables cause the likelihood function of the model cannot be solved by an analytical solution. The solution is using a numerical integration approach. Adaptive Gauss Hermite Quadrature (AGHQ) is a numerical technique that can be applied in models with latent variables or random-effects models. AGHQ better captures the peak of the integrand and uses fewer quadrature points than the Gaussian Hermite (GH) classical method, an integration method commonly used in panel probit estimation. In addition, AGHQ has a better speed and accuracy in computation compared to GH. The result of the first derivative of the likelihood function is not closed form so that the parameter estimation process is continued by using Newton Raphson iterations. The application of the panel data probit method was carried out on economic data in 31 Indonesian provinces from 2011 to 2018. The modeling results that the export variable, labor force participation rate, and electrification ratio have a significant influence on the level of the economy with a classification accuracy of 68.95%.

Development Autotracking Control Antenna Software Using Stepper Motor Hybrid 2 Phase

P-169

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Abstract. To support use of LAPAN satellites in low earth orbit, the ground station must have a reliable receiving antenna system Rancabungur ground station requires a satellite tracking control system that can follow the movements of the satellite. It is vital to use a control system to make the antenna movement more smooth and rapid. The speed of movement of the satellite in a low orbit at an altitude of about 630 km is 7.5 km/sec The purpose of this research is independence in the design and application of antenna systems with high accuracy pointing in tracking satellites.. The system proposed was prototype antenna motion control using stepper motor hybrid 2-phase includes antenna control systems, tracking automation, exact direction and parking automation. The result of this research is a prototype antenna system with the ability to perform tracking more accurately and reliably both in software and hardware. .Moreover, this system is also tested to receive signal form LAPAN-A1, DFS ang IRS satellites using parabolic antenna. In general, this system can follow the motion of the satellite.

Keyword: satellite, LAPAN, antenna, stepper motor, ground station

Magnetic Mineral Characterization of Iron Sand Deposits in Bambang Beach Lumajang, East Java, Indonesia

P-183

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Abstract. The presence and potencies of iron sand in Indonesia have an important role for primary raw material in steel and construction industry, but its existence is not yet optimally benefited. The aims of the research was to identify the percentage of magnetic mineral content in the iron sand around Bambang Beach which is located in Pasirian Sub-district, Lumajang, East Java to optimize its benefits. The presence of iron sand in the research area is assumed originating from beach placer which have concentrated along the Bambang Beach. The iron sand samples were directly obtained from the beach and its surroundings. The sand then dried and pounded to reduce the water content. The characterization using XRF (X-ray Fluorescence) in the laboratory. From the characterization of XRF, the iron (Fe) were found in samples with concentrations about 31,7% to 51,4%. Iron sand based magnetic mineral containing iron (Fe) in mineral hematite (Fe_2O_3).

Enhance Sensitivity of Glass Optical Fiber with Various Configuration for Displacement and Force Sensor

P-187

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Abstract. In this paper, a research has been carried out by testing the sensitivity of displacement sensor. The sensor is made of glass optical fiber (GOF) with various configuration, structure and based on Optical Time Domain Reflectometer (OTDR). The sensor has been made consisting of two structures singlemode and singlemode-multimode-singlemode (SMS). The configurations using gamma, bowknot and loop shape with indentation diameter variations in the singlemode and SMS structure. Each sensor is given displacement and compare between two structures. Furthermore, the research continued to application and given variation of the force that perpendicular to the sensor. Displacement will affect the output in the form of power losses read on the OTDR in dB units. The results showed that the smaller the diameter of sensor, the increased power loss so affect to the sensitivity and resolution values of sensor. The best result obtained at the loop configuration diameter 1 cm with SMS structure. For displacement sensor, the sensitivity value of 0.036 dB/mm and a resolution value of 0.027 mm. While the sensitivity and resolution of the force applied sensor obtained is 0.407 dB/N and 0.002 N. Displacement and force sensor can be used for landslide application with high sensitivity and better resolution.

Keyword: Displacement, force, GOF, sensor, SMS.

Detection of Building Slope and Land Subsidence Using Ultrasonic HC-SR04 Sensors Based Arduino Uno R3 and Blynk

P-248

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Abstract. This study aims to build and test prototypes of building slope and land subsidence based on Internet of Things (IoT) using ultrasonic HC-SR04 sensors and data delivery testing uses ESP8266-01 wifi module. The devices used in this study are ultrasonic HC-SR04 sensors, Arduino Uno R3 microcontroller, ESP8266-01 wifi module, LED indicator, resistor, cable and power supply. The measurement of building slope done by placing sensors next the building and to detect distance between the building and sensors using $\Delta S = S\text{-}S'$ equations. After then converted into a slope angle using θ = arctan $\Delta S/y$ equations, to measure the land subsidence the ultrasonic sensors were attached in the edge of building in some height, facing to the ground using $\Delta y = y'–y$ equation. These ultrasonic sensors were used to detect any land subsidence that occur around the building. The experiment indicated that design monitoring prototypes system successfully displayed what sensor had read translated Arduino Uno and display it into serial monitor on Arduino IDE, and Blynk. Result of building slope an showed that correlation coefficient manually calculated of 0,999, accuracy value between sensor reading and comparison tool is 99.2% and precision value of 96.4% from 15 times data retrieval. And result of land subsidence showed correlation coefficient manually calculated of 0.999, accuracy value between sensor reading and comparison tools is 99.9% and precision value of 99.9% from 10 times data retrieval. And the third LED indicator shows the corresponding indicator.

Purification of SWCNT by Acid Treatment for Carbon/Silicone Solar Cell

P-262

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Abstract. The study of solar cells based on carbon/silicon hybridization has attracted a lot of attention. In solar cells, the SWCNT film shows a p-semiconductor feature which functions as an active or charge carrier material. Individual SWCNTs can form p-n junction diodes with n-silicon. SWCNT shows high carrier mobility, tunable optical properties and bandgap, as well as good stability and flexibility. However, in general the synthesized SWCNT contains impurities in the form of amorphous carbon, metal catalysts, and reactants which can reduce the performance of SWCNT in its application. Therefore, this study examines an effective purification method to eliminate impurity in SWCNT. Purification is carried out with two variations of acid treatment, namely by HCl and HCl/H_2O_2 where this concentrated acid can dissolve the impurities contained in SWCNT. Furthermore, the sample is characterized using XRD to determine crystal phase and structure of sample, SEM-EDX to determine the morphology and elements contained in the sample, and solar simulators to determine the efficiency of solar cells. The results showed that the best level of purity for SWCNT was using a mixture of HCl/H_2O_2. Based on the results of solar simulator measurements, the efficiency of solar cells has increased after purification on the SWCNT pristine.

Atomic Emission Characteristics of Helium from Helium Discharge Lamp Using Optical Multichannel Analyzer

P-291

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Abstract. Study on atomic emission characteristics of helium obtained from the helium discharge lamp has been conducted using optical multichannel analyzer, which has wavelength from 300 nm to 800 nm. This study is very urgently necessary to know and confirm the purity of atomic emission from the discharge lamp, which is now commercially available in the market. In the experiment, a helium discharge lamp was turned on by a high voltage power supply to obtain a discharge plasma. The discharge plasma from the discharge lamp was then send into a multichannel analyzer (OMA) via an optical fiber. Some analytical emission lines with high emission intensity and low background emission are obtained and clearly identified from the OMA system including neutral and ionic He emission lines at 492.2 nm, 501.6 nm, 587.6 nm, 667.8 nm, and 706.5 nm. The technique of OMA system can effectively used to identify elements and to distinguish the impurities from the discharge lamp emission.

Atomic Emission Characteristics of Hydrogen from Hydrogen Discharge Lamp Using Optical Multichannel Analyzer

P-292

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Abstract. Emission characteristics of hydrogen taken from the hydrogen discharge lamp have been studied using an optical multichannel analyzer (OMA) system. Experimentally, a hydrogen discharge lamp was connected to high voltage power supply to induce a hydrogen discharge plasma. The atomic emission spectrum of hydrogen was then obtained from the discharge lamp via an optical fiber connected to the OMA system. Some atomic emission lines of hydrogen were clearly observed with high emission intensity and low background emission. The atomic lines of H include neutral hydrogen at the wavelengths of 434.0 nm, 486.1 nm, 656.3 nm, which represent to H gamma, H beta, and H alpha, respectively.

Physics Education
Day 1

Invited Speaker

Learning Science Model Based on Indonesia Partnership for 21th Century Skills Standard (IP21CSS)

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Abstract. This study aims to develop the science learning model in society 5.0 era be based on IP21CSS. Focus of the research to develop the learning model which can to improve the skill of spiritual value appropriate with the IP21CSS. Adaptation of new habits in many aspects of life including education is required amid the COVID-19 outbreak. Many countries including Indonesia suddenly implement online learning as a realization of social distancing policies. Beside that the technology impact to the science learning must be created on the learning corresponding actually to life daily in the era industry revolution 4.0 to 5.0. The authority of supporting competency in the 21th century depend on role of school as place of education to find of the knowledge. Commonly the schools aware preparedness of the graduate to deal of competition in the 21th century, and so always to innovation and appropriate of the era development, specially for situation of the COVID-19 pandemic. In the appearance of era society 5.0.still be in accordance with the Industrial Revolution 4.0 in focus by technology application to facilitate of human activity. Indonesia Partnership for 21 Century Skills Standard (IP21CSS) mapped major competency to cover critical thinking competency, collaborate and spiritually value. Spiritually competency have role to take care of self and come up sense pay attention of sphere. Spiritually value to teach that the student is part of nature and each have role and endorsement mutually. Spiritually value can be found by teaching-learning through applied of model learning. Framework IP21CSS is formed community realization existence Indonesia nation. Framework IP21CSS to be able to answer the competency by Indonesia community deal industrial revolution 4.0 and society 5.0 era. The procedure of the research appropriate with Research and Development (R & D) Borg & Gall, Steps of the this Research and Development consist of preface study, model development, and potent test of learning science model. Thin research consist of two years estimate or consideration. In this step that is preface study and learning development model appropriate to IP21CSS as well as adaptation of new habits to implement online learning during pandemic. The preface study be done to know necessity and feasibility of learning. Survey to be carried out to 40 teachers SMP in Surakarta and be sported by literature study. Development of model design to be tried out to find the effectiveness of capability of science content and IP21CSS.competence appropriate. Result of research show that : 1). model development of learning science appropriate with field need, that is science learning which easy to be carried out in the pandemic and to improve the competency suitable to IP21CSS. 2). have found the conceptual model IP21CSS and syntax model consist of orientation, exploration, innovation, evaluation, and reflection. Basically conceptual model wish free learning by student utilize equipment appropriate the condition so teacher and student must be conceived learning program contextual.

Preliminary Research on The Development of Digital Hypercontent Modules in Mathematical Physics Subjects

PE-86

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Abstract. This research is an initial study on student learning outcomes in the Mathematics Physics course. Mathematics Physics is a compulsory subject for the Physics Education Study Program, University of Muhammadiyah Makassar. Mathematical Physics examines the application of mathematics in solving physical phenomena. However, mathematical Physics is often considered difficult by students. Still, Mathematical Physics is essential because of its role as a provision for students to study advanced Physics courses, such as Mechanics, Optics, Waves, Electricity, and so on. Therefore, the search on the perception and acquisition of student learning outcomes in Mathematics Physics lectures is the basis for providing intervention for researchers through research and lessons in the selection of strategies, learning methods, and even the development of learning tools. This research is survey research. The way of data collection is through interviews with 14 fourth semester students of the Physics Education Study Program at the University of Muhammadiyah Makassar. The results of the study found that as many as 57,14% of students scored less than 70 (categories C, D, and E). this percentage gain is still far from the expected results in Mathematics Physics learning. In addition, the absence of learning tools that are following the characteristics of the Mathematics Physics course for Physics Education students also has an impact on the common understanding of students' Physics concepts.

Enhancement of Critical Thinking Skill in Physics through Experimental Method: Is It Effective?

PE-158

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Abstract. In recent years, there has been an increasing interest in Problem-Based Learning. To accommodate the Problem-Based Learning model, education researchers compete to make modifications to learning methods. Besides, the stages in Problem-Based Learning lead to students' critical thinking skills because it leads to decision-making to solve the problem. However, the research to date has tended to focus on Problem-Based Learning more than the method that needs to be used. Therefore, this study was undertaken to analyze students' thinking skills by applying experimental methods to accommodate the Problem-Based Learning model. This study used a static group comparison design involving 72 class X students in Karanganyar, Central Java, divided into two groups. The first group was taught using the experimental method, while the second group was taught using the demonstration method. The students' critical thinking skills were then tested, employing six aspects: clarity, accuracy, precision, relevance, depth, breadth, and logic. The results revealed that the students' critical thinking abilities taught using the experimental method were higher than those taught using the demonstration method. It was because the experimental method provides flexibility for students to manipulate in solving the given problem. Implications of the results and future research are also presented.

The Comparison of Learning Style on Thermodynamic Learning Outcomes of Public High School and Islamic Boarding School

PE-167

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Abstract. This study aims to determine the effect of learning styles on thermodynamic learning outcomes of high school students with different characteristics. This study use survey research with an embedded approach. Quantitative data were obtained using a learning style questionnaire and thermodynamic tests. Research subjects were 66 public high school students and 66 Islamic boarding school high school students who had taken thermodynamics material. Data were analyzed using the Mann-Whitney test and Kruskal-Wallis test then completed with students' interviews. Results showed that students' learning styles in public high school and boarding school do not affect thermodynamic learning outcomes.

Development of Learning Media Based Assessment for Learning with Adobe Flash Professional CS6 Program

PE-240

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Abstract. Utilization of technology in education will produce quality learning, train critical and conceptual thinking (Nabilah, 2020). The existence of technology in education requires teachers to use learning media in order to increase student motivation (Kurniawati, 2018). This study aims to developed assessment for learning based learning media with the Adobe Flash Professional CS 6 program on Momentum and Impulse material for class X high school students who have good criteria. The method used in this research is Research and Development with ADDIE development model. The procedure for developing learning tools only reached the third stage of the five stages, namely (1) analysis; (2) designs; (3) development. The data obtained are qualitative data supported by quantitative data. Sources of data came from 2 experts, 3 high school physics teachers, 5 colleagues, and 36 students. All teachers and students are from SMA Negeri 5 Surakarta. The data analysis technique used is qualitative and quantitative. The qualitative data analysis technique uses the Miles and Huberman model, namely data reduction, data presentation, and drawing conclusions. While the quantitative data analysis technique uses the calculation of the percentage of the components of the questionnaire. The conclusions of this development research are: (1) the stages of developing assessment-based learning media include: (the analysis stage, which is the stage of analyzing various problems that exist in the learning process; (the design stage, namely the stage of making flowcharts and storyboards for learning media; (the development stage, namely the stage of carrying out the validation process, assessment by users (teachers and peers), one-on-one trials, small group trials, and field trials. (2) The final result of this research is an assessment-based learning media that meets the very good category so that it can be used in the learning process. (3) product specifications for assessment-based learning media that have good criteria, namely assessment-based learning media with the Adobe Flash Professional CS 6 program in the form of three learning media applications with different sub-materials including the sub-material of the law of conservation of momentum, momentum and impulse, and collisions to facilitate students in learning that can be run on smartphone devices with the Android mobile operating system and laptop devices.

Keywords: Learning Media, Assessment for Learning, Adobe Flash Professional CS 6

The Correlation of Self Efficacy to Student's Critical Thinking Skill on the Material of Motion and Force

PE-254

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Abstract. The development of critical thinking skills can be determined by the level of the student self-efficacy. This study aims to determines (1) the relationship between the self-efficacy and the critical thinking skills of grade VIII junior high school students on the material of a motion and a style, (2) The effect of each dimension indicator of the self-efficacy with the critical thinking ability of grade VIII junior high school students on the material motion and force. The method used in this research is quantitative with correlation research design. The research sample consisted of 62 students who were selected by using a cluster random sampling technique. The research data were obtained through filling out questionnaire and three tier multiple choice question test. The results of the study was analyzed using the bivariate correlation techniques, and simple regression tests. The results showed that: (1) there are significant relationship between the self-efficacy and the critical thinking skills of grade VIII junior high school students in the material of the motion and style, as evidenced by the correlation coefficient value of 0.784, (2) there is an influence on each indicators of the self efficacy with critical thinking skills, the strongest influence is the level dimension, amounting to 54.9%. Keywords: self efficacy, critical thinking skills, three tier multiple choice

What Do Teachers Need to Teach Free-Body Diagrams Effectively? : A Need Analysis In Development Country

PE-264

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Abstract. Indonesia as a developing country was still unable to provide adequate technology in the classroom evenly across all regions. The aim of this study to investigate the needs of physics learning media, especially in determining force and drawing free-body diagrams. This research was used a descriptive quantitative method. A total of 67 teachers and 20 students participated in this study using the convenience sampling technique. The results showed that the teachers 'and students' awareness of the difficulty in understanding force diagram material was quite high. Teachers and students consider magnetism to be a medium that can be used to describe force diagrams effectively and efficiently. The implication for teachers from the results of this research needs analysis is that teachers need to design learning media using magnets. For other researchers, it was tested on students 'skills in drawing style diagrams and students' mastery of concepts.

Keywords: need analysis, free-body diagrams, magnetic whiteboard, development country

The Prospective Science Teachers' Metacognition Profile In The Basic Physics Course

PE-192

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Abstract. The prospective science teacher must have skills in partial knowledge included in cognition and the whole dimension of knowledge, which provides for factual, conceptual, procedural, and meta-cognitive. Mastery of the extent of knowledge strongly supports the success of the profession as a teacher. This research aims to determine prospective science teachers' metacognition profile. The study conducted on 73 students in The Basic Physics Course in the Science Education Program Universitas Sebelas Maret. Data obtained through the Metacognition Awareness Inventory (MAI), which contains eight sub-components of metacognition. Data triangulation was done by crosscheck assignment and open questionnaire. Results of the MAI measurements showed that the achievement meta-cognition indicators are: 1) declarative knowledge at 71.35%; 2) procedural knowledge at 70.02%, 3) conditional knowledge at 71.98%, 4) planning at 71.74%, 5) information management system at 71.37%, 6) comprehensive monitoring at 70.02%, 7) debugging strategies at 74.78%, and 8) evaluation at 69.17%. The highest achievement was in debugging strategy, and the lowest one was in evaluation. Items that students have never or rarely done are: draw picture or diagram to help understand the material (44.25%), make a resume after completing studying the material (41.59%), automatically use learning strategy without much consideration and the strategy was successful (33.63%), know every learning strategy that they used was the most effective (42.48%), analyze how useful the strategies are used when learning (38.05%), focus on the overall meaning instead specifically (30.09%), know their ability of self-organizing and rearranging information become an organized entity (27.43%), understand what is expected by the lecturer to learn (24.78%). The results of students' assignment analysis and open questionnaire support it. The discussion based on these results indicates the need for a learning model that trains the students to improve their metacognition.

Keywords. Metacognition, Science Education, The Prospective Teacher

The Effect of Simulation Based Formative Assessment on Student Problem Solving Skill in Learning Newton Law

PE-176

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Abstract. Simulation based formative assessment is one method for measuring comprehensive problem solving. The purpose of this study is to analyze the impact of simulation based formative assessment on student problem solving skills. Fifty high school students participated in this quantitative study with explanatory design. The key instrument in this study was an adaptation of FCI (force concept inventory) and FVA (force velocity and acceleration), which were validated by two physicists and had a reliability of 0,804%. The data was analyzed using descriptive statistic as well as inferential statistics, specifically the independent sample t test. The result is significant differences in the problem-solving skills of students. The effect of simulation based formative assessment was that the problem of students solving the category of experts was improved by 11% and category of novice was reduced by 44%. However, in this study, traditional class was used.

Science Education
Day 1

Invited Speaker

Integrated Science Teaching: Perceptions and Problems of Pre-service Science Teachers

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Abstract. The development of modern science leads to the interdiciplinary nature of science which aims to combine concepts, perspectives, and methods from various scientific diciplines to interpret scientific phenomena in daily life. The characteristics of integrated science that require interdiciplinary relationship has been rised problems in its implementation for students, teachers, including pre-service science teachers in science teacher education. This is supported by previous studies that the implementation of integrated scince in various countries still poses problems. This article describes perceptions, problems and analyze the causes difficulties of pre-service science teachers in integrated science teaching. The investigation was conducted with 228 participants included pre-service science teachers in science education department of Universitas Sebelas Maret, Surakarta, Central Java. Results showed 85,5% participants wiew that integrated scinence is difficult, only 30,8% participants have understanding of integrated science correctly, 55,7% stated difficult to make interdiciplinary relationships in suitable integrated science model. In the context of teaching and learning practice, 88,6% participants have difficulties when they have to explain the relationship concepts in multidisciplinary, difficulties in managing class discussions that encourage students to integrated thinking (70%). Qualitative analysis difficulties showed that to find the relationship of concepts interdisciplinary requires high order and combinatorial thinking skills, so they have difficultties. The quality and quantity of science educators, science curricula, and institutional policy also contributes to emergence of these difficulties. Therefore, equilization of perception science educators about integrated science teaching through various trainings or workshops is highly recommended in order to improve pre-service science teachers' competence in integrated science teaching .

Keywords: integrated science, integrated science teaching, pre-service science teachers' perceptions, pre-service science teachers' problems.

Learning Science In The Pandemic: The Design And Feasibility Of STEM@Home Aquaponics

SE-38

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Abstract. Integrated science learning needs to be applied in Middle School science learning. STEM approach, which adopts interdisciplinary concepts, is suitable for integrated science learning. This study aims to design and determine the feasibility of the STEM@Home Aquaponics learning design. The study used a mixed-method exploratory design, with the first stage is preparation for the STEM learning design, and the second stage was feasibility testing using the ex post facto method. Respondents for the feasibility test were lecturers, teachers, and pre-service teachers (N = 171). The data were analyzed quantitatively using Rasch analysis. The results showed that STEM@Home Aquaponics was valid and reliable. The level of positive assessment of male respondents is 60.5%. As many as 72.3% of teachers gave positive statements. 73.4% of respondents who have worked for 1–5 years stated that the design was valid. There are various kinds of unique assessment patterns. 18.7% of the respondents that have this unique answer pattern indicates that the respondent gave a dishonest and careless assessment. But in general, the STEM@Home aquaponics design was eligible.

Keyword: STEM, aquaponics, science learning, interdisciplinary concepts

Learning Model and Media in the Science Learning for Student with Deaf and Hard of Hearing

SE-47

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Abstract. Students (including students with Deaf and Hard of Hearing) can control the concept of science and learn more when learning is presented in a real-world context. Students with deaf and hard of hearing can understand science process skills by applying appropriate learning models supported by good facilities. The current literature review aims to provide an overview of learning models and media that can improve the understanding of science concepts in Deaf and Hard of Hearing students. A three-step literature review method was used in the current study, namely selection, analysis, and categorizations of the articles. Based on the results of previous research studies, the project approach, contextual, picture and picture, and inquiry learning model can improve conceptual understanding and learning outcomes of Deaf and Hard of Hearing students. On the other hand, visual media Schedule, multimedia (media that combines text, visuals, and interactive medi, Flashcards, virtual reality technology, and mind mapping media can be options for implementing science learning that helps to improve students' understanding of the concept of hearing impairment.

Keyword: Science Learning, Deaf and Hard of Hearing, Learning Model, Learning Media

The Science Learning Model for Students with Visual Impairment

SE-48

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Abstract. The students with visual impairment can understand and learn science concepts through appropriate supporting tools and learning models. Both students with and without visual impairment can learn a science concept if it is presented in a real-world context. Although students with visual impairment have limitations in obtaining information through their visual sense, they have the same range of cognitive abilities as students without visual impairment. The current study aims to provide an overview of various learning models in science learning that can effectively and efficiently improve visually impaired students' understanding of science concepts. This paper reviewed previous studies by selecting, categorizing and analyzing the articles extracted from databases of ERIC, Science Direct and Google Scholar respectively. According to a large body of literature, it has been found that the best learning models that can be applied to students with visual impairment are the Problem-Based Learning (PBL) and Sonified Learning (SL) models. These learning models are based on the student-centered approach and can be combined with supporting assistive media such as audio-based in form of computer and mobile learning games. Learning models with appropriate media integration have been found to improve conceptual understanding and learning outcomes of students with visual impairment in both special and inclusive schools.

Keyword: Science Learning, Student with Visual Impairment, Learning Models, Problem-Based Learning, Sonified Learning

Junior High School Students' Creative Thinking Skills: A Gender-based in The Era of A Covid-19 Pandemic

SE-49

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Abstract. Creative thinking skills are highly essential in this globalization era and become one of the 21st-century learning skills that must be integrated into learning. In addition, the era of a covid-19 pandemic encourages all people including the students to think creatively especially in completing distance learning. This study aims to reveal the students' creative thinking skills who are engaged in distance learning based on their gender. The subjects of the study were 32 students. Particularly, 15 male students and 17 female students. This study employed qualitative research. The research instrument was in the form of creative thinking questions. Then, the test scores were analyzed quantitatively. This was to obtain the result score on students' creative thinking skills. The results showed an insignificant difference between the score of students' creative thinking skills in male and female. Each gender (male and female) got an average score of 31.94 and 40.56. However, both were considered in the low category of creative thinking. This indicates the need to improve creative thinking skills training in distance learning.

Students' Metacognitive Abilities and Creative Thinking Skills: A Gender-based in The Era of Covid-19 Pandemic

SE-50

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Abstract. Metacognitive abilities and creative thinking skills are must-have skills for students in learning, the nowadays online learning. The students who possess adequate metacognitive abilities and creative thinking skills will be able to stabilize or improve the learning outcomes in online learning. Thus, this study aims to investigate the students' metacognitive abilities and creative thinking skills based on their gender. The study focuses on the students who are engaged in online learning during the pandemic of covid-19. The population of this study was 32 students. Specifically, 12 male students and 20 female students. This study employed a qualitative study. The instruments used were a metacognitive ability questionnaire and creative thinking questions. The results of the study revealed an insignificant difference between the score of metacognitive ability in male and female students. Each gender (male and female) got an average score of 75.54% and 76.12% and was in the high metacognitive category. The creative thinking skills, on the other hand, presented an adequate difference between male and female students' scores. Each gender (male and female) got an average score of 30.42 (low creative thinking category) and 46.87 (intermediate creative thinking category). This indicates the students' metacognitive abilities should be maximized and the students' creative thinking skills in online learning should also be improved.

The Role of Game-Based Learning in Developing Students Computational Thinking Skills: A Review of the Literature

SE-52

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Abstract. In the 21st century, computational thinking skills are essential for solving problems around computer science and solving problems in everyday life. This belief has been recognized globally, and more and more education systems integrated computational thinking into their compulsory education in recent years. Game-based learning (GBL) is one of the pedagogical frameworks used by educational units to develop CT skills. This study was conducted by reviewing the literature from 20 studies that provide empirical evidence of the use of game-based learning to develop computational thinking. This study used a literature review method by adapting Brennan and Resnick's framework to identify CT abilities that are expected to develop in game-based learning. The main finding in this study identified CT skills that can be obtained from the use of game-based learning based on the framework mentioned above. Additional CT skills not listed or explicitly stated in the framework were also included. Furthermore, this study also discusses the development of student learning motivation during learning activities using game-based learning.

The Analysis Results of National Examination on Human Digestive System Materials in SMPN 6 Ngawi

SE-70

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Abstract. This study aims to analyze the results of the national examination (UN) in science subjects on the human digestive system material in SMP Negeri 6 Ngawi from 2015-2019. The data collections use the documentation technique of the national examination results published on the official website of the Education Ministry and Culture's Puspendik. The data analysis is used descriptive qualitative research. The results of the study indicate the percentage of students who answered correctly on the human digestive system material was still low. It was proven that the percentage of students answered correctly the digestive system material for 5 years, namely in 2015 (62.98%), 2016 (25.73%), 2017 (53.20%), 2018 (33.66%), and 2019 (44.11%)

Keywords: National Examination, Human Digestive System.

Vocational Literacy: A New Paradigm Of Vocational Education And Training (VET) In Indonesia

SE-78

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Abstract. The research aims to create a vocational literacy theoretical model that can be used in vocational education in Indonesia. Vocational literacy is a development of the long-known concept of scientific literacy in the vocational school. This study uses narrative literature reviews from a variety of pre-existing scientific references. The existence of vocational literacy is important to build specificity and character in Vocational Education. The measurement of the literacy ability of vocational school students is often equated with the high school students who differ in their characteristics. The theoretical model of vocational literacy was developed to address these problems more focused and in-depth. The results of the study proposed a new concept of vocational literacy consisting of 4 dimensions and 16 indicators, the dimensions divided into the context of vocational, mastery of vocational knowledge, competency processes, and work attitudes which are then developed into 16 instruments, namely work preparation, response to technology, communication, and collaboration into each dimension. Furthermore, this study is also intended as a matter of consideration, basic information, and reference to the policyholders in the relevant agencies in making a decision.

Keywords: Vocational Literacy, VET, Scientific Literacy

Does The Scientific Literacy of Vocational High School Students (SMK) Competency Of Building Skills Low?

SE-79

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Abstract. Scientific literacy is one of the very important soft skills for students to have in the face of current competition. Therefore, this research will discuss how the scientific literacy test results of SMK students of the Construction and Property Engineering expertise program in Jakarta and Bogor (SMKN 26 and SMKN 35 Jakarta and SMKN 1 Kemang Bogor). This study uses comparative descriptive methods based about Mechanical Engineering. The results showed that out of 20 scientific literacy items, students at SMKN 1 Kemang Bogor had a higher score than SMKN in Jakarta with an average of 12.33 questions answered correctly, a maximum score of 16, and a minimum of 9. Meanwhile, students of SMKN 26 Jakarta have an average of 11.81 correct answers, a maximum score of 18, and a minimum of 7. At SMKN 35 Jakarta, the average student answered 10. 26 point with maximum scores of 14 and a minimum of 5. Although the results of the three schools showed a sharp difference. However, the results also show that there is still a very low scientific literacy ability of students in vocational schools building both in Jakarta and Bogor that can occur due to the lack of application of scientific literacy of students in vocational school Construction and Property Engineering expertise programs. The concept and model of scientific literacy that exists today is one of the factors why the literacy of vocational school students is low. This research suggests that there needs to be a more detailed and specific concept of literacy models that are prepared specifically for vocational school students

Keywords: Scientific Literacy, Vocational Building, Vocational Literacy

Mathematics
Day 2

Application of Combined GSA&sCSO Algorithm to Modified Bounded Knapsack with Multiple Constraints Problem against Uncertain Coefficient

M-61

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Abstract. Optimization problems are interest and common problems that are often encountered in life. Optimization can be applied to solve various problems, for example development, government, business, social, economic and something related to the limitation of resource capacity. The most frequently encountered, optimization is often used to find the best solution, that is maximizing profits or minimizing production costs. One of the optimization problems that often occurs is the knapsack problem. There are several types of knapsack problems, one of which is Modified Bounded Knapsack with Multiple Constraints (MBKMC) problem. In popular mathematical studies, metaheuristic algorithms are very often used to solve optimization problems. In this paper the authors did not only use one algorithm, but implemented two metaheuristic algorithms which were combined into one, namely the Gravitational Search Algorithm (GSA) and the Cat Swarm Optimization (CSO) algorithm. The combined algorithm uses the entire GSA algorithm mechanism which is added with the CSO algorithm seeking mode to become the GSA&sCSO algorithm. The author uses the GSA&sCSO algorithm to solve the MBKMC problem of uncertain coefficient. Based on the results of this paper, the GSA&sCSO algorithm produces a better solution than the GSA algorithm and the CSO algorithm and earn a better advantage in accordance with the knapsack capacity. In addition, the uncertain coefficient greatly affects the solution obtained from the problem.

Value at Risk Estimation with Hybrid-SVR-GARCH-KDE Model for LQ45 Portfolio Optimization

M-71

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Abstract. Stock is one of the financial instruments that has high variation. One way to determine the risk of a stock is to estimate its Value at Risk. However, Value at Risk cases tend to have fluctuating variations over time and are difficult to model because they are hypothesized to be non-linear. To capture the heteroscedasticity element, modeling with GARCH was carried out. Meanwhile, the identification of non-linear models can be solved using machine learning methods, one of them is the Support Vector Regression which is sensitive to over fitting cases. To produce an optimal model, it is strengthened by the Kernel Density Estimation. By using this combination, the SVR-GARCH-KDE hybrid method is obtained. From the estimation results of Value at Risk, it is best to optimize the portfolio to find out the right combination of investments to achieve optimum profit. The model is applied to Indonesia's LQ45 stock data, with representatives from each sector having the lowest PER and PBV. The study was conducted to determine whether the method used is able to capture various data patterns that contain heteroscedastic elements.

Stability Analysis of Coronavirus Disease Spread Model in Central Java Province, Indonesia

M-72

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Abstract. The coronavirus disease epidemic has been increasing rapidly, and it still has been in a state of concern since the first suspected case on December 1st, 2019, in Wuhan, Hubei Province, China. The purpose of this study is a dynamic model development for the coronavirus disease epidemic. The proposed model is built by considering the public awareness factor in using medical masks as parameters. Model analysis uses the Next Generation Matrix method to obtain the basic reproduction numbers. To observe the dynamics of the system, a stability analysis of disease-free equilibrium (DFE) of the proposed model is performed. DFE is stable if the basic reproduction number is less than unity, and unstable if it is more than unity. The Lyapunov method is used to determine the global stability of system. The system is globally asymptotically stable, if the value of the scalar function is definite positive and its first derivative is definite negative. Numerical simulations are demonstrated by using data coronavirus spread cases in Central Java Province, Indonesia. Declining the rate of transmission to the ideal level could empower us to control disease spreading. Numerical simulations are also carried out to anticipate the spread of disease in the community.

Mixed Spline Truncated, Kernel, and Fourier Series Estimator in Biresponse Nonparametric Regression

M-77

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Abstract. The general regression model is divided into three forms, namely parametric, nonparametric, and semiparametric model. Regression is a method used to analyze the relationship between response variables and predictor variables. The shape of the regression model depends on the regression curve. Nonparametric regression has become a concern of many researchers because it can determine the relationship between the predictor variable and the response variable which has an unknown regression curve. Nonparametric regression is very flexible so that the model can follow linear or nonlinear functions. Several nonparametric regression approaches that are often used are Spline Truncated, Kernel, and Fourier Series. Nowadays, many studies related to nonparametric regression have been carried out, either with a single estimator or a mixed estimator. So far, research with mixed estimators mostly uses only two estimators. There have not been many studies related to nonparametric regression models involving 3 mixed estimators. Therefore, the purpose of this study is to find a mixed estimator of Spline Truncated, Kernel, and Fourier Series in the biresponse nonparametric regression using the WLS method. The results show that the WLS estimation produces a Spline Truncated estimator, Kernel estimator, Fourier Series estimator, and also a mixed of that 3 estimators.

Mixed Estimators Spline Truncated, Kernel, and Fourier Series in Nonparametric Regression for Longitudinal Data

M-81

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Abstract. One of the approaches to determine the relationship pattern between predictor variables and response variables in regression analysis is using nonparametric regression. This approach can be used when the data pattern is unknown. Recently, researchers have assumed that each predictor variable in nonparametric regression has the same data pattern by using one form of the estimator for all predictor variables. However, in many cases, there are different data patterns for the relationship of each predictor variable and response variable that partially change in certain sub-intervals, some do not have a set pattern, and some others have a repeating pattern. When used only one form of an estimator to estimate each predictor variable, it will produce a bias estimation. Therefore, it requires a mixed estimator to get the better nonparametric regression estimation which is set with data patterns. In this study develop a mixed spline truncated, kernel, and Fourier series estimator for nonparametric regression estimation. It was applied to longitudinal data that repeatedly measured in each subject at different time intervals. A real case was presented to estimate the poverty model in 34 provinces in Indonesia from 2015 to 2020. Weighted Least Square (WLS) approach was utilized as the estimation method. Based on the results of the analysis, the best nonparametric regression model was obtained, namely the model with 1 knot 1 oscillation, with a minimum GCV value of 0.25.

Application of the Delone and McLean Information System Success Model to evaluate the Success of Web-Based System Adoption - A Literature Review

M-87

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Abstract. The success of an information system is important in supporting the development of the information system. McLone and DeLone's success model is one way to evaluate the success of an information system. Success Model DeLone and McLean have six success factors to determine the success of an information system. This paper provides a review on 20 papers with a systematic review method, which discusses the characteristics of success in information systems and the implementation of the adoption of the success model. This systematic review has adopted Chitu Okoli and Kira Schabram framework as the premise for defining and identifying Information System Success Theory. The main findings in this paper is there is a knowledge gap in the form of steps or strategies taken to follow up on the results of the research on the success of information systems that have been carried out. Also, there is still a lack of literature that explicitly discusses the evaluation of the success of academic information systems using the DeLone and McLean is success model.

Mathematical Model for Inflammatory Response to Coronavirus Infection with Anti-Inflammatory Treatment Intervention

M-95

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Abstract. Increasing the concentration of anti-inflammatory cytokine inhibits inflammation in human blood vessels due to the excessive production of the pro-inflammatory cytokine, i.e., cytokine storm during Coronavirus infection. This research aims to construct and analyze a mathematical model of the interaction between pro-inflammatory cytokine and anti-inflammatory cytokine with the addition of treatment factor on anti-inflammatory cytokine to identify the effect and the appropriate level of the treatment in reducing the possibility of the cytokine storm. The method used in this research is constructing a three-dimensional differential equation system as the mathematical model of inflammatory response system including the treatment factor, an accurate analysis by calculating the equilibrium points and their local stability, numerical simulation, and medical interpretation of the results as the conclusion. There are two equilibrium points in the model related to the treatment effect. The E_i equilibrium point represents the static condition of the concentrations for a long time without treatment while the E_0 equilibrium point represents the static condition for a long time with treatment. E_i is a saddle, the cytokine storm has a possibility to be triggered. E_i is asymptotically stable, therefore that the production of pro-inflammatory cytokine is reduced to a specific value due to the effect of the treatment on anti-inflammatory cytokine. The maximum rate of treatment should be in the range of values which is a condition for the existence and asymptotic stability of the E_0, So that the concentration of pro-inflammatory cytokine can be reduced. Furthermore, the possibility of cytokine storms can be decreased.

MaxXS^{tn} Control Chart for Monitoring Mean and Variability Process

M-110

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Abstract. Control charts are the most often technique used in the industry to continuously monitor a process for quality improvement. This paper proposes a variable control chart based on attribute inspection, denoted as Max-**XS**^{TN}, to evaluate the stability of mean and variability processes using a single chart. The main advantage of using the attribute inspection is its ease of use and lower costs required compared to the variable-type inspection that using the actual value. Quality characteristics are monitored using a go/no go gauge with five categories. In practice, a sample with the size of n is taken periodically and each item is allocated to one of five categories with adjusted go/no go boundaries, then a value is generated randomly for each item based on a truncated normal distribution with an upper and a lower limit truncated according to the dimensions of go/no go gauge. The performance evaluation is carried out using the Monte Carlo simulation and its efficiency is confirmed by adding the sample size. Therefore, the proposed Max-**XS**^{TN} chart can be considered as an alternative to control charts with the variable-type inspection. An example with the real case is presented to illustrate the application of Max-**XS**^{TN} chart.

Domination Number Of A Complement Of Signed Graph

M-127

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Abstract. Abstract. A signed graph Σ is transformed into a complement of Σ and denoted as Σcα with the same vertex set as Σ and the edge set E(Σcα) = E(Kn) + E+(Σ) − E−(Σ). In this paper, We study the N-G bounds for Σ. In addition, we achieving the upper bounds for Σcα.

Keywords: Signed graph, Dominating set, complement

2010 Mathematics Subject Classification: 05C22, 05C69.

Generally Weighted Moving Coefficient of Variation (GWMCV) Control Chart Using Three Parametric Log-Normal Transformations

M-157

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Abstract. Nowadays, statistical process control (SPC) is widely used in manufacturing companies and services. The control charts are the most necessary tool in SPC because they can timely detect assignable causes that affect the quality of the production process. Mostly, the control charts are used to monitor the process mean and process standard deviation. However, when the mean changes but considered as in-control and the standard deviation is proportional to the mean, the Coefficient of Variation (CV) chart is suitable for monitoring process variability. In recent years, the CV control chart is developed based on the Exponentially Weighted Moving Average (EWMA) type using three parametric of log-normal transformations. In this study, we propose a Generally Weighted Moving Coefficient of Variation (GWMCV) control chart using three parametric of log-normal transformations to enhance the detection ability of the control chart. The Simulation studies show that when parameter GWMCV chart is more sensitive than EWMCV chart. Also, the proposed GWMCV chart is applied to monitor the process production of NPK fertilizer. The result shows that proposed chart detect out-of-control signal rapidly than the existing chart.

Some Snake Graphs are Edge Odd Graceful

M-199

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Abstract. Sholairaju and Chithra introduced a graph which admits an edge odd graceful labeling called an edge odd graceful graph. An edge odd graceful labeling of a graph G on q edges is a bijection f :E(G)⟶ {1,3,5,…,2q-1} so that the induced mapping f+ :VG⟶ 0, 1,2,…,2q-1 given by f+x=xy∈EGfxy(mod 2q) is injective. A triangular snake C3m is a graph obtained from a path u1u2 u3um+1 by joining every ui and ui+1 to a new vertex vi. A quadrilateral snake C4m is a graph obtained from vertices u1,u2, u3,…, um+1 by joining every ui and ui+1 to two vertices vi and wi. In this paper we study edge odd graceful labelings of C3m and C4m.

Keywords: labeling, edge odd graceful, triangular snake, quadrilateral snake.

Characterization of F-bounded on Fuzzy-Metric Space

M-201

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Abstract. Metric has an important role in analytical and applied mathematics. The expansion of the metric space continues to arise and studied until examined more deeply. One of the new concepts of this metric space is fuzzy α-metric space. This paper discusses convergence sequences, Cauchy sequences, completeness, and construction of fuzzy α-metric space that fulfill characteristics of F-bounded.

Pricing Indonesian Earthquake Catastrophe Bond based on Depth and Magnitude

M-203

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Abstract. An earthquake is a big disaster that might cause a large amount of loss. Various ways had been proposed to overcome this situation, including the usage of catastrophe bonds. In this study, we propose an earthquake catastrophe bond in which both the coupon payment and principal payment are affected by the occurrence of earthquakes during the period. The pricing of this bond consists of several steps as follows: (1) obtain the earthquake data, (2) model the probability distribution of earthquake magnitude and depth, (3) propose the catastrophe bond's payment structure, and (4) derive the price formula. A numerical study using the data of earthquakes around Java and Sulawesi, Indonesia, is provided. We find that these data can be modeled well using Generalized Extreme Value (GEV) distribution, Rayleigh distribution, and Generalized Pareto distribution.

Benchmarking Hierarchical Bayesian Small Area Estimators in The Percentage of Poverty at Sub-districts Level in Central Java

M-205

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Abstract. Solving poverty is the biggest global challenge, so it becomes the first goal in the Sustainable Development Goals (SDGs). The availability of accurate data is an important aspect to support poverty reduction strategies. The Central Bureau of Statistics (BPS) has not been able to calculate the percentage of poverty up to small areas, such as sub-districts, because the samples in the survey were not representative. Small area estimation (SAE) is a method used to estimate a small area with less or no sample. The problem arises when the estimator produced is not the same as the official statistics published for the higher level. The SAE often involves constructing predictions with an estimated model followed by a benchmarking step. In the benchmarking operation, the predictions are modified so that weighted sums satisfy constraints. In this study, Hierarchical Bayesian (HB) area level models are used to estimate the sampled and non-sampled areas. Posterior means and posterior variances of parameters of interest are first obtained using the Markov Chain Monte Carlo (MCMC) method. Then the HB estimators (posterior means) are benchmarked to obtain Benchmarked HB (BHB) estimators. Posterior Mean Squared Error (PMSE) is then used to measure uncertainty for the BHB estimators. The PMSE can be represented as the sum of the posterior variance and the squared difference of HB and BHB estimators. We evaluate the HB and the BHB estimators in the context of the estimated percentage of poverty at the sub-districts level in Central Java, Indonesia.

MGSTARX Model for Forecasting Space-Time Data with Metric Exogenous Variable

M-211

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Abstract. The Multivariate Generalized Space-Time Autoregressive (MGSTAR) model is a model that used to forecast space-time data with several variables in several locations. MGSTAR model has been developed into hybrid MGSTAR ANN model for non-linear cases and hybrid MGSTARX-RNN model for cases with non-metric exogenous variable, that is calendar variation effects. This study aims to propose MGSTARX model for cases with metric exogenous variable. There are two steps of MGSTARX modeling. The first step is modeling the data that involve exogenous variables using two approaches, i.e., Time Series Regression (TSR) and Transfer Function (TF). Then, the residuals from the first step are modeled using MGSTAR. This study focused on a simulation to evaluate the goodness of the MGSTARX model. The result shows that the MGSTARX model with transfer funtion approach is more accurate and has smallest RMSE for forecasting the data than the others model. In general, MGSTARX model with an exogenous variable can improve the accuracy of forecasting. This result is in line with the results of the M5 Accuracy Competition. Further study is needed to expand the MGSTARX model for higher dimensions data and other patterns such as seasonal and non-linear.

Keywords: Metric Exogenous Variable, MGSTARX, Multivariate Space-Time, Time Series Regression, Transfer Function.

Portfolio Optimization with Mean Absolute Deviation Models using Particle Swarm Optimization Algorithm: A Case Study in Indonesia During Covid-19 Pandemic

M-215

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Abstract. The risks that are occurring due to the impact of Covid-19 pandemic in investment activities, that is the effect on the movement of stock prices various companies in Indonesia. The purpose of this research is to minimize the risk and maximize return in stock investments in the Mean Absolute Deviation (MAD) model by using Particle Swarm Optimization (PSO) algorithm based on historical data. The first stage in the research, that is the implemented of a portfolio into the form of linear programming, then performed calculations on the MAD risk model, then the development of PSO algorithms will be arranged and evaluated based on fitness value using MATLAB. The proportion result is compared and obtained the optimal weight given to selected stocks from the expected return and the standard deviation. The results showed that the MAD risk model using PSO algorithms have the consistency and speed of convergent solutions in developing and optimizing stock portfolios and are certainly has better performance than MAD risk model. Therefore, PSO algorithms in this research is considered effective that it is useful to assist investors in designing investment strategies and building optimal portfolios.

Parameter Estimation and Hypothesis Testing of Multivariate Adaptive Bivariate Generalized Poisson Regression Spline

M-227

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Abstract. Poisson regression is a regression method used to model the count data. The response variable of Poisson regression has a Poisson distribution. Poisson regression assumes that the response variable average value is equal to the response variable variance value, called the equidispersion condition. Generalized Poisson Regression (GPR) is used to overcome that if the equidispersion assumption cannot be fulfilled. If there are two correlated responses variable, the modeling used Bivariate Generalized Poisson Regression (BGPR). Multivariate Adaptive Regression Spline (MARS) is a nonparametric regression method with flexibility in high-dimensional data. Multivariate Adaptive Bivariate Generalized Poisson Regression Spline (MABGPRS) is a development of the MARS method and BGPR method. This study will discuss parameter estimation and test statistics for the MABGPRS model. The estimation of the MABGPRS model parameters was carried out using Weighted Least Square (WLS) method and the Maximum Likelihood Estimation (MLE) method. The test statistics for simultaneous and using Maximum Likelihood Ratio Test (MLRT).

Keywords: BGPR, MABGPRS, MARS, MLE, MLRT, WLS

Mathematical Literacy in Primary Schools: A Systematic Literature Review

M-242

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Abstract. Mathematical literacy began to receive international attention with the release of PISA results. PISA measured the mathematical literacy performance of 15-year-old students, and most recent studies used PISA's definition of mathematical literacy. The mathematical literacy of young learners had not received much attention. This study reviewed articles on mathematical literacy, especially those related to primary schools published within 2013-2019. This study aimed to determine the mathematical literacy concept, instructional, and assessment in primary schools. The research was conducted followed the Systematic Literature Review (SLR) protocols. Only high-quality articles, which were published in SJR indexed journals, were included in the review. Twenty articles derived from Google Scholar, Springer, Science Direct, and Taylor & Francis had been selected. The results showed that (1) mathematical literacy for primary schools was defined differently from one institution to another; (2) mathematical literacy instruction in the present should place more emphasis on the competencies needed in the real world, especially thinking skills that computers can not do, for example, fair decision making based on social and mathematical thinking; and (3) mathematical literacy can be measured in various ways according to the purpose of the assessment.

Bivariate Binary Logistics Regression

M-280

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Abstract. Regression analysis is a statistical analysis method that used to describe the relationship model between two or more variables. In the relationship model, the variables that used are grouped into two, namely response variables and predictor variables. Logistic regression is a regression model that is often used for modeling the relationship between the qualitative (categorical) dependent variable and one or more independent variables. Modeling with logistic regression depends on the category and the number of categories on the dependent variable. Logistic regression model that has a dependent variable of two categories is called a dichotomous (binary) logistic regression model. Binary logistic regression using one response variable can be developed into a binary logistic regression model with two response variables namely bivariate logistic regression (BLR). This research is focused on developing a second-order bivariate binary logistic regression model for the independent variables. *Maximum Likelihood Estimation* (MLE) method is used to estimate the parameter with *Fisher Scoring* and Berndt-Hall-Hall-Hausman (BHHH) iteration methods. The hypothesis testing for bivariate logistic regression model is carried out simultaneously dan partially by the *Maximum Likelihood Ratio Test* (MLRT) method.

Keywords: Logistic Regression, Bivariate Binary Responses, MLE, Fisher Scoring, BHHH, MLRT

The Relationship between LipF(a,and BVFα.p(a,b)

M-311

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Abstract. In this paper we introduce a new concept of fractal Lipschitz space (, -) ( ) and fractal bounded variation space (, -) ( ) which generalizes the Lipschitz space and bounded variation space respectively on fractal set, and discuss some relationship between that space. In particular, In particular, we show that a function (, -) if and only if (, -) where is fractal variation function.

Mathematics Education
Day 2

Invited Speaker

Designing a Family Board Games for Teaching Fractions Based on Theory of Mathematical Abstraction and Multiple Representation

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Abstract. Fraction as one of the fundamental basic concepts in mathematics is one of the most challenging topics for students in elementary and secondary level. Many students impartially understand that fraction has more than just symbols to be operated but it has many faces as a part-whole, a division, a measurement, an operator and ratio.During pandemic situation, teachers need to collaborate with teachers in order to teach the students in remote learning. Teaching fractions in this situation actually can be done by giving real examples in daily life, unfortunately some parents also having difficulties in helping their children to understand concept of fraction. This study aims to describe the design process of a family board games that can be used to learn concept of fraction through in joyful situation. The board games is designed based on theory of mathematical abstraction and multiple representation. The ADDIE method is used to accomplish the board games design. The result of the study is a final design of the board games with the title "Fraction Bakery" consisted of a board games, a packed of cards and a set of learning strategie.

Keyword: fraction, mathematical abstraction, multiple representation, board games.

Improving Critical Thinking Skills Through Asychronus Learning with Scientific Approach in The Seminar Courses of S1 Mathematics Education Study Program, FKIP University Of Bengkulu

ME-152

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Abstract. This study aims to improve students' critical thinking skills through Asynchronous learning using a scientific approach in the Seminar course. This research method is Classroom Action Research with 2 cycles consisting of planning, implementation, observation and reflection. The subjects of this study were S1 Mathematics Education Students, FKIP University of Bengkulu, odd semester 2020/2021 with Seminar Courses. Data were collected through tests and observations. The improvement of students' critical thinking skills has increased from 64.8 to 82.6.

Keywords: Critical thinking, Asynchronous Learning, Scientific Approach

Reflective Experiences in the Development of Learning Activities for Teaching Mathematics

ME-160

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Abstract. A core component of the Master of Teaching (MTeach) programme in the graduate school of education in a university in Brunei Darussalam is a module called Professional Practice and Seminar (PPS). The PPS entails the graduate teacher candidates to be placed in schools for 12 weeks in each of the two semesters within the 18-month programme. During the PPS, teacher candidates will be encouraged to examine and reflect on how the evidence they collected during their teaching practicum relates explicitly to the set assessment criteria to be discussed during fortnightly seminars. In this study, we explore the development of learning activities from relevant lesson contents that assisted the teacher candidates in informing the decisions they made in their Mathematics classroom teaching. The sample consisted of six MTeach graduate teacher candidates teaching Mathematics at three different secondary schools. Data were collected from the seminar presentations and analysed qualitatively using emerging themes. The themes that transpired in relation to their responses to the assessment criteria are firstly, establishing learning goals based on the school's scheme of work; secondly, designing and providing learning experiences that involves several different styles of approach as depicted by their own students' needs and interests; and finally, the use of technological tools in their lessons depends on the resources that are available. These reflective experiences supplemented with evidence from their classroom teaching are necessary in shaping the professional knowledge and skills of the teacher candidates.

Indonesian Ethnomathematics for Mathematics Learning in Junior High Schools: a Scoping Review

Me-220

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Abstract. Ethnomatematics is a learning innovation using culture as a context for studying school mathematics material. Cultural exploration is the first step in finding and analyzing what culture can be used as a context in learning a mathematical concept. The purpose of this scoping review is to identify the results of Indonesian ethno-mathematics exploration in junior high school mathematics material. The method used in this scoping review uses the framework proposed by Arksey and O'Malley's. There are 643 journal articles found through the google scholar database based on predetermined keywords. Furthermore, 36 articles were selected to be used as review material. The article criteria have been used in the last 5 years, from 2016 to 2020. The results of the study show that the results of ethnomatematics exploration in Indonesia for junior high school mathematics material, (1) explored ethnomathematical products in the form of ideas, artifacts and activities; and (2) fields of mathematics related to ethnomathematics, including geometry, algebra and statistics.

Ethnomatematics Learning Media Based On Augmented Reality For Learning Geometry : A Needs Analysis

ME-221

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Abstract. Two-dimensional and three-dimensional geometric shapes are often mathematical objects that are difficult for elementary and junior high school students to understand. Using Augmented reality technology to visualize it can make it easier for students to learn geometry material. The purpose of this study was to analyze the need for developing learning media based on ethnomathematics with augmented reality. This research is quantitative research. The research subjects were 41 mathematics teachers in Yogyakarta, Indonesia. Subject determination techniques using cluster random sampling in 5 districts in Yogyakarta Province. Research data were collected by giving questionnaires to respondents. The results of this study indicate (1) most of the teachers found that their students had difficulty in learning geometry material; (2) most mathematics teachers rarely use culture as a learning context; (3) all mathematics teachers have never used ethnomathematics-based Augmented reality-assisted learning media; (4) all mathematics teachers are in dire need of learning multimedia innovations to teach geometry material, such as Augmented Reality; and (5) the development of ethnomathematical AR multimedia based on geometry material can be a solution to create an innovation in mathematics learning that can facilitate students in learning, so as to improve mathematical abilities, make learning more meaningful, and can increase student self-regulated learning during the pandemic.

Critical Thinking Ability of Students at SMPN 2 Kudus with Impulsive Cognitive Style on Two Variables Linear Equation System Material

ME-259

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Abstract. Critical thinking ability is ability to use strategy, analyse, and collect the information based on evidence to make a conclusion. This research is aimed to find out student's critical thinking ability based on impulsive cognitive style on the two-variable system of linear equations in SMPN 2 Kudus. The samples in this research were two students. This research was qualitative research. Instrument that used was researcher itself as main instrument. Besides, it used Matching Familiar Figure Test and critical thinking ability's test. The finding of the research showed that student's critical thinking ability with impulsive cognitive style on the two-variable system of linear equations had the fairly good critical level. The students only fulfilled two of four critical thinking ability indicators.

Analogical Thinking of Student in Solving Function Problems Based on Mathematical Disposition

ME-305

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Abstract. The purpose of this study was to describe the analogous thinking process of students in solving functional problems. This type of research conducted in this research is descriptive qualitative. This research was conducted on all the third-semester students taking online basic calculus courses in the 2020/2021 academic year in Mathematics Education Program (Tadris Matematik Institut Agama Islam Negeri Curup. By using the purposive sampling technique, the sampling consisted of three students who were selected based on the students' mathematical dispositions, namely high, medium, and low dispositions. Based on the results of the research and discussion, it can be concluded that the following are: first, that the research subject does not understand how the actual analogy thinking stage is, the subject only performs the mapping and applying stages; Second, the students' mathematical disposition is quite good in working on the problems, but if it is seen in the problem solving, the students are not persistent, not thorough, have less curiosity and do not work hard in solving functional problems; and Third, students with high, medium, and low disposition levels have the same analogical thinking process. There is no difference in the solving of the problems.

Keywords: analogy thinking, functional problems, mathematical dispositions

Contributions And Constraints When Using The Self-Directed Learning Model To Improve Mathematical Understanding Ability, Self-Regulated Learning and Self-Confidence

ME-319

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Abstract. The purpose of this study is to know and analyze the contributions and constraints when using self-directed learning models towards mathematical understanding ability, self-regulated learning, and self-confidence. This research was conducted at one of the universities in West Java in mathematics education program level 1. This type of research is descriptive qualitative research and the instrument used are observation sheets, questionnaires, and interviews. The results of the research show that the process of self-directed learning contributes to the ability of mathematical understanding and to the development of self-regulated learning and self-confidence of students. The obstacles faced in self-directed learning include students who have not been able to follow the learning process, do not plan activities and learning components and there are still students who have not been able to express opinions or ideas during the discussion.

Keywords: Self-directed learning model, mathematical understanding ability, self-regulated learning, self-confidence

Pre-Service Mathematics Teachers' Engagement in Geogebra Applet-based Task Design in Online Learning

ME-321

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Abstract. In online learning during this pandemic, pre-service mathematics teachers' engagement is the key to success in mathematics course, especially in analytic geometry courses. The way to encourage , pre-service mathematics teachers' engagement in analytical geometry lectures is to use a geogebra applet-based didactic design. This study aims to describe , pre-service mathematics teachers' engagement in online lectures using geogebra, namely in analytical geometry and multivariable calculus courses. This research was conducted on 72 pre-service mathematics teachers who enrolled in analytic geometry or multivariate courses. Data were collected using a Math Engagement Scales questionnaire consisting of cognitive, behavioral, social and emotional dimensions. This questionnaire uses a Likert scale. The data were analyzed quantitatively descriptively. The results show that pre-service mathematics teachers' engagement is in the high category. In detail, pre-service mathematics teachers' engagement in the high category in terms of cognitive, behavioral, emotional, and social engagement. These results show the use of geogebra applet-based didactic design can encourage pre-service mathematics teachers' engagement in online lectures.

Environment Education & Biology Day 2

The Analysis of Quality Service Suroboyo Bus based on Passenger's Perception

EE-307

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Abstract. Surabaya is a metropolitan and the capital city of East Java Province, with the level of traffic congestion is getting more congested. People should decide to use public transportation to create better, orderly, effective, and efficient transportation. In 2018, the Surabaya City Government issued a public transportation policy by operating the Suroboyo Bus. It is one of the solutions to reduce congestion problems that occur in Surabaya. However, the operation of the Suroboyo Bus is still not optimal. It from the lack of passengers who use the Suroboyo Busto meet the needs of public transportation. Therefore, the study analysis of Suroboyo Bus quality service aims to improve the service quality of bus facilities based on passenger's perception. The method used in this study includes the distribution of questionnaires through Google Forms with stated preference and revealed preference techniques.

Ventral Pelage Variation of the Endangered Colobine Monkey, Javan Fuscous Langur *Presbytis comata fredericae* Sody, 1930

B-210

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Abstract. *Presbytis comata sensu stricto* is an endemic langur from Java inhabiting the lowland to the upland forest in the west, central, and few regions in the east part of the Java Island. This species inhabits the 33 sites in Java with an endangered status as according to the IUCN. The '*sensu stricto*' means that this species may be classified differently. Some authors agreed that they fall into two separated species, while others prefer to keep it as one species with two subspecies categories. Without attempting to intervene in the classification polemic, this paper aims to present the variation of the ventral pelage coloration of the langur. This paper stand on the descriptive analysis. We analyzed 11 photos of the langur representing 11 different individuals from Petungkriyono (the western part of Dieng Mountains) and Mount Merbabu. We also analyzed four videos from both research site and one taxidermic specimen of individual from Mount Merbabu. The ventral coloration of the newly found langur of Merbabu resembles the *Presbytis comata fredericae* identified from Mount Slamet. Commonly, the pelage of the Merbabu's langur is black or dark gray on the dorsal side and with a clear white hair color on the ventral side. The bright white in the ventral side differs Mount Merbabu's langur from its conspecific of the Dieng Mountains.

Overstory Community Analysis of the Habitat of Fuscous Javan Langur in Mount Merbabu with Implication for the Management Plan for the Langur's Conservation Strategy

B-212

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Abstract. Habitat fragmentation becomes the main factor affecting the population size and distribution of the leaf-eater langur *Presbytis comata fredericae*. This phenomenon can affect the available floristic composition in terms of the diversity and abundance to support an adequate amount of foraging substrate for the monkey. This paper deals with overstory floristic community structure in the habitat of the Javan Fuscous Langur. Here, we focused on the community structure analysis of the tree community. This type of vegetation is critically determining the arboreal behavior and providing the leaf-food source for the langur. We employed survey-based research by applying the Point-Centered Quarter (PCQ) technique to gain the data from two research stations with 14 grids and 24 representative points in the primary and secondary forests. We used PAST analysis to assess the appropriateness of the results of the diversity index (H') resulted from Shannon-Wiener's diversity formula. The formula yielded the diversity value of 1.02 and 0.89, indicating a low diversity index and showing problems of species evenness and diversity. This low diversity index of the tree community tells the low diversity of foraging substrate for *Presbytis comata fredericae.* Yet, as the available food, choice is restricted, the problem related to resource competition and conservation may occur. Conserving the habitat of *Presbytis comata fredericae* through restoration and corridor maintenance is critically ensuring the existence of the *langur* in its habitat.

Lower Crop Community Structure and its Implication on the Availability of Food Substrate for the Javan Fuscous Langur

B-219

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Abstract. Habitat degradation and fragmentation may provide the opportunity for succession allowing invasive species and many other lower crop communities to exist and contribute to the structure of the lower crop community. Mount Merbabu in Central Java is one of the protected areas in Java that has suffered from forest degradation and fragmentation, threatening the habitat of the endangered primate Javan Fuscous Langur *Presbytis comata fredericae*. Nowadays, invasive species have abundantly created a cover in the forest ground. This new lower vegetation structure may lead to some ecological consequences, including the quality and quantity of food substrate available for the langur. As the study on this new vegetation structure has not been carried out yet, therefore our research aims at examining the community structure of the lower vegetation on the forest ground. We analyzed the community properties based on the species richness and equitability that is expressed in the community's diversity index (H'). We engaged with the PAST Software to validate the value of the H' index. The overall of our analysis and discussion stands in the context of linkage between the vegetation diversity and its service in providing a more diverse food source. This research found 122 plant taxa. As the species equitability is considered low, the overall value of the H' index then falls into only 1.02 and 0.01, indicating a low-value diversity index. Most of the lower crop species were potentially serve as an alternative food resource for the Javan Fuscous Langur. The Javan Fuscous Langur may adaptively use this abundant ground crop to survive in the degraded forest.

Biology Education
Day 2

Development and Feasibility Test Of The Educational Card Game "RECAME" Based On Scientific Literacy In The 11st Grade Students

BE-189

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Abstract. The low scientific literacy in Indonesia can be caused by the unpreparedness of students in HOTS (High Order Thinking Skill). HOTS learning has not been fully maximized, especially in biology. Biology has some complex material, for example studying the human body system. In order to increase scientific literacy, the learning style can work well if the learning is interactive and fun, one way is by using game learning. This study aims to 1) Know the characteristics of the scientific literacy-based of Educational Card Game "RECAME" for the 11st grade students 2) Determine the feasibility of the scientific literacy-based of Educational Card Game "RECAME" for the 11st grade students on the concept of respiratory system so that it is feasible to use. This research is a mixed method research, it's adopted the research steps of Arnel A. Gutirrez that consists of three stages, (1) the preparation stage, (2) the game development stage, and (3) the validation test. The research subjects were a final year students of biology education of Sebelas Maret University and biology teachers of the MGMP Karanganyar region. The data collected in this study are data from an online questionnaire and analyzed using RASCH analysis. The results show that 1) the characteristics of RECAME are the topics and conceptualization, learning progressions are made based on the NGSS and 2013 curriculum, visualization in the form of static and dynamic media, structured game rules, and aspects of scientific literacy that are included in each game round. 2) the results of the product feasibility assessment show that the logit rating scale has increased from 0.59, 1.82, 3.36 and the Andrich Threshold size moves from NONE, negative, positive, the MNSQ outfit value data 0.66 to 1.24, ZSTD value 1.45 to -1.71, and the point measure value 0.60 to 0.40. The conclusion is RECAME's characteristic and RASCH data have been tested as a valid card game so that it is feasible to use.

The Effect of The Local Wisdom-Based Comic Media On Students' Conceptual Understanding Viewed From Gender

BE-191

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Abstract. This study aims to reveal the effectiveness of local wisdom-oriented comic media in expressing students' conceptual understanding of different genders. This research was a quasi-experimental study that adopted a separate sample pretest-posttest design. The subjects of this study were junior high school students from two different regions in West Nusa Tenggara Province, namely SMPN 2 Gangga, North Lombok and SMPN 2 Batukliang, Central Lombok. Schools were taken randomly with a total number of 48 students as samples. The students' conceptual understanding was collected through tests and analyzed using the formulas of N-gain, N-Loss, and independent-sample t-test to determine the effectiveness of comic media. The results showed that the implementation of comic media had a positive impact and could increase students' conceptual understanding of coral reef. More specifically, female students were likely to have smaller N-loss scores than male students and have a better conceptual understanding than male students ($p<.05$).

Keywords: Comic media, conceptual understanding, gender.

The Influence of Demographic Factors on Environmental Knowledge of University Students in Indonesia

BE-198

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Abstract. This study aims to explore and reveal the demographic factors that influence students' environmental knowledge in Indonesia. This research is survey research that involves 1345 students from 15 universities across Indonesia. The research instrument used is a questionnaire on environmental knowledge adopted from Raymond et al (2010) and modified to match the circumstances in Indonesia. The instrument consists of 6 statements with 5 scales, namely 1 = strongly disagree, 2 = disagree, 3 = indifferent, 4 = agree, and 5 = strongly agree. Five demographic variables were tested together to determine their effect on students' environmental knowledge. Descriptive analysis, ANOVA, and multiple linear regression were used to test the independent variables. The result of the study reveals that gender, study program, grade point average, and parents' occupation variable have an effect simultaneously on students' environmental knowledge ($p<.05$) with a contribution of 6.2% (R square = .062), while the students' grade variable has no effect on environmental knowledge ($p>.05$). This research reveals that; (1) female students have better environmental knowledge than male students ($p <.05$), (2) the trend shows that the higher the grade point average, the higher the environmental knowledge of the student ($p<.05$), (3) the trend shows that students whose parents have lower income tend to have better environmental knowledge than those whose parents have higher income, and (4) students in science education and computer course have better environmental knowledge than science, non-science education, and social humanities study programs. The result of this study implicates the importance of introducing environmental insights through education to increase the environmental knowledge of the students in higher education.

Keywords: Demographics, environmental knowledge

Analysis of Potential Learning Models to Formulate Fact-Based Concepts

BE-223

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Abstract. This study aims to find out potential learning models to find facts and concepts on biological subjects. The method used in this study is library *research.* Literature research is the collection of data directed at the search for data or information through documents, be it written documents or electronic documents that can support in the writing process. Literature research can be sourced from scientific articles, journals, and documents that are willing to be confused with research. From the discussion can be accommodated that the potential learning model to find facts and concepts is a discovery-based learning model, which actively builds and composes its year based on its own experience.

Analysis of the Needs of Android based Mollusca Teaching Materials for The Learning of Class X High School Students

BE-224

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Abstract. Teaching materials are needed to help the learning process. The increasing technology development of teaching materials is not only packaged in printed form, but also in electronic form. Android-based electronic teaching materials can be operated anywhere with a series of interactive menus making it easier for students to access and get various materials to be studied. This study aims to analyze the need for teaching materials that need to be developed on the Mollusca material. This data will later be used as the basis for the preparation of teaching materials that need to be developed in Mollusca subjects which can improve understanding and can be studied independently by students. The type of research used is qualitative with a qualitative descriptive approach. The research subjects were students of class X IPA Class 2020-2021 SMA. The sample was randomly selected as many as 80 students. The data collection technique was carried out by distributing questionnaires through the help of google form, teacher interviews and observations. Interview data were analyzed descriptively and questionnaire data were analyzed by percentage. Based on the research data, it can be concluded that it is necessary to develop Android-based Mollusca teaching materials. Android-based Mollusca teaching materials were chosen because they can facilitate students to learn independently and interactively.

Keyword: *android, mollusca, teaching materials*

Religious Values in Biology Learning: A Need Analysis of An Islamic-Integrated Reference Book of Medicinal Plants Typical of Central Kalimantan

BE-229

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Abstract. People of Central Kalimantan have knowledge and utilization of plants as a medicine for generations inherited from their ancestors orally with no written archives. The research aims to find out the potential of the importance of developing an Islamic-integrated reference book of medicinal plants typical of Central Kalimantan. The book is a supporting book in a lecture that contains the utilization of medicinal plants in the people of Central Kalimantan integrated with the utilization of plants as a medicine according to Qur'an and Hadith with to instill religious values of a healthy lifestyle and the relationship between humans and natural environment. The research is descriptive qualitative research using data collection techniques of observation method, interviews, and surveys. The data collection uses the instrument of Google Form questionnaire distributed to 24 students of semester 6. The interview question sheets are given to three lecturers of Biology Education Study Program FTIK IAIN Palangka Raya including the observation sheets. The survey result indicates that 68% of respondents know information about medicinal plants typical of Central Kalimantan from websites, 48% of respondents know the information from research journals, and 28% from their families. All respondents (100%) state the need for developing a reference book of medicinal plants typical of Central Kalimantan. The reference book is expected to become an additional information material on the utilization of medicinal plants by the people of Central Kalimantan and the utilization of medicinal plants described in Qur'an and hadith as support in lecture to train religious values of a healthy lifestyle and the relationship between humans and natural environment.

Keywords: Reference Book, Medicinal Plants, Central Kalimantan, Integrated Islam

Analysis of Potential Development of Preserved Media with Bioplastic Techniques as a Medium of Biological Learning in Indonesia

BE-238

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Abstract. This research aims to find out the medium of aging with bioplastic techniques as a medium of biological learning that has been developed in Indonesia, the average quality of preserved media with bioplastic techniques that have been developed, and the effectiveness of preserved media with bioplastic techniques that have been developed in learning. The method used in this research is the study of literature from several kinds of literature that correspond to the theme of research. The sampling technique used in this study is purposive sampling based on items that correspond to the theme of the study, the journal articles used are taken from searches in google scholar data with a total of 10 articles with a range of the last 10 years (2011-2021). The results of this study show that preserved media with bioplastic techniques has not been done much. Preserved media with bioplastic techniques that have been developed in Indonesia are Magnoliopsida-class plant preserved from chrysanthemum plants, soil arthropods, thallus plant preserved, flower organ preserved, river macroinvertebrate, moss plant preserved, and arthropod preserves. The durable media that has been developed is very well developed, interesting, and worthy to be used in biological learning based on assessments from material experts (80.92%), media experts (91.7%), peer reviewers (88.5%), biology teachers (81.15%). The preserved media that has been developed also received a response from students who strongly agree (89.4%). Media preserved with bioplastic techniques have a positive influence on the learning outcomes of learners. In addition, the medium preserved with bioplastic techniques is also able to improve the learning outcomes and entrepreneurial interests of learners by using the group investigation learning model. Another learning model that has been tested using bioplastic preserved media is the project-based learning model.

Keyword: preserved media, bioplastic preserved, biological learning media

Development needs analysis of E-Modul based on POGIL (Process Oriented Guided Inquiry Learning) on Structure Material and Function of Plant Network Student Class XI

BE-253

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Abstract. The swift improvement of technology and science carries an impact on education. It needs outlining in conducting the learning process applying technological flow. One of them is e- is e-module as an electronic learning media which is practically used in the learning process. E-modules serve as tools to help students understand concepts and develop specific skills in learning. The aim of this survey study was to dig out the student needs for learning media in the form of interactive e-modules and POGIL (Process Oriented Guided Inquiry Learning) learning models, namely learning models that involve the students actively. The population of this study was biology teachers and students of class XI MIPA at SMA Negeri 3 Sragen. The sampling technique used the biology teacher interview and questionnaire method with the Guttman scale. The survey results showed that the learning media in the form of e-modules have not been applied to the students. In contrast, the learning model of POGIL, the teacher not implemented it because there are some obstacles, there is the difficulty to stimulate student's activity because not all are active and on the material of the structure and function of the plant's network of students is still difficult to understand. Based on the survey result, the development of an e-module depend on POGIL as a medium for student learning needs to be done.

The Validity of Markerless Augmented Reality-based Learning Media on The Concept of Cell Organelles

BE-263

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Abstract. The development of Science and Technology (IPTEK) is one of the factors affected by the flow of globalization, including in the education sector. This is a challenge for educators who are involved in the world of education. The development of science and technology encourages educators to be more creative and challenged to follow these developments, this is evidenced by the existence of educational products created. Educators must be able to create a more interactive and fun atmosphere in the classroom. Augmented Reality is the development of Virtual Reality (VR) and facilitates the display of the user interface by combining the virtual world (virtual world) with the real world around. The results of the validation test of Augmented Reality-based media applications show the average result of r count is 0.89 which is above the critical r of 0.30 and is categorized as High interpretation and has a valid feasibility level. The readability test of students is carried out to get the feasibility value of the product being developed, besides that it is also to get suggestions and input or criticism for improving the product being developed. The results of the student readability test showed an average percentage result of 88.19% with Eligible qualifications. The percentage of readability test feasibility of 80-89% is said to be feasible with the conclusion that the media product is ready to be used as a learning resource. So that the conclusion drawn based on these data is that the 3D AR Cell learning media application is valid and suitable for use.

Keywords: Validation, Augmented Reality, Cell Organelles.

Analysis of Utilization of Local Wisdom-Based Learning Media on Evolutionary Materials

BE-269

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Abstract. This study is a preliminary study related to exploration utilization sources and learning media based on local wisdom in biological learning, especially evolutionary materials. The research purpose is to explore and analyze the utilization of Sangiran site learning resources in the study of evolution. This research used a quantitative survey design. The respondents are 54 high school and junior high school teachers in Surakarta, Klaten, Sragen, Karanganyar, and Sukoharjo (N=54). Data collected with an online questionnaire instrument contains about potential utilization of local wisdom (Sangiran Site) source of learning to support learning. The results show that evolutionary material is elusive because of the abstract concept to connect the past and present, religious doctrine/dogma relation, and short time allocation. On the other hand, there are suitable learning methods or models for teaching evolution materials, namely project-based learning, problem-based learning, discovery learning, and inquiry learning. While the way of lectures and Q&A considered less appropriate. Learning evolutionary materials need to be assisted by learning media based on local wisdom and, respondents have not maximized Museum Sangiran as a source and understanding media evolution during this time, but they consider its importance.**Keywords**: Evolution Materials, Learning Media, Local Wisdom, Sangiran Museum.

Development of an Android-Based E-Module of Excretory System to Improve Interest Learning for the Senior High School Students

BE-276

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Abstract. Poor performance of students in Biology may be caused by unfavorable teaching materials. Therefore innovations in teaching materials must be created. Regarding the rapid development of mobile technology, the learning process cannot ignore the important role of technology. ADDIE study is divided into five stages, namely analysis, design, development, implementation, and evalution conducted to develop e-module android-based excretion system to the interests of learning learners. The results of this study are android-based e-modules on the sub-material of the excretion system, the average assessment of the overall criteria is very good, namely media experts by 75%, material experts by 76%, biology teachers by 86%, small class trials by 79% and large class trials by 81%. Based on the results of the assessment, android-based e-modules on the sub-material of the excretion system are very feasible to be used as media / teaching materials in schools.

Development Of Website-based Learning Media Using Wordpress On Virus Material To Empowered Students' Learning Motivation

BE-285

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Abstract. This research aims to (1) Produce website-based learning media development products (2) Know the feasibility of website-based learning media (3) Empower students' learning motivation by using website-based learning media.

This research was included in the type of research and development (R&D). The model used was ADDIE which was conducted at SMA Negeri 5 Surakarta. The subject of the research was students and biology teachers. The product validation was carried out by 2 learning media experts and 1 material expert. The instruments used in this research were: needs analysis instrument, student and teacher response questionaire, and learning motivation questionaire. Data retrieval techniques were carried out by distributing the questionnaires for students and teachers' responses after learning. The learning motivation qustionaire were distributed before and after learning using by website. Data were analyzed using quantifiative and qualitativetechnique .

The result of this study was learning website containing Virus material which can be operated either on a smartphone or PC. Media websites have been validated material expert with a score of 78.75 (feasible) and media expert with an average score of 84.03 (very feasible). There was an input from the validator to revise the student's trial. The limited scale trial results of the website with a total of 15 students resulted in an average score of 93.61% (very feasible) and in the larger trial scale with a total of 36 students (grade X MIPA 1) resulted in a score of 89.43% (very feasible). The teachers's response of website media were 98.44% (very feasible) and 89.06% (very feasible). Student's learning motivation increased by 5.41% after using the website media. There was a difference score before and after the website implementation based on the paired T Test. The test results showed a sig score of 0.002< 0.05 which means that there is a significant difference between the initial and final motivation. The result of this study indicate that the developed website-based learning media is able to increase students' learning motivation.

Keywords: ADDIE, Website Learning, WordPress, Learning Motivation.

Emotion Regulation for Improving Argumentation Skills

BE-294

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Abstract. Argumentation skills considered as important skills in 21th century since they used in many activities such as social interaction, trading, educating, etc. Hence, efforts for improving argumentation skills are needed. This study aimed to investigate whether emotion regulation level influences argumentation skills so that it can be used to improve that skills. Emotion regulation questionnaire and argumentation skills test were given to 37 4th semester students from a state university to reach the answer. Quantitative data were analyzed using SPSS and qualitative data were analyzed from interviews. Pearson correlation test result showed a negative value (-0.329), which denoted that students with low emotional regulation possessed high argumentation skills. Whereas, simple linear regression showed coefficient value of 0.108, which denoted that emotion regulation level possessed an influence to argumentation skills as much as 10,8%. The results of the qualitative analysis show that students who have low emotional regulation are more easily motivated to argue. Although the effect of emotion regulation is small, it is estimated that it can be increased by using a trapping cycle strategy, that is improving argumentation skills by degrading emotion regulation level through the using of sensitive topics repetitively.

Keywords: Argumentation skills, emotional regulation level, trapping cycle strategy.

Profile of Critical Thinking Skill Pre-Service Biology Teachers

BE-296

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Abstract. The 21st century requires individuals to have both hard skills and soft skills. One of the important thinking skills, along with the times is critical thinking skills. Critical thinking is considered as one way to overcome the global challenges that are being faced. Critical thinking skills are needed to improve the quality of human resources for prospective educators in Indonesia who will become agents of change. Thus, critical thinking skills are skills that must be possessed by students, including Biology Education students. The purpose of this study was to determine the initial profile of critical thinking skills of Biology Education students. The design of this research is descriptive quantitative. The research participants were 55 students who had gone through the Biology Learning Strategy course from six universities. The technique of collecting data is through description questions with six indicators of critical thinking skills. The results showed that students' critical thinking skills on interpretation indicators had a percentage of 47%, analysis 42%, evaluation 44%, interference 44%, explanation 38%, and self-regulation 21%. Based on these results, it can be seen that the average critical thinking skills of students are 39% which shows that students' critical thinking skills are still relatively low.

The Effect Of E-learning-based Learners With Google Classroom And Microsoft Teams On Student's Learning Motivationsbased On Economic Capabilities

BE-314

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Abstract. This study aims to determine the effect of e-learning-based learners with Google Classroom and Microsoft Teams on students' learning motivations based on economic capabilities. The method used in this study is quantitative research. The population of this study is all students of grade X IPA at SMA 5 Surakarta which amounted to 172 people and the research sample is students of grade X IPA 2 and X IPA 4 which amounted to 68 people. Sampling techniques used are simple random sampling techniques. The data collection techniques used in this study are questionnaires and observations. Questionnaires are used to collect data on students' learning motivation and parents' economic abilities, while observations are used for observation of students' learning motivation and parents' economic abilities. The data analysis technique used is hypothetical analysis with Two Ways-Anova. The results of this study show that (1) Microsoft Teams affects the learning motivation of students who are shown by signification scores is 0.015 < 0.05 (2) Google Classroom affects students' learning motivations shown by signification scores is 0.045 < 0.05 (3) economic ability affects students' learning motivation shown by signification score is 0.000 < 0.05 (4) there is no interaction between Microsoft Teams, Google Classroom, and economic ability to students' learning motivation shown by signification score is 0.746 > 0.05.

The Effect Of Reading Questioning Answering Model On Critical Thinking Skills And Students Learning Motivation In E-Learning

BE-315

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Abstract. This study aims to determine the effect of reading questioning answering model on critical thinking skills and students learning motivation in e-learning. The method used in this study is quantitative research method. The population of this study is all students grade XI of science at Senior High School 6 Surakarta which amounted to 144 people and the research sample is students grade XI of science 4 and XI of science 5 at Senior High School 6 Surakarta which amounted to 72 people. Sampling techniques used are simple random sampling. The data collection techniques used in this study are tests, questionnaires and observations. Essay test are used to collect data on critical thinking skills, questionnaires are used to collect data on learning motivations, and observations are used for syntax execution. The data analysis technique used is hypothetical analysis with the Multivariate Analysis of Variance. The results of study show that (1) the RQA Model affects critical thinking skills shown by signification scores 0.014 < 0.05, (2) the RQA model affects students learning motivation shown by signification scores 0.027 < 0.05, and (3) the RQA model affects critical thinking skills and student learning motivation shown by signification scores 0.047 < 0.05.

Keyword: RQA model, critical thinking, students learning motivation

Utilization of Potential TAHURA KGPAA Mangkunagoro I Through The Development of Fungi Mobile Learning Application for Grade X Students in Fungi Material

BE-316

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Abstract. Based on previous research fungi material taught in grade X high school is one of the materials that are less interested in students and difficult to learn because of its characteristics that contain many terms in Latin. Efforts that can be made to overcome the problem are to develop learning media that can create meaningful learning, one of which is the Fungi mobile learning application. This study aims to (1) utilize TAHURA KGPAA Mangkunagoro I as a learning resource for high school students class X on fungi material, (2) develop an android-based function mobile learning application on fungi material for high school students class X, (3) test the feasibility of android-based fungi mobile learning application on fungi material for high school students class X so that it is feasible to be used in biology learning. This research is a type of research and development. The development model used in this study is ADDIE by (Branch, 2009) which consists of stages (1) Analyze, (2) Design, (3) Development, (4) Implementation, and (5) Evaluation. This research was conducted at TAHURA KGPAA Mangkunagoro I and SMA N 5 Surakarta as the subject of research on mobile learning application development fungi. The application feasibility testing stage is conducted by one material expert, one media expert, one learning expert, and one biology teacher. The author also gave a questionnaire to students to find out the response of students to the fungi mobile learning application. The instruments used in this study use learning media feasibility questionnaire instruments. Validation data is analyzed with descriptive percentage analysis techniques and student perception data is analyzed by Rasch modeling. Validation results by material experts worth 72.05% with a decent category, media experts worth 84.72% with a very decent category, learning experts worth 86.61% with a very decent category, and biology teachers worth 95% with a very decent category. Most students agree that fungi mobile learning application can facilitate the process of learning Fungi materials indicated by a logit person value of 3.05 and an Cronbach's alpha value of 0.89 which is very good. Based on the results of expert validation and student response fungi mobile learning application is eligible to be used in biology learning with improvements according to the advice and input of experts.

Keywords: learning media, mobile learning, Fungi materials.

E-module Development Through *Kvisoft Flipbook Maker* As A Teaching Material Supplement In Biotechnology Sub Chapter Of Health To Enhance Student's Analytical Thinking

BE-323

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Abstract. This study aims to (1) Develop of health biotechnology e-module through *Kvisoft Flipbook Maker* which enhance the analytical thinking ability of learners (2) Knowing the response of teachers and learners to the development of Health Biotechnology e-module through *Kvisoft Flipbook Maker* that enhance students' analytical thinking skills. This research is included in the type of Research and Development research (RnD). The research model used is 4D but adapted into 3D (Define, Design and Development). The research was conducted at SMA Negeri 2 Surakarta. The subject of the research was media development Health Biotechnology e-module through *Kvisoft Flipbook Maker*. The validation stage is performed by 1 media expert, 1 material expert and 1 learning expert. Instruments used in the study include needs analysis questionnaires, teacher response questionnaires, student response questionnaires, and test questions (pretest and posttest). Data retrieval techniques are carried out by sharing questionnaires of teachers and students' responses after learning. Data analysis techniques using qualitative and quantitative analysis. The results of the research conducted was a e-modules health biotechnology e-modul which can be accessed by smartphones and PC. E-module has been validated by the material expert validator with a score of 79.03 % (feasible), media experts with a score of 88.63 % (very feasible), and learning experts with an RPP score of 88.42 % (very feasible) and a test question score of 76 % (feasible). The teacher's response showed a score of 92.10 % (very feasible), while for student's response score can be known through T paired test. The test results showed that there was an improvement in students' analytical thinking ability through T paired test sig. 0.00 < 0.05, so it can be concluded that the Health Biotechnology e-module media through *Kvisoft Flipbook Maker* is able to enhance students' analytical thinking skills.

Keyword: RnD, e-modul, *Kvisoft Flipbook Maker*, analytical thinking, *Simple Paired T-test*

The Effectiveness of Human Nervous system Comics in online learning During Covid-19 to Strengthen Students' Learning Achievement

BE-14

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Abstract. Online learning during the Covid-19 period resulted in a decline in student achievement. Comic learning media is here to support online learning to improve student achievement. This research article aims to determine the effectiveness of human nervous system comics in online learning during Covid-19 to strengthen student achievement. The ADDIE research and development model has been used for the development of comic media. Student achievement data collection uses multiple-choice tests. The comic trial was conducted on 20 public high school students. The research results reveal that comic media was valid (CVR = 1), and the increase in student learning achievement was high (N-gain = 0.83). This research concluded that comic learning media in online learning during Covid-19 could strengthen student learning achievement. This research recommends that teachers use comics as an effort to improve their student achievement

Analysis Of 2013 Curriculum Implementation On Biology Learning Design In Potential Senior High School Yogyakarta

BE-228

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Abstract. The purpose of this study is to describe the formulation of competency achievement indicators in Potential SHS whether the same or higher than KD Curriculum 2013, the learning model used by teachers, and the teacher factors behind it. This research is a descriptive research that describes the conformity between expectations and reality in Potential SHS. The research subjects were conducted by convenience sampling to biology teachers of grade XI odd semester. Data collection is conducted with interviews and questionnaires. The data analysis was conducted by comparing policies and facts about the design of the implementation of the 2013 curriculum on biology learning at Potential SHS. The results of research and data analysis show that all teachers in Potential SHS have formulated competency achievement indicators reaching the C4 level by 38% and the largest percentage of 52% in the formulation of indicators that reach the C4 level and one level below. The most widely used learning models are discovery and PBL models but teachers still use other learning models such as PjBL and inquiry only for certain KD. The teacher factors behind the design of the implementation of the 2013 curriculum are the length of teaching teachers, educational background, MGMP participation.

Chemistry
Day 2

Synthesis of Cycloheptylcinnamamide by Shiina Esterification

C-217

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Abstract. Cinnamamide (3-phenylacrilamide or cinnamic acid amide) is a cinnamic acid derivative present in various natural products such as fagaramide, piperine, antiepilepsirine, cinromide, etc. Cinnamamide and their derivatives demonstrate wide spectrum of biological activities i.e anti-microbial, anti-fungal, anti-tubercular, anti-inflammatory, and anti-cancer, antimalarial, antiviral, anti-diabetic, anticonvulsant, antidepressant. Cinnamamides are generally generated from cinnamic acid and the corresponding amines in presence of thionyl chloride, phosphoryl chloride, EDC or DCC. However, these chemicals are dangerous, toxic, explosive, and some of them are categorized as third-class chemicals in the chemical weapons conventions. In this study, the Shiina esterification by using 4-dimethylaminopyridine (DMAP) and 2-methyl-6-nitrobenzoate anhydrate (MNBA) was utilized for the synthesis of cycloheptylcinnamamide. Reaction of cinnamic acid with activated acyl carboxylate MNBA produced the corresponding mixed anhydride (MA). The reactivation of MA by nucleophilic catalyst followed by the attack of amino group in *N*-cycloheptylamine to the host molecule gave cycloheptylcinnamamide. The structure of product was confirmed by spectroscopic analy

Facile Synthesis of Iron Oxides-Silica by Direct Combustion of Mohr's Salt and Oil Palm Leaves Powder

C-225

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Abstract. Iron oxide-silica is synthesized easily by direct decomposition at high temperature (500 °C for 5 h) of oil palm leaf powders in the presence of Mohr's salts under solid-solid state reaction. After the reaction mixture was cooled, a red powder was obtained and subjected to morphology, elemental, functional group and phase analysis using several instruments. The current product contains a mixture of metal-oxides, Fe_2O_3 and Fe_3O_4, as a result of iron oxidation, as well as amorphous silica derived from the decomposition of oil palm leaves (OPL), according to X-ray diffraction (XRD) analysis. Scanning Electron microscopy (SEM) shows that current techniques produce irregular particle shape products. Furthermore, the main elements which appear in the sample are silicon and iron along with other minor elements, as demonstrated by Energy-Dispersive X-Ray (EDX) analysis. The sample was also analyzed using Fourier Transform Infra-Red (FTIR) and the results showed that the current mix of metal-oxides gave specific peaks at 1112 cm^{-1} (Si-O-Si stretching vibration overlapped with Fe-O-Si stretching vibration), and 596 cm^{-1} (Fe-O stretching). Based on the results of this study, a new synthetic approach was obtained for the synthesis of mixed iron oxide-silica using sustainable precursors, oil palm leaves (OPL) with a simple combustion technique.

Keywords: Mohr's Salt; Oil Palm Leaves; iron oxides-silica; combustion

Synthesis of 5′-bromo-1,1″-bis(2-chlorobenzyl)-[3,3′:3′,3″-terindolin]-2′-one

C-239

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Abstract. Isatin is a privileged framework in the drug development and drug design area. Trisindoline, an isatin derivative, acts as a lead compound for the development of α-glucosidase inhibitors. The presence of the bromo group at C5 position of isatin and halogens at the *ortho*- position of *N*-benzyl of indole have been reported to be pivotal for the inhibitory activity of α-glucosidase. This paper reports the synthesis of 5′-bromo-1,1″-bis(2-chlorobenzyl)-[3,3′:3′,3″-terindolin]-2′-one **(1)** by indole *N*-benzylation and electrophilic addition. Reaction of indole and 2-chlorobenzyl bromide in DMF afforded 2-chlorobenzyl indole. The subsequent reaction of this product with 5-bromoisatin in THF in presence of sulfuric acid yielded the title compound **1**. The spectroscopic methods (FTIR, HRMS-ESI, ^{1}H and ^{13}C NMR) were utilized for structure identification of all compounds. The synthesis of compound **1** was successful and it was obtained in 75% yield.

Keywords: synthesis, isatin derivative, trisindoline, *N*-benzylation of indole

Hydrophobic Support: A Phenomenon of Interface Lipase Activation In Polyurethane Foam As A Heterogeneous Biocatalyst In Natural Flavor Synthesis

C-241

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Abstract. Polyurethane foam (PUF) has rigid, inert, and high porosity properties, allowing it to be used as a support lipase immobilization. Co immobilized, which is made up of surfactant gelatin, lecithin, PEG, and MgCl2, coats the PUF and turns it into a hydrophobic support. The sorption ability of PUF on the supporting material (co), lipase, and lipase activity were all investigated in this study. Immobilization of Co and lipase occurs via activation of the interface on PUF, which is tested for its ability as a heterogeneous biocatalyst. PUF was soaked in co for 1,2,3,4,5 hours and dried in the first stage. It was also soaked in lipase and dried in the second stage to determine its activity. The best conditions were obtained after 3 hours of immersion, with the sorption ability of PUF:co/surfactant ratios of 1:10, 1:20, and 1:30 (w/w) of 6.95 g/g, 23.54 g/g, and 19.95 g/g, respectively. The best activity of biocatalyst ratios PUF: co, 1:10; 1:20; and 1:30 (w/w) is 2.32 U/gram PUF, 4.01 U/gram PUF, and 3.34 U/gram PUF, respectively. In the third stage, heterogeneous biocatalysts were used to synthesize natural flavors by esterifying lauric acid from coconut oil and citronellol from citronella oil. The results showed that the heterogeneous biocatalyst converted to citronellyl laurate at a rate of 55%. Because the presence of an open PUF macrostructure reduces diffusion resistance, mass transfer can occur. Due to their low cost and ease of maintenance, PUFs can be used commercially as hydrophobic supports.

Comparison of Bitumen Asbuton Diluents: Kerosene vs. Diesel

C-243

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Abstract. Asbuton is a natural asphalt company based in Indonesia. Indonesia has the potential to become self-sufficient in asphalt, because of its vast reserves. The properties of Asbuton are hardness and the high viscosity , so suitable diluent are required to separate the bitumen from the minerals. The purpose of this research is to compare the percent recovery of Asbuton bitumen with the use of kerosene or diesel oil as a diluent. The use of kerosene and diesel as diluent in this study is based on FTIR analysis, which indicates that kerosene and diesel have close functional groups with Asbuton bitumen. The first step is to conduct a viscosity analysis by dissolving the Asbuton bitumen or diesel oil in a 30: 70.40: 60.50: 50.60: 40 (percent mass) ratio at temperatures of 30.40, 50, 60.70.80, and 90^{o}C. The viscosity results show a 60:40 percent ratio in kerosene and diesel, which can be used to separate the bitumen from the Asbuton. Heating and stirring at temperatures of 50, 70, and 90^{o}C was used to separate the bitumen from the Asbuton. At a temperature of 90^{o}C, the highest percentage of recovered bitumen was obtained with a ratio of 40:60 percent using kerosene of 76.3010285% and diesel of 61.6528989%..Kerosene is a good diluent for Asbuton bitumen percent

Effect of Calcination Temperature on Hydrotalcite for Organic Dye Waste Elimination from Aqueous Solution via Adsorption

C-247

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Abstract. Hydrotalcite as one of advanced materials are applied in wide range aspects like adsorption. This research aims to study the capability of the hydrotalcite like compound Mg-Al-CO_3 material to remove organic dye, namely, congo red and methylene blue in water through adsorption. Prior to the adsorption process, hydrotalcite like compound Mg-Al-CO_3 was calcined within temperature ranges of 300-750^{o}C. The adsorption process was carried out by batch method with variations in calcination temperature of the hydrotalcite material of and variations in contacting time. The performance effectiveness of hydrotalcite was evaluated through the adsorption percentages based on the absorbance measurement data using the UV-Vis instrument. The results showed excellent hydrotalcite's capability of removing both organic dyes. Hydrotalcite calcined at 600^{o}C was able to remove 94% of the organic dyes within 30 minutes.

Application of Ozone Generator: The Accuracy of Ozonation Duration on the Quality of Commercial Drinking Water at Teaching Factory

C-252

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Abstract. Disinfection process in commercial drinking water production has an important role to fulfill the quality standards. The ozonation process requires fidelity of duration, in order the production efficiency at Teaching Factory can be achieved. During this time, the ozone generator with a capacity of 5 grams / hour, for 20 minutes application still did not fill the standard. SNI 3554 2015 test results showed that out of 31 parameters, there are 2 parameters that have not met the requirements, namely the microbiological aspects of total coliform and *Ps. Aeruginosa* with a value of <2 and <1 colony / 250 ml respectively. The target of this research is to get the exact ozonization time, until the total number of both bacteria become zero. The duration time used in the ozonation process are 20, 30, 40, 50, 60 minutes, before refined with ultra violet process. The result showed that the efficient time in ozone application was 50 minutes, proven by there were no coliform and *Ps. aeruginosa* in commercial drinking water, so that all SNI requirements were fulfilled. The accuracy of duration time has an impact on the entire series of processes in order to provide efficiency for Teaching Factory

The Sinergy Effect of Essential Oils from Traditional Herbs and Medicines as Antibacterial Materials of Edible Coating on Fresh Fruit

C-257

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Abstract. The selling strategy of peeled honey pineapple is carried out to attract consumers who want fresh, uniform, and ready-to-eat fruit. However, honey pineapple has a short shelf life, primarily when sold as a peel. Hence, additional treatment to prevent damage and maintain the quality of peeled honey pineapple can be done by applying an edible coating. The materials used in this research were jackfruit seed starch, essential oils (ginger, lemongrass, lemon eucalyptus), and citric acid. This research aimed to determine the effect of the edible coating application with the addition of essential oils of ginger, lemongrass, lemon eucalyptus, and citric acid as an antibacterial material on the shelf life of honey pineapple. The treatment variations in this research were the concentration of essential oils (0%; 10%; 30%; 40%), and citric acid added to the edible coating, with pineapple honey storage at room and cold temperature. Antibacterial activity was then analyzed for *Escherichia coli* and *Staphylococcus aureus*. The results showed that the edible coating with 10%, 30%, and 40% ginger essential oils could form an inhibition zone in *S. aureus* bacteria, while the addition of all variations in the concentration of lemongrass essential oil could inhibit the growth of *E. coli* and *S. aureus*. The addition of lemon eucalyptus essential oil revealed an inhibition zone of *E. coli* at a concentration of 40% and *S. aureus* at a concentration of 30% and 40%. It was proven that the addition of citric acid to the edible coating indicated the formation of a greater bacterial inhibition zone than the edible coating without citric acid. The organoleptic test results also uncovered that honey pineapple stored at cold temperatures had the preferred color, texture, aroma for panelists, and longer shelf life than honey pineapple at room temperature storage.

Keywords: *edible coating, essential oil, citric acid, antibacterial, shelf life, honey pineapple*

Characterization of Eggshell Combination with Activated Corn Cob as Ion Pb^{2+} Adsorbent with Batch Method

C-271

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Abstract. This study aims to determine the characteristics of the combination of corn cobs and eggshells as Pb metal adsorbent by the Batch method and absorption isotherm pattern. This study used an experimental approach in the laboratory. There are four stages in this experiment: (1) sample preparation, (2) sample activation, (3) adsorption process and (4) functional group characterization by FTIR, adsorbent effectiveness test and the effect of initial concentration on capacity with AAS. The determination of the adsorption isotherm was carried out using Langmuir, Freundlich, Temkin and Dubinin-Radushkevich isotherm patterns. The results showed that (1) the adsorbent combination of corn cobs and eggshells contained OH, $CaCO_3^{2-}$ groups, cellulose and protein constituent groups that played a role in the adsorption process, (2) using Langmuir isotherm pattern, which means the adsorption process takes place chemically, and (3) the optimum composition ratio of the adsorbent corn cobs and eggshells is 1: 2 with a percentage of 94.49%; the optimum mass was 0.2 g with the percentage of Pb^{2+} adsorbed was 98.69 %; the optimum time is 60 minutes with the percentage of Pb^{2+} adsorbed is 99.03%; (4) the more significant the concentration of Pb metal, the greater the adsorption capacity in this study the largest adsorption capacity at a concentration of 30 ppm with a value of 1.393445 mg/g.

Keywords: Adsorption, Eggshells, Corn cobs, Lead

Periodic Trends in the Character of First-Row Transition Metals-Based Catalysts Embedded on Mordenite

C-272

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Abstract. This research studied the effect of transition metals (TMs) in one period (TMs = Fe, Co, Ni, Cu, and Ag) on the characteristics of mordenite type zeolite. The loading method used was wet impregnation with a metal salt concentrate of 0.025 M. The results showed that the diffraction pattern of mordenite did not change. However, an in-depth analysis of XRD data obtained a decrease in the characteristic peak intensity and a change in the phase composition of the mordenite. On the other hand, the functional group analysis results showed a shift in the wave number of mordenite. The addition of transition metals to the catalyst tended to reduce the acidity and surface area of the mordenite. Morphological analysis showed that TM/mordenite catalysts are more heterogeneous than mordenite.

Synthesis Of C7-acylamino Derivatives Of 7-Aminocephalosporanic Acid (7-ACA) With Benzoyl Chloride And Cinnamoyl Chloride

C-258

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Abstract. Modifications of the cephem basic skeleton of 7-ACA usually posseses greater stability towards lactamases and improved pharmacological properties. There are two positions available for chemical manipulation in cephalosporin nucleus i.e. C3 and C7. A wide variety of amine acylation methods have been used for the production of C7- acylamino derivatives by the use of acylchlorides, mixed anhydrides, active esters, and carbodiimides to improve pharmacodynamic property. In this research, modification of C7-acylamino derivatives by the use of benzoyl chloride and cinnamoyl chloride according to method of Keltjens group under Schotten-Baumann conditions. Different solvent has been used in two N-acylation with benzoyl chloride and cinnamoyl chloride. N-acylation with benzoyl chloride has been used saturated aqueous $NaHCO_3$ and acetone (3:1), however in N-acylation with cinnamoyl chloride has been used saturated aqueous $NaHCO_3$ and acetonitrile (1:3). Products reaction were purified by suspended, stirred, and washed with diethyl ether, and for further purification has performed by chromatograpy method. Molecule structure of both product reaction has been confirmed by NMR spectroscopy analysis.

The Application Of C-4-Carboxymethoxyphenyl-calix[4]resorcinarene As Antibacterial Agent

C-37

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Abstract. The research has been conducted to determine the ability of C-4-carboxymethoxyphenyl-calix[4]resocinarene as antibacterial agent. The investigation has also studied the increasing its effectiveness due to the presence of Ag(1) in the calix complex. The antibacterial activity assay of the C-4-carboxymethoxyphenyl-calix[4]resocinarene and C-4-carboxymethoxyphenyl-calix[4]resocinarene-Ag(I) complex against Staphylococcus aureus and Escherichia coli was carried out by measuring the inhibition zone diameter using the paper disc diffusion method. The result showed that the C-4-carboxymethoxyphenyl-calix[4]resocinarene its self does not have antibacterial activity toward Escherichia coli in various calix concentration of 10%, 15%, 20%, 25%, and 30%. However, the compound has weak antibacterial activity against Staphylococcus aureus. The existence of Ag(I) metal in calix compound complex cause the increasing in antibacterial activity for both of gram-positive bacteria, i.e. Escherichia coli, and gram-negative bacteria of Staphylococcus aureus. The complex calix-Ag(I) compound indicated moderate response for Staphylococcus aureus and weak response for Escherichia coli.

Effect Of Gelatin In The Synthesis Of Nanosilica For Methylene Blue Adsorption Applications

C-112

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Abstract. The uniform mesoporous nano silica has been successfully synthesized using the soft template method with Poly(ethylene glycol)-block-poly(propylene glycol)-block-poly(ethylene glycol) (Pluronic P123) and gelatin. Nanosilica was prepared by adding 1%, 3%, and 5% gelatin as surfactants with pluronic modification P123. The characterization of nano silica material structures using FTIR spectroscopy and powder X-Ray Diffraction. The result of FTIR analysis showed that nanosilica material sieves had silanol (Si-OH), siloxyl (Si-O-Si). While the XRD analysis showed that the smaller the addition of gelatin affects the crystallinity of the nano silica which is better for the nano silica with a particle size based on the Scherer calculation of 10-25 nm. This is because the soft templating process with gelatin which has an amine group (-NH2) increases the bonding interaction with the Si-OH group so that the nano silica molecule molding process takes place in the size of a nanometer with structural geometric regularity. Adsorption performance of nano silica material investigated by using synthetic dye methylene blue as an adsorbate model and measured by a UV-Vis spectrophotometer. The optimum contact time result was analyzed with the adsorption kinetics model. The optimum contact time for the adsorption of nano silica to methylene blue compounds is 60 minutes with a maximum adsorption capacity of around 120 mg/g. Based on the data, the optimum contact time shows that the mesoporous silica nanosilica material in the adsorption of methylene blue follows the second-order pseudo-kinetic model.

Keywords: Nanosilica, gelatin, Plironic P123, methylene blue

The Effect Of Different Types Of Molecules Methylene Blue On The Adsorption Capacity Of Improved Nanosilica

C-20

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Abstract. Research has been carried out on the synthesis of nano silica using the hydrothermal method at 90°C for 24 hours. Preparation of nano silica was initiated by reacting precursor pluronic 123 with 1% gelatin at 45°C. To shorten the process of making nanosilica, this research adds an electrolyte solution of HCl which is useful for increasing the adsorption and desorption processes of ions in changing the form of gel to particles. After that, the nanosilica will be activated using 50 mL of 0.1 M HCL and followed by an impregnation process of TiO_2 1% wt for the preparation of TiO_2/NS adsorbent. Crystallinity analysis was performed using an X-Ray Diffractometer (XRD) and determination of functional groups using Fourier Transform Infrared Spectroscopy (FTIR). The adsorption value was determined by a UV-Visible (UV-Vis) spectrophotometer. The characterization results showed that TiO_2/NS had amorphous properties of NS and did not experience significant changes in surface structure due to impregnation by TiO_2 with a particle size between 4 to 10 nm. The TiO_2/NS functional group based on the FTIR test showed that the absorption occurs at wavenumbers 1056.9 cm-1 and 794.6 cm-1 which are external asymmetric and asymmetric strain absorption in the form of O-Si-O or O-Al-O groups. The results of the TiO_2/NS adsorption test on three variations of Methylene Blue molecules showed the adsorption of molecules of the methylene blue type of Methylthioninium chloride; 3,7-Bis (dimethylamino) phenothiazin-5-ium chloride has a higher adsorption capacity than the other 2 variations because the molecular size of Methylene Blue is the smallest among other samples. The adsorption capacity values of the three molecules methylene blue were 125, 110, and 95 mg/g, respectively. Apart from the molecular size factor, Methylthioninium chloride; 3,7-Bis (dimethylamino) phenothiazine-5-ium chloride has a chloride group that binds more strongly to Ti-OH and Si-OH and has the least steric barrier compared to other groups in methylene blue type of Methylene Blue trihydrate; 3,7-Bis (dimethylamino) phenothiazine-5-ium chloride trihydrate and Methylene Blue hydrate; 3,7-Bis (dimethylamino) phenothiazine-5-ium chloride hydrate (1:1:x).

Keywords: Adsorption, TiO_2/NS, Methylthioninium chloride, Methylene Blue trihydrate, Methylene Blue hydrate

The Effect Of Temperature Using 1% Fe_2O_3 / Nanosilica On Application For Methylene Blue Adsorption

C-118

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Abstract. Methylene blue is a dye in the textile industry which is found in large quantities and is harmful to health, so it requires handling through the adsorption process. This research is related to the synthesis of gelatin-modified nanosilica (NS) adsorbent impregnated with 1% Fe_2O_3 (1% Fe_2O_3 / NS) by hydrothermal process. 1% Fe_2O_3 / NS sample was characterized using FTIR and XRD 1% Fe_2O_3 / NS adsorbent then used in methylene blue adsorption with the specifications of the adsorbent weight of 0.05 grams, contact time of 120 minutes and speed of 150 rpm. The effect of the temperature of the methylene blue adsorption process using 1% Fe_2O_3 / NS was observed at 30, 40 and 50 °C and the results showed that the higher the temperature, the lower the adsorption capacity due to decreased methylene blue bonds with SiO-Si and Fe-O groups. The optimal adsorption was carried out at a temperature of 30 °C which was in accordance with the second order pseudo adsorption kinetics model with a maximum capacity of 105 mg / g (adsorbent weight 50 mg, initial concentration of 100 ppm, 120 minutes contact with a stirring speed of 150 rpm).

Keywords: Adsorption, Hydrothermal, Methylene blue, Fe_2O_3 / NS, Second order pseudo, Effect of temperature

Effect Of Weight Adsorbents ZnO-Silica Nanoparticle Modified Gelatin For Methylene Blue Adsorption

C-92

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Abstract. Dyes pollution in the water may cause environmental problems and endanger organisms. Many dyes are found in water waste, one of them is methylene blue. One of the methods to overcome the danger of waste dyes is the adsorption method. The purpose of this research was to determine the weight influence of adsorbents in methylene blue adsorption using ZnO which impregnated in gelatine modified nanoparticle silica (NpSG) using the wet impregnation method. NpSG was successfully created by reorganizing silica molecules in P123 molecules as molds and gelatins as surfactants with HCl catalysts through hydrothermal and calcination processes. For the impregnation stage Zn(CH3COO)2.2H2O as a source of zinc oxide dissolved in ethanol and NpSG has been activated then carried out the calcination process. ZnO/NpSG materials are characterized using FTIR and XRD and then applied as adsorbents for methylene blue adsorption measured with UV-Vis spectrophotometers with ZnO/NpSG weight variations of 0.05g, 0.1g and 0.15g . The result of characterization for ZnO crystal structure does not provide changes in the structure and function group of NpSG. ZnO/NpSG 0,15g adsorption capacity in methylene blue adsorption is higher than ZnO/NpSG 0.05g and 0.1g due to interaction factors between Zn and methylene blue. In general ZnO/NpSG has higher effectiveness than NpSG and be a potential adsorbent for methylene blue absorption.

Keywords: ZnO, silica nanoparticle, gelatin, adsorption, methylene blue

Adsorption Kinetics Of Methylene Blue With 1% TiO_2 /SBA-15 Using Using Lagergren, Ho McKay, And Pandey Kinetic Model

C-114

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Abstract. The adsorption kinetics of methylene blue with 1% TiO_2 / SBA-15 has been investigated. This research begins with the synthesis of TiO_2 / SBA-15 using TEOT (Tetra Ethyl Orto Titanate) as a source of TiO_2 and SBA-15 as a support material using the wet impregnation method. The structure and physicochemical properties of TiO_2 / SBA-15 were observed by XRD (X-Ray Diffraction) and FTIR (Fourier Transform Infrared Spectrophotometer). The study of the adsorption kinetics of the experimental data on the adsorption of methylene blue to TiO_2 / SBA-15 will use several approaches, namely the Lagergren pseudo-first-order irreversible reaction model, Ho McKay pseudo-second-order reaction model, and the pseudo-Pandey first-order reversible reaction model. The results showed that the adsorption kinetics of methylene blue approached Ho Mckay's pseudo-second-order model where the adsorption rate was linearly related to the square of the number of adsorption sites with a material adsorption capacity of 106.7 mg / g which represented the material's ability to adsorb methylene blue molecules.

Keywords: Adsorption, Kinetics, Methylene Blue, TiO_2 / SBA-15, Lagergren, Ho McKay, and Pandey

Carbon Obtained From Fish Bone Supported Titania As Catalyst In Styrene Oxidation With Aqueous Hydrogen Peroxide As An Oxidant

C-39

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Abstract. The evaluation of Carbon obtained from fish bone supported titania as catalyst in styrene oxidation with aqueous hydrogen peroxide as an oxidant was carried out. The catalysts were prepared by carbonation of fishbone powder at varying temperature 500, 600 and 700 °C for 2 h, followed by sulfonation with sulfuric acid (1M) for 24 h and impregnated by varying titania concentration 500, 1000 and 1500 µmol. The physical properties of catalysts were characterized using Fourier transform infrared (FTIR) spectroscopy, X-ray diffraction (XRD), and Scanning Electron Microscope-Energy Dispersive X-Ray (SEM-EDX). Styrene oxidation with aqueous hydrogen peroxide as an oxidant was used to test the catalysts. The catalytic activity result show that sulfonated carbon from fishbone supported titania better than without sulfonation. The increasing of styrene conversion is in line with the increasing the amount of titania in the catalysts.

Keywords: Fishbone; styrene; carbon; titania, oxidation

Effect of Fermentation Time and Sugar Concentration on the Quality Characteristic of Organic Fertilizer from Cattle and Rabbit Manure Using Vinnase Media

C-274

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Abstract. Vinasse waste is liquid waste from distillation products in bioethanol.Vinasse processes. The rest is organic matter which can be used to fertilize the soil. Therefore, alcohol waste must be treated with the addition of complementary organic materials in order to obtain it used as a plant media for probiotic bacteria which are very good for soil and plants.The production of probiotic bacteria culture media used the basic ingredients of vinasse waste mixed with rice bran and shrimp paste. The EM-4 bacteria which will later be cultured is a mixture of beneficial microorganisms, which can work effectively to ferment organic matter. Bacteria will be cultured by adding vinasse waste and shrimp paste boiled for 5 minutes and cooled to room temperature 25^{o}C, let stand for 3 weeks (21 days). Cow manure is one of the potential ingredients for making organic fertilizers with N, P, K nutrient content of 0,4% each; 0,2%; 0,1%. The rabbit urine contains N, P, K of 2,72%, 1,1%, and 0,5% which have a higher content than other livestock urine. Furthermore, making fertilizer from cow dung and rabbit urine using EM-4 bacteria cultured with vinasse using variationsin fermentation time of 7, 14, 21 days and sugar content of 0,25; 0,5; 0,625 (% w/v). Then the finished fertilizer sample is tested for analysis of the levels of N, P, K, and C. Organic. Test nitrogen levels with the Kjeldahl method, analysis of phosphorus content (P_2O_5) and K (K_2O) levels with HNO_3 and $HClO_4$ extraction and C.Organic analysis using the Walkley & Black method. The results of the analysis test for the optimum levels of Nitrogen (N) obtained fermentation time of 21 days with a level of 1,14%. The percentage of phosphorus (P_2O_5) and and potassium (K_2O) obtained the best fermentation time of 14 days with levels of 0,51% and 0,74% respectively. The optimum conditions for Nitrogen (N) and potassium (K_2O) are in a 0,5% sugar concentration except for the optimum Phosphorus (P_2O_5) in a sugar concentration of 0,625%. The results of the analysis of fertilizers that meet the parameters of SNI 19-7030-2004 are the variation of fermentation time on the 21st day with an N content of 1,14%; P 1,43%; K 0,42%; C. Organic 20,26; and the C / N ratio of 17,81.

Keywords: waste vinasse, EM-4, cow manure, rabbit urine, fertilizer, fermentation, sugar concentration

New Lead(II) Ion-imprinted Polymer Potentially for Lead Preconcentration in Airborne Particulates

C-277

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Abstract. Lead is one of the metal elements that are commonly found in many environmental samples including airborne particulates. One of the most widely used separation and preconcentration methods for metal ion is Solid Phase Extraction (SPE) with Ion Imprinted Polymers / IIPs. Lead(II) imprinted polymers (Pb-IIPs) were prepared by bulk polymerization method involving the Pb (II) ternary complex with PAR (ligand) and 4-vinylpyridine (functional monomer), methacrylic acid (monomer), trimethylolproprane trimethacrylate (TRIM, cross-linker), BPO (initiator), and methanol (porogen). The polymer was characterized by using FTIR. IIPs capacity to rebind Pb(II) was investigated from aqueous solutions. Effect of pH and concentration of Pb(II) ion in batch methode were studied. The lead ion concentration was determined by flame atomic absorption spectrometry. Optimum pH was obtained at 6.0, and maximum adsorption capacity for Pb-IIP achieved 7,47 mg/g polymer which is higher than the Non Imprinted Polymers (NIPs). The synthesized Pb-IIPs has the potential to be used as a sorbent for lead ion preconcentration in airborne particulate samples.

Keyword: Lead(II), Pb-IIPs, PAR, ternary complex.

Analysis of Adsorption of Adsorbent Sugarcane Bagasse Activated Charcoal in Concentration Variations of Pb^{2+} and Cu^{2+} Metal Mixture

C-286

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Abstract. Excessive amounts of heavy metals in the waste can cause environmental pollution. Heavy metals in aquatic waste are not found in a single state but are found in combination with other heavy metals.The purpose of this study is to determine the adsorption competition between mixed metal ion solutions of Pb^{2+} and Cu^{2+} in concentration variations of the two mixed metals. This study employs experimental method in a laboratory. The adsorbent in this study was activated charcoal of bagasse activated NaOH. FTIR spectroscopy was used to characterize the adsorbents. The adsorption capacity was determined by making variations in the concentration of a mixture of Pb^{2+} and Cu^{2+} metal ions with a fixed ratio, Cu^{2+} metal ions concentration variations, and Pb^{2+} metal ions concentration variations. The 0.25 grams adsorbent of sugarcane bagasse activated charcoal was used, and each sample was contacted for 60 minutes. Metal ion concentrations were determined using an Atomic Absorption Spectrophotometer (AAS). The results of this study suggest that when concentrations of the two metals are compared,the higher the concentration, the greater the adsorption capacity.In various comparisons of concentration variations of mixed metal ion solutions,competition for adsorption capacity with Cu^{2+} metal ions is more competitive than Pb^{2+} metal ions.

Keywords: competition, adsorption capacity, sugarcane bagasse activated charcoal, Pb^{2+} metal ions and Cu^{2+} metal ions mixture.

Recovery of Graphite From Lithium Ion Batteries Leaching Using Sulfuric Acid as Anode Materials

C-287

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Abstract. Used lithium-ion battery can be recycled and reused as a new battery component. Separation of graphite by mechanical method was carried out to remove plastic components. The graphite obtained was washed using dimethyl carbonate (DMC) and N-methyl-2-pyrrolidone (NMP) and leached in H_2SO_4. The residue obtained was heated in furnace at 500°C for 1 hour using N_2 atmosphere. FTIR and XRD characterizations were carried out to compare anode materials that obtained by mechanical process only and by leaching process. The FTIR characterization showed that DMC and NMP washed graphite, H_2SO_4 and H_2O_2 leached graphite did not show any significant differences in term of their functional groups. XRD results indicated that the residue that obtained were graphite that in accordance with JCPDS 96-901-2231. The 2θ diffraction peaks of DMC and NMP washed graphite, H_2SO_4 and H_2O_2 leached graphite were at 26.37°, 26.32° and 26.33°, respectively. The diffractogram peak of $LiMn_2O_4$ impurities in spent graphite at 18.70°, was no longer appears on the treated graphite. It is because the $LiMn_2O_4$ has dissolved in the sulfuric acid. SEM images of washed graphite and leached graphite show similar morphology. The graphite obtained has the potential to be reused as anode material for new lithium-ion battery.

The Characterization of Spent Lithium ion Battery Anode Material Leaching Products as New Anode Material

C-288

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Abstract. Lithium ion battery (LiB) was widely used for various electronic devices. This caused the increases of LiB production and subsequntly, increases electronic waste. LiB recycling was the right choice to reduce electronic waste especially at the anode materials. Graphite is one of anode materials that can be be recycled. Graphite was widely applied in metallurgy, atomic energy industry, and other fields. Impurities such as binders, electrolytes, and metals in graphite had to be removed to produce high purity graphite. The removal of impurities was carried out by washing using Dimethyl carbonate (DMC) and N-methyl Pyrrolidone (NMP), leaching using HCl and HCl:H_2O_2, and heating at 500°C for 1 hour to remove binder and electrolyte in carbon. The residue was washed using DMC-NMP, leached using HCl, and leached using HCl:H_2O_2. Fourier Transform Infra-Red (FTIR) characterization showed the presence of functional groups such as C≡C; C=C=C stretching; and CH_2 bending. The X-Ray Diffraction (XRD) diffractogram showed the presence of graphite at the diffraction peak (2θ) of ~26° for all the sample. It indicated that the sample with or without treatment had a structure that matched with JCPDS No. 96-900-0047 which confirm the structure of graphite. The results of SEM characterization showed that the morphology of washed DMC-NMP was more uniform with a spherical shape, while the morphology with leached showed agglomeration. The average diameter of the particle size in SEM is 22.53; 19.06; and 17.53 µm for samples of DMC-NMP washing, HCl leaching, and HCl:H_2O_2, respectively, it showed the treatment with HCl:H_2O_2 leaching producing smallest average diameter compared with the other treatment.

Periodic Trends in the Character of First-Row Transition Metals-Based Catalysts Embedded on Mordenite

C-333

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Abstract. This research studied the effect of transition metals (TMs) in one period (TMs = Fe, Co, Ni, Cu, and Ag) on the characteristics of mordenite type zeolite. The loading method used was wet impregnation with a metal salt concentrate of 0.025 M. The results showed that the diffraction pattern of mordenite did not change. However, an in-depth analysis of XRD data obtained a decrease in the characteristic peak intensity and a change in the phase composition of the mordenite. On the other hand, the functional group analysis results showed a shift in the wave number of mordenite. The addition of transition metals to the catalyst tended to reduce the acidity and surface area of the mordenite. Morphological analysis showed that TM/mordenite catalysts are more heterogeneous than mordenite.

Physics
Day 2

Solution Of Klein-gordon Equation For Screened Manning-rosen Potential Combined With Trigonometric Poschl-teller And Kepler Problem In Hypersphere Non-central Potential Using Hypergeometric Method

P-298

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Abstract. Klein-Gordon equation for screened Manning-Rosen potential combined with Poschl-Teller potential and Kepler problem in hypersphere non-central potential was solved by hypergeometric method. Klein-Gordon equation was divided into a radial part, an angular part, and an azimuthal part by using a variable separation method. The radial part used screened Manning-Rosen potential while the angular part used Poschl-Teller potential, and the azimuthal part used Kepler problem in hypersphere potential. The relativistic energy spectrum was calculated numerically. The value of the relativistic energy increases as the quantum number n and parameter potential increase. The wave function was expressed in hypergeometric equation term.

Energy Analysis of The Relativistic Klein-Gordon Equation with Hyperbolic Scarf and Gendenstein III Potentials Using Hypergeometric Method

P-299

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Abstract. The analytical solution of The Klein-Gordon equation was solved using the hypergeometry method for Hyperbolic Scarf plus Gendenstein III potential. The Klein-Gordon equation for spin symmetry case is reduced to the differential of one-dimensional Schrodinger-like equation. The wave function and the corresponding energy eigenvalues equation are simply obtained using variable separation and hypergeometric method. The numerical result of relativistic energy is calculated by Matlab R2013. These results can be applied to determine the thermodynamic properties of the system such as vibrational mean energy, vibrational mean free energy, and vibrational specific heat.

Non-relativistic Energy Analysis of Class of Shape Invariant Potentials Using Dong Proper Quantization and Variable Transformation in SUSY WKB

P-300

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Abstract. Non-relativistic energy of a three-dimensional Harmonic Oscillator was obtained by using Supersymmetry WKB quantization rule through Dong Proper Quantization. By using appropriate variable transformation in the SUSY WKB quantization condition formula, a class of shape invariant potentials was reduced to the Coulombic potential ones. The non-relativistic energy of these potentials was obtained by comparing the constant parameters in the SUSY WKB quantization rule scheme between the transformed ones and the Coulombic potential. The thermodynamics and superstatistics properties of these potentials were determined approximately in semiclassical conditions.

Optical Properties in Spherical Quantum Dots of Deng Fan Yukawa Potential Model

P-301

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Abstract. The aim of the reported work was to study the optical properties in the spherical quantum dot confined in the Deng fan Yukawa potential. The Schrödinger equation for Deng Fan Yukawa potential was solved using the NUFA method to obtain the analytical expressions of the eigen energies and the eigenfunctions. The eigenfunction which was a function of the energy spectra was determined from the eigenfunction equations and the calculated energy spectra. By applying the eigen energies and wave functions, the linear, the third-order nonlinear changes in absorption coefficients and refractive index were investigated using the density matrix formalism.

Thermodynamic Properties and the Superstatistics of Trigonometric Scarf Potential Analysis Using Dong Proper Quantization and Supersymmetric WKB Method

P-302

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Abstract. The Schrodinger equation with trigonometric Scarf potential was solved using Supersymmetry Quantum Mechanics Method. In the Supersymmetry WKB quantization condition scheme, the variable of trigonometric Scarf potential was transformed into the Poschl-Teller potential. The spectra energy was obtained by comparing the constant parameters between Trigonometric Scarf potential and Poschl-Teller potential and by using Dong proper quantization condition of transformed Supersymmetry WKB for trigonometric Scarf potential. The energy spectra of the system increase by the increase of the radial quantum number and potential width. The thermodynamics properties of the quantum system were obtained approximately using the spectra energy equation and were expressed in the erf function. The superstatistic mechanics was approximately obtained by using modified Delta Dirac function distribution for the Boltzmann factor.

Solution of Klein-Gordon Equation Screened Hartmann Ring-Shaped Plus Kratzer Potential using Hypergeometry Method

P-303

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Abstract. Klein-Gordon Equation is an equation that describes dynamic of a spin-0 particle in quantum mechanics with relativistic energy. The Klein-Gordon equation can be formed as Schrodinger-like equation. Hypergeometry method can be used to find a solution to the Schrodinger equation, by introducing new variable and then reduce the equation into second-order differential equations. By this method we can find the wave equation and energy equation, and also we can calculate the energy. The Klein-Gordon equation for Screened Hartmann Ring-Shaped plus Kratzer potential can be solved bt hypergeometric method. From the results of the energy we can conclude that energy of the meson particle increase if the orbital quantum number L increase. The energy decrease if the radial quantum number n_r increase.

Development Of Attractive Learning Media 3D Pocketbook Based On Augmented Reality Of The Solar System For College Student

P-293

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Abstract. The industrial revolution 4.0 requires synergies in various sectors, one of those sectors is education which has resulted in the digitization of education. Augmented Reality technology has recently been used in education to enhance student's understanding of some subjects that can't be observed directly, such as physics and astronomy. This research aims to develop a 3D pocketbook (AR3POB) based on augmented reality on the topic of the solar system that meets good eligibility for astronomy learning of college students. Augmented reality is a technology that combines the real world with a computer-generated world interactively in one environment. The research was conducted through the research and development (R&D) method with the ADDIE model. In this research, the ADDIE model is only limited to analysis, design, and development. AR3POB solar system is a learning media in the form of a pocketbook with descriptive explanations equipped with augmented reality technology to produce a 3D form of the solar system. The solar system images are scanned using an application on the gadget, then a 3D form of the solar system will appear on the screen. In addition, the pocketbook provides a descriptive explanation of each topic discussed.

Effect Of Yttrium Doping On The Structural, Magnetic Properties, And Photocatalyst Performance Of Cobalt Ferrite $Co(1-x)Y(x)Fe_2O_4$ (x = 0; 0,02; 0,08; 0,10)

P-132

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Abstract. This study aims to determine the crystal structure and examining the efficiency of the Yttrium doped Cobalt Ferrite nanoparticles as photocatalysts. The method used in this research is an experimental method. The result of this research is that the crystal structure analysis showed that the sample has a cubic crystal system belonging to the Fd-3m group. It is also known that the addition of Yttrium doping decreases the crystal size and increases the lattice, volume, and d-spacing parameters of the sample. XRD results were confirmed using FTIR which showed the elements of Co, Fe, O, and Y in the sample. Characterization using SEM showed the morphology of the sample in the form of granules and clumping due to the use of low annealing temperatures. The VSM test results indicate a decrease in magnetic properties along with the increase in Yttrium content in the sample. The photocatalyst performance of the samples showed an increase with increasing exposure time and doping mass. The sample efficiency of Cobalt Ferrite doped Yttrium as a photocatalyst was 88.11%.

Keywords. Cobalt Ferrite, Photocatalyst, Sol-gel Autocombustion, Yttrium

Science Education
Day 2

Indigenous Knowledge and Its Potential for Junior High School Ethno-STEM Learning

SE-235

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Abstract. Indegenous knowledge is the local knowledge which are followed by certain community hereditary and some of them still exist until nowadays. In accordance to the Regulation of the Minister of Education and Culture Republic of Indonesia no. 35 of 2018, the education in Indonesia is rooted in the culture of nation. Even though many indegenous knowledges exist, the usage of those knowledges are not common yet. Recently, the 21st century skills are being promoted as the part of learning outcomes that students have to master besides the core concepts. In line with that, learning on 21st has to provide guide student to relate the knowledge and the real life problem. Furthermore, using STEM approach in the learning can ehncance students' understanding about problems and creative ways to solve it based on their knowledge. Combining STEM and indegenous knowledge could be an efective way to reach both of two concerning things above. This article focuses on research of indegenous knowledge in Indonesia, identification of it's potensial as ethno-STEM learning based on for Junior High School and it's problem in the real life education.

Keywords: Indigenous, knowledge, ethno-STEM, creative, problem

Local Wisdom Based Science Learning To Improve Creative Thinking

SE-245

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Abstract. Education 4.0 serves as an answer to the needs of Industrial Revolution 4.0. It aims to support the provision of smart education through the improvement and even distribution of education quality, provision of broader access, and relevant use of technology to deliver a world-class education that produces students with 4Cs (Communication, Collaboration, Critical thinking, and problem-solving skills, and Creativity and Innovation) skills. Without these skills, students are likely to fail the competition. In education 4.0, students are demanded to be creative in solving any issue and make innovations to answer problems in modern human life. To answer this challenge, several researchers have developed and applied the local wisdom-based science learning model. In this study, previous literature on the implementation of this model were systematically reviewed. This study concluded that the local wisdom-based science learning model plays a pivotal role in improving students' creative thinking skills.

Keywords: Local wisdom, Science learning, creative thinking.

Analysis of Students' Attitudes towards Engineering and Technology Viewed from School Area Differences

SE-251

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Abstract. This study aimed to describe students' attitudes towards engineering and technology according to school area differences. This study used a quantitative descriptive method with a cross-sectional survey design. The research sample was obtained from three different school areas in Boyolali Regency, Indonesia. The samples in this study were 24.9% from Rural Junior High School, 36.2% from Suburban Junior High School, and 39% from Urban Junior High School. The research sample was taken using a proportional stratified random sampling technique from 7th to 9th grades. Data on student attitudes towards engineering and technology were taken online using the Google form in urban and suburban schools and offline in rural schools. The data analysis technique used simple statistics that describe central tendencies such as means and percentages with SPSS 25. The results indicate that based on the students' attitudes towards engineering and technology, the mean score of the students in rural school was 3.58, students in suburban schools were 3.69, and students in urban schools were 3.64. Students in suburban schools have more positive attitudes towards Engineering and Technology than students in urban and rural schools.

Keyword : Students attitudes, Engineering and technology, School areas

Enhancement of Student Critical Thinking Ability And Environmental Awareness Through E-Module Based On SETS-Edutainment: A Need Analysis

SE-255

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Abstract. The students critical thinking ability are thoughts that encourages curiosity about various information or problems to reach a deep understanding to find solutions to problems encountered. Based on the test of critical thinking skills at the observation stage through HOTS (Higher Order Thinking Skill) questions regarding environmental problems, it was found that about 80% did not understand the impact of environmental damage and had not maximally found real solutions that were useful for the surrounding environment in accordance with current developments and technology. Based on a need analysis, the environmental awareness of students in the Balerejo District Junior High School showed that 70% were not used to throwing garbage in its place, 85% did not know the benefits of planting trees around the riverbanks in Balerejo District and almost 90% did not know the cause of flooding in Balerejo District in 2019 ago. Empowerment of critical thinking can be done by teachers with learning that has the potential to empower critical thinking skills, such as using the SETS-Edutainment approach. SETS-Edutainment provides Science, Environment, Technology and Society-oriented learning that combines science with environmentally friendly technology and is expected to provide benefits to the community or the surrounding environment. The research sites are SMPN 1 Balerejo, SMPN 2 Balerejo and SMPS Wisma-Wisnu Balerejo. The research subjects were the seventh grade students of each school divided into two classes as the control and experimental class. In the initial stage, the limited trial used the randomly selected students control and experimental classes. To find out the effectiveness of the Interactive E-Module, a final stage trial was carried out on all students.

Keywords. Critical thinking ability, Environmental awareness, SETS-Edutainment, E-Module

The Difference in the Effect of Teacher's Learning Models in TPACK Approach

SE-275

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Abstract. The learning model is certainly very helpful in the guiding teachers to choose the right techniques, strategies, and methods to be effectively used in situations and learning materials to achieve optimal learning goals. Thus, the learning model will be packaged with the Technological Pedagogical Content Knowledge (TPACK) approach, which is new knowledge that teachers in the 21st century must master to integrate technology well in learning. However, teachers do not understand that TPACK is the basis of effective teaching with three core components (content, pedagogy, and technology) that can be interacted with through a learning model. This study aims to see the difference effect of teacher's learning models with Contextual Teaching and Learning (CTL), Cooperative Learning, and Conventional Learning model. The method used in this research is descriptive qualitative. The population of this study were three teachers in the elementary school in grade V SDN Mangkubumen Kidul No. 16 Surakarta. The findings were 1) The application of the Contextual Teaching and Learning (CTL) model to the TPACK approach in elementary schools average is 79% (good). 2) The application of the Cooperative Learning model to the TPACK approach in elementary schools averages is 89% (very good). 3) The application of the Conventional Learning model in the TPACK approach in elementary schools averages is 69%(fair).

The Influence of Emotional Intelligence, Social Intelligence and Adversity Intelligence on Videography Creativity

SE-289

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Abstract. The digital industry is growing very rapidly due to the industrial revolution 4.0 and society 5.0. The COVID-19 pandemic accelerates digital literacy for all ages from children to adults. This is marked by the emergence of youtube channels. Content managers who are usually called YouTubers must have videography competence, besides that creativity, emotional intelligence, social intelligence, and adversity intelligence are no less important. This study aims to reveal the influence of Emotional Intelligence, Social Intelligence, and Adversity Intelligence on Videography Creativity. The method used in this study is a quantitative method with a survey approach, data analysis techniques using multiple regression. The research population was all students of SMK Negeri 4 Bekasi City majoring in Broadcast and Multimedia as many as 186 students. The sampling technique used is random sampling, with a population of 180 students, the number of samples is 142 students with a significance level of 1%, referring to the Isaac and Michael sample tables. The research data was obtained using a valid and reliable instrument. Research Results 1) Emotional Intelligence affects the creativity of videography; 2) Social Intelligence Affects Videography Creativity; 3) Adversity Intelligence affects the creativity of videography; 4) Emotional Intelligence, Social Intelligence, and Adversity Intelligence simultaneously affect Videography Creativity.

Keywords: Emotional Intelligence, Social Intelligence, Adversity Intelligence, Videography Creativity.

Teacher Social Competency Analysis Study

SE-297

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Abstract. This study wants to analyze various research results on teacher social competence systematically. Although it is recognized that teachers play a very important role in student development, research that focuses on teachers' social competence is still minimal. This study specifically aims to find state-of-the-art on the social competence of teachers. The systematic review method used in this study consisted of 2 (two) levels, namely: (1) identification and screening, (2) feasibility and input. Articles were searched using Google Scholar and ERIC for the last six years (2016-2021). The criteria for the selected articles must be based on international proceedings and the language used in English, which can be accessed with full text. The results show many research articles that have discussed the social competence of teachers. Most of the articles published in international proceedings and research come from developed countries. The results of the study provide recommendations for further research on the social competence of teachers.

Keywords: Emotional, social development, character development

An Analysis of Teachers' Self-Reflection Performance to Improve Teachers Professionalism

SE-318

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Abstract. The quality of education in Indonesia, according to the Political and Economic Risk Consultant (PERC) survey, is in the lowest rank of 12 countries in Asia. One of the factors that influence this problem is the low competence of teachers in carrying out self-reflection to improve the quality of learning. Therefore, this study was conducted to analyze the performance problems in teachers' self-reflection and to find solutions to the problems of the teachers' reflection. The research methodology used in this research is qualitative research. Data Collection techniques were questionnaires, interviews, observations, and documentation of the teachers in 10 elementary schools in Nogosari District, in Boyolali Regency. The data analysis used the Miles and Huberman technique, namely data reduction, data display, and concluding. The results of the study stated that about 64.67% of teachers sometimes conducted self-reflection, and the solution done from the problems was providing self-reflection training to improve the quality of the teachers' competence. The results of these studies can contribute to the improvement and development of teacher professionalism.

Keywords: self-reflection, teacher, professionalism

CIPP Vs KIRKPATRICK Model In Teacher Competency Development Program Evaluation: A Literature Study

SE-320

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Abstract. This study aims to systematically review and analyze the results of research on cipp and kirkpatrick models in the evaluation of teacher competency development programs. This literature review is specifically intended to determine the advantages and disadvantages of both evaluation models in the implementation of program evaluation. The research method uses systematic studies through four stages, namely; identification, selection, feasibility and inclusion. Search articles using the Google Scholar, ERIC, Sciencedirect and SpringerLink databases. Based on the results of the study found 1115 research articles that discuss the use of cipp and kirkpatrick models in the evaluation of competency development programs. The articles are mostly published in the form of proceedings and international journals and research comes from several countries. The final results showed there were 18 studies discussing the use of CIPP and Kirkpatrick models to evaluate competency development and training programs. Recommendations of the results of the study, in order to be able to combine two models namely CIPP and Kirkpatrick as an alternative evaluation model, the goal is to get an overview of the results of the evaluation of teacher competency development programs more comprehensively especially in the program that contains training components.

Keywords: CIPP Evaluation Model, Kirkpatrick Evaluation Model, Teacher Competency

Feasibility Of Material, Language And Media Aspects In The Development Of Environmental Pollution Learning Tools

SE-327

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Abstract. A research instrument is a measuring instrument used to collect data or objects from a variable to be studied. In getting the data that is correct and in accordance with what should be and required valid and reliable instruments. Therefore, this research aims to develop science learning tools whose material content is related to environmental pollution using a 4D development model consisting of stages: define, design, develop, and disseminate. This paper is specifically to describe at the development stage, which describes the feasibility aspects of material, language, and learning media from the validator. Based on the validation results of the material, language and media experts show that the learning tools are feasible to use in the field

Keyword : Feasibility of Material Aspects, Feasibility of Language Aspects, Feasibility of Media Aspects

Living Curriculum: A Learning Policy Evaluation Kuala Lumpur Indonesian School

SE-332

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Abstract. This article aims to study an evaluation of the Kuala Lumpur Indonesian School Living Curriculum policy by examining the latest trends and contextual factors that can promote a stronger evaluation of educational learning policies, as well as identifying key challenges. It takes a view of policy evaluation as an activity that takes place throughout the policy cycle, before and after the policy is taken. It proposes a supporting framework for education policy evaluation that integrates institutional factors that can help build a solid foundation for policy evaluation. It also presents some specific considerations to take into account individual and institutional policy evaluation processes.

Key Word: Living Curriculum: Policy Evaluation

Computer Supported Collaborative Learning As Learning Environment During Pandemic Covid-19

SE-21

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Abstract. The Covid-19 pandemic has ravaged the world for more than a year, far beyond what experts predict. The impact of the Covid-19 pandemic for Indonesia is to accelerate the implementation of the 4.0 education revolution. Computers and the internet have an important role in the learning process during the Covid-19 pandemic. This research is a descriptive qualitative study that aims to explore Computer Supported Collaborative Learning (CSCL) as a technology-based learning environment. The subjects in this study were students and mathematics teachers in several high schools in Boyolali. Data collection was carried out using questionnaires and in-depth interviews. The results showed that a CSCL-based learning environment was needed and expected to be present in mathematics learning during the Covid-19 pandemic.

Keywords. SCL, learning environment, covid-19

Joyful Elements Implementation on Online Learning: How It Should be?

SE-96

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Abstract. Online learning has been widely applied during COVID-19 outbreak. In Indonesia, it has been about one and a half year conducted in schools. This paper's aim was to reveal how joyful elements had been implemented on online learning during COVID-19 outbreak. Hence, we can learn some mistakes or good results which show us how joyful elements should be implemented on online learning. Qualitative-descriptive method was used in this study. A questionnaire, which related to joyful elements of online learning, had been shared to 1st year college students of 2 departments and 3 classes. The students' answers based on their experience during online learning in this outbreak time. The data was processed and the result consisted of: 1) Jokes and appealing stories were the most effective online learning tactics (as a note, images and videos presentations had almost the same number of voters), 2) Learning in the form of assignments from teachers or lecturers were the most discouraged thing for them, 3) Oral lecturing was the most proper learning method for them, 4) Relaxed feeling because no need to attend formally in real classes was the most thing they liked. Based on the result, it was concluded that on online learning students need teachers' or lecturers' roles greater than when face-to-face learning in order to gain joyful elements. Besides, students actually enjoy their houses as learning classes as long as independent learning methods (such as assignments) implementation are reduced.

Redesigning Online Discussion Learning Method to Improve Critical Thinking Skill and Motivation Students

SE-101

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Abstract. The condition of the Covid-19 Pandemic in Indonesia has an impact on the process of science learning activities at the junior high school level, so learning is carried out online. The role of a teacher is very important to stimulate critical thinking skills through discussion activities by actively involving students to express opinions in discussion activities. Student learning needs need to be considered in applying appropriate learning methods to increase learning motivation and learning objectives that have been determined can be achieved. Thus this study aims to redesign science learning using the online discussion method, especially in online learning activities on environmental pollution material so that it can build social relations between students in online learning. The type of research used is research with a literature study approach where the author uses research sources by collecting related information. The results obtained from this literature study are through learning activities with online discussion methods that actively provide a positive impact on students in developing reasoning, thinking skills, solve, and provide answers or solutions to the problems given. Therefore, in the learning process, the teacher must select and apply learning methods that are by the learning needs of students. learning by using the online discussion method can improve the ability to think so that critical thinking skills can be explored and students' learning motivation increases which have an impact on the ability to understand environmental pollution material

Keywords: online discussion, critical thinking, motivation

Need Analysis for the Development of POGIL-SSI based Natural Science e-Modul to Improve Creative Thinking Ability in the Pandemic Period

SE-107

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Abstract. Creative thinking ability is one of the high-order competencies considered one of the key competencies for the success of the 21st century. This ability makes it easy to face opportunities and challenges that are part of a complex and rapidly changing world. Creative thinking abilities include fluency, flexibility in thinking, originality, and elaboration. This study aims to do a need analysis for e-module development with creative thinking abilities. This need analysis for e-module development with creative thinking abilities needs to be conducted to support online learning. This study used a qualitative method. The research subjects were natural science teachers and 32 seventh-grade students at SMP N 2 Mojolaban. The data collection techniques employed were questionnaires and interviews, which were analyzed descriptively and percentage of the results of the number of answers given are divided by the maximum score for each indicator multiplied by 100, then averaged. This study revealed several results: students' creative thinking abilities were still low on indicators of fluency (49.78%), originality (44%), and elaboration (54.49%). For this reason, POGIL-SSI is a learning model that can be applied to improve students' creative thinking abilities. Further, teachers and students need e-modules to support the online learning process. This research can be developed with the POGIL-SSI-based Natural Science e-module development to improve students' creative thinking abilities.

Need Analysis of Integrated Natural Science e-Module Development Using Kvisoft Flipbook Maker

SE-109

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Abstract. The research objective was to analyze the need for an integrated natural science e-module developed with the Kvisoft Flipbook Maker Pro at SMP N 2 Mojolaban. This study employed a qualitative method with the research subjects of two natural science teachers and 15 seventh-grade students. The data collection techniques were executed hrough observation, questionnaires, and interviews, in which the data were then analyzed descriptively, and the percentage of the number of answers given divided by the number of respondents multiplied by 100 %. The results revealed that (1) natural science learning had not used the integration expected in the curriculum 13. (2) 73.33% of students stated the need for e-modules to support online learning. (3) Students and teachers need effective, flexible, interesting, and not boring teaching materials, equipped with pictures, animation, video, and audio. It indicates that developing teaching materials in the form of an integrated natural science e-module utilizing the Kvisoft flipbook maker pro is necessary.

Exploring Prospective Teachers' Science Process Skills: A Voice from Freshman to Senior of Science Education Major

SE-122

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Abstract. This research conducted to determine the science process skills of science education students in a public university in Indonesia. This research is a survey research with research subjects of science education students: Senior (81 people), Junior (75 people), Sophomore (77 people), and Freshmen (90 people). This study involved cross-sectional case study with one-shot survey. The 50-item science process skills test was applied to students. The components of the science process skills tested include observing, measuring, formulating hypotheses, predicting, manipulating variables, identifying response variables, controlling variables, recording data, interpreting data, and making conclusions. Based on data analysis from test results, the average science process skills of students were 59.66 (Senior), 57.48 (Junior), 47.39 (Sophomore), and 51.57 (Freshmen) respectively, while each component of the science process skills for all students for four years have the same tendency. The lowest component is controlling variables. Based on the data, it can be concluded that the science process skills of prospective science teacher are in the inadequate category, and it indicate to reform the professional development in preparing future science teacher.

Needs Analysis of SCROLY Learning Method Design (Study Case and Role Playing) About Environmental Issues in Science Learning in the Thema of Global Warming

SE-130

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Abstract. Lack of student activity and the lack of relevant science concepts in learning make science learning less functional and meaningful. Improvements are needed in learning methods to increase student engagement and understanding by using a combination of case study learning methods and role playing. The purpose of this study was to obtain: 1) students' initial knowledge of environmental issues, 2) field learning methods used by teachers. The data collection technique used was questionnaire filling and descriptive data analysis. Based on the filling out of environmental awareness questionnaires conducted by 47 junior high school students at different schools 70.2% of students have read environmental issues, 57.4% of students discuss environmental issues with their friends, and 85, 1% stated that they care about their environment. This shows a high interest in environmental issues and teachers need to bring environmental issues such as global warming to their lessons. Based on the results of filling out the questionnaire conducted by 32 science teachers, it was stated that 71.9% taught using the Cermah method which caused monotonous learning. SCROLY learning (Study case and Role Playing) is designed to involve students as an investigation team, a team of scientists, and a team of policy makers related to the issue of global warming so that learning is more meaningful. Based on the results of filling out the questionnaire conducted by 32 science teachers, it was stated that 71.9% taught using the Cermah method which caused monotonous learning. SCROLY learning (Study case and Role Playing) is designed to involve students as an investigation team, a team of scientists, and a team of policy makers related to the issue of global warming so that learning is more meaningful. Based on the results of filling out the questionnaire conducted by 32 science teachers, it was stated that 71.9% taught using the Cermah method which caused monotonous learning. SCROLY learning (Study case and Role Playing) is designed to involve students as an investigation team, a team of scientists, and a team of policy makers related to the issue of global warming so that learning is more meaningful.

Keywords: Study cases, role playing, learning methods

Project-Based Learning Models : Effect On Student Self-Confidence And Digital Storytelling Results Using The Schoology Platform

SE-139

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Abstract. The purpose of this study was to analyze the application of Schoology-based project-based learning (PjBL) learning models on students' self-confidence and the results of digital video storytelling. This type of research is a pre-experimental design with a one-shot case study design. The population in this study were all students of class X IPA for the 2018/2019 academic year. The sample was students of class X IPA 4 who were taken by purposive sampling technique. The instruments used in this study were a self-confidence questionnaire and a digital video storytelling rubric that had previously been validated by expert judgment. The data obtained were analyzed by using the Mann Whitney U Test through the SPSS for Windows program. The results showed that: the Schoology-based project-based learning model had no effect on self-confidence (p = 0.565) and the Schoology-based project-based learning model had an effect on the results of digital video storytelling (p = 0,000). The conclusion in this study is that the application of the Schoology-based PjBL model with digital video storytelling media has no effect on student self-confidence. The application of the Schoology-based PjBL model with digital video storytelling media has an effect on the results of students' digital video storytelling.

Keywords : Project-Based Learning, Schoology, Self Confidence, Video Digital Storytelling

In-Service Teachers' Perception And Experience For Integrating STEM Approach In Science Learning

SE-172

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Abstract. STEM approach has been widely applied in classroom learning. STEM education is not a curriculum by itself, but it is an approach for teachers to organize and deliver instruction in a way that helps students apply their knowledge with their peers in meaningful situations. A teacher training program that preparing a high-quality teacher also makes some changes regarding STEM in their curriculum. However, little has been exposed to the findings on in-services teachers' challenges through the program. This study investigated in-service teachers' view of integrated STEM education and their practice in preparing STEM-based learning. The theme of STEM-based learning is Low-Carbon Education. Data was collected through surveys and online discussions. The discussion was conducted during the online workshop on STEM. It involved thirty teachers in Solo Raya, Indonesia. Data analysis used qualitative-descriptive analysis. The findings show that less than 30% of In-service teachers have difficulties in applying STEM learning. However, two experienced teachers have a sound understanding and positive perceptions of their competencies.

Keyword : In-Service Teacher, STEM, Science Learning

Project-Based Learning Of Short Filmmaking To Enhance Students' Creative Thinking Abilities On Environmental Pollution Concept

SE-204

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Abstract. Project-based learning is a method of learning by doing projects and producing products. The product produced in this project-based learning is a short film. Project-based learning is used to improve students' creative thinking abilities. Creative Thinking is one of the highest levels of abilities that students should have at this time. Creative thinking is also able to make students break down new problems more effectively, even allowing students to produce new discoveries to help in everyday life. The purpose of this study is to determine the effect of the project-based learning model of short filmmaking to improve students' creative thinking abilities on environmental pollution concepts. The sample in this study consisted of 76 students of grade X of State Senior High School 3 Serang City which was divided into two sample groups, namely the experimental and control group. The instrument used is a creative thinking test instrument. Data analysis was conducted using independent samples t-test to analyze the effects of project-based learning on creative thinking abilities. The results show: (1) project-based learning of short filmmaking has a significant influence on students' creative thinking abilities (2) creative thinking abilities in the experimental group was higher than the control group.

The Effect Of Whatsapp As A Tool For Learning In Scientitic Reading Based Project (SRBP) Model To Enhance Collaborative And Critical Thinking Skill Of Teacher Candidats

SE-218

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Abstract. The purpose of this study was to prove the effect of whatsapp groups as an informal channel in improving critical thinking skills and the ability to collaborate in science learning for PGSD students. The research method is a quasi-experimental pretest posttest. The research sample was 80 PGSD students. Collecting data by tests, interviews, observation and documentation. The results of the study can be concluded that whatsapp has a positive effect on the treatment class by increasing critical thinking skills and collaboration skills in PGSD students. Based on the t test, there was a significant difference between the treatment and control classes. The application of WhatsApp in learning can improve critical thinking and collaboration skills for PGSD students or prospective teachers. The recommendation of this research is that whatsapp can be used as a tool to stimulate creative thinking skills.

Keywords: collaborative, critical thinking, students, science

The Implementation of GIS as a means for Study Source of Community of Practice

SE-230

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Abstract. The usage of computational Geographic Information System (GIS) has been spread this last two decades, either for achieving organization goals to only personal use. One of the opportunity of GIS implementation is, it can be used as study hub and provide bunch of datasets of certain area for research purpose. The purpose of this paper is to discuss on how to implement a GIS as a study source of Community of Practice. This paper will conduct a Systematic Literature Review on 17 articles and literatures published between 1998 to 2020 with keyword 'GIS', 'Community of Practice', and 'GIS Community of Practice'. This paper is specified but not limited to only discuss the prefered application of GIS for Community of Practice based on reviewed articles and literatures only. However, a further research is needed to complement and improve the main goal of this article and also to adapt the system in further human society.

Nowcasting of Daily Consumer Price Index Using Time Series Regression and Support Vector Regression

SE-233

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Abstract. Consumer Price Index (CPI) is one of the economic indicators used to measure inflation. Badan Pusat Statistik (BPS) publishes a monthly CPI and inflation with a time lag of one working day. Policies based on the monthly inflation rate could be losing momentum as the events associated with inflation had occurred long before inflation or CPI was published. Therefore, it is necessary to calculate daily CPI to describe near real-time price changes. Nowcasting can overcome this issue by predicting daily inflation through predicting daily CPI. The calculation of daily CPI is done by entering daily data price of basic commodities in Sistem Informasi Ketersediaan dan Perkembangan Harga Bahan Pokok (SISKAPERBAPO), daily Jakarta Interbank Spot Dollar Rate (JISDOR) from Bank Indonesia, and daily Brent crude oil futures prices from Id Investing into a nowcasting model and validated by monthly CPI published by BPS. The nowcasting method used in this study is the Time Series Regression (TSR) and Support Vector Regression (SVR) applied to predict daily CPI nowcasts in East Java Province. The performance comparison between TSR and SVR is evaluated based on the Root Mean Square Error (RMSE), symmetric Mean Absolute Percentage Error (sMAPE), and Mean Absolute Deviation (MAD).

Keywords: Nowcasting, Support Vector Regression, Time Series Regression, Inflation, Consumer Price Index, JISDOR, SISKAPERBAPO, RMSE, sMAPE,MAD

International Conference on Science, Mathematics, Environment and Education

CE-329

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Abstract. The development of science and technology can be used as one way to improve the quality of learning. Teachers as learning facilitators should be adapted and improve their TPACK. Technological Pedagogical Content Knowledge (TPACK) is the knowledge to integrate technology into the teaching of certain materials. This study aims to analyze the profile of chemistry teachers' TPACK in Klaten Regency, Indonesia. The research design is quantitative-descriptive method with purposive sampling. The sample in this study was fourteen chemistry teachers. A survey was employed to collect the data. The questionnaire consists of thirty questions related to content knowledge, pedagogical knowledge, technological knowledge, technological content knowledge, technological pedagogical knowledge, pedagogical content knowledge. The results showed that the TPACK ability of Chemistry teachers is classified as lacking with the lowest score in the TPK domain of 27, 55% and the highest in the TK domain 64, 28%.

Keywords: TPACK, Chemistry Teachers, Acid and Base

The understanding of metacognitive skills among biology teachers and lectures in Makassar, South Sulawesi, Indonesia

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The Understanding of Metacognitive Skills among Biology Teachers and Lectures in Makassar, South Sulawesi, Indonesia

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Abstract. Teachers and lecturer must can comprehend the nature of metacognition and how it can be implemented in the learning process. This study aimed to investigate to what extent Biology teachers and lecturers understand metacognitive skills. A survey with a descriptive quantitative approach was employed in this study. The data of this study were gathered using a questionnaire and an interview. The population all Biology lecturers who were teaching at the Department of Biology Education and Biology school teachers from Makassar, South Sulawesi, Indonesia. The samples were selected by using a purposive sampling technique. The samples were 46 Biology lecturers and 48 Biology school teachers. The results showed that the participants had an issue in comprehending metacognitive skills; only a few of them understood what metacognition was. In fact, the majority of the lecturers and teachers had not integrated the skills into the learning process. It is expected that the findings of this study can be contemplated as an insight to the development of the learning quality in the 21st century era.

INTRODUCTION

Metacognitive skills comprise the ability to and the awareness of monitoring one's own learning process [1]. Education should be able to rise this awareness in student [2]. Metacognitive skills play an essential role [3]–[5] as a compass which enables students to be responsible for their own learning [6]–[8]. Metacognitive skills help students to plan as well as to monitor their learning progress and process, problem-solving [9]–[12].

Teachers and lecturers need to be able to comprehend the nature of metacognition and how to incorporate metacognitive skills into learning [13], [14]. The teachers' and lecturers' understanding of metacognition seems to be closely related to their perception of learning strategies that can help students raise their metacognitive awareness and metacognitive abilities [15], [16]. Educators with good understanding of pedagogy can understand what needs to be taught [17]–[19] and can be more successful in improving their students' metacognitive skills [9] [20].

Empirical evidence shows that most students are willing to reflect on their learning process and adjust their learning strategies to various conditions. However, many unable to identify appropriate learning strategies nor implement a new plan [21],[22] . The students' metacognitive awareness and metacognitive skills are at the level of "cannot really" (cannot distinguish between what to think and how to think) and of "at risk" (the students do not seem to be aware that thinking is a process) [23], [24]. This shows that students experience a difficulty in measuring and managing their thinking evolution [3].

The early provision of metacognition to Biology teacher candidates is expected to give a strong foundation for their pedagogical competence. Students learn from their teachers; in this case, lecturers. Therefore, how lecturers teach in the classrooms are the examples of how learning should be conducted. However, it has been found that learning activities at universities have not reflected the proper science learning. The classrooms are mostly dominated by lecturing, textbook reading, and power point presentation by the lecturers, while students' problem solving and higher-order thinking skills have been left untouched [25], [26]. The habits of teaching by using conventional techniques are still found in many schools. Therefore, it is less likely that students' metacognitive skills can be empowered [27].

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Research conducted by Theodosiou [28] and Veenman [29] have proven that discovery learning and task-based learning had an effect on activating students' metacognitive processes. By understanding metacognition, teachers and lecturers can help their students generate their metacognitive awareness and metacognitive ability [15]. Metacognitive empowerment can stimulate reflective thinking skills, critical thinking, making effective decisions and self-confidence in class discussions and have superior performance [30]–[33]. Success in learning and education occurs when teachers, lecturers, supervisors, educational institutions design, implement and manage learning by empowering metacognitive skills [34].

The main purpose of this research was to investigate the extent to which Biology lecturers and school teachers understand concepts related to metacognition. The results of this study are expected to provide insights for improving the quality of the 21st century learning. Synergy between teachers and lectures in promoting metacognitive skills in the classroom and the early provision of metacognitive skills at universities are beneficial to improve the quality of education.

METHOD

This study was designed as a descriptive quantitative survey. The research data were obtained using a questionnaire and an interview. The population of this research was all the lecturers from Biology education program in Makassar and all Biology teachers in Makassar, South Sulawesi. The research samples were taken from the population by using a purposive sampling technique. Altogether, there were 48 teachers and 46 lecturers (12 lecturers from Universitas Islam Negeri (UIN) Alauddin Makassar; 11 lecturers from Universitas Pejuang Republik Indonesia (UPRI) Makassar; 23 Lecturers from STKIP Pembangunan Indonesia (PI) Makassar). The criteria for selecting the samples from the university were that the lecturers came from an accredited biology education program, had been serving as an associate lecturer in the department, and had been teaching Biology for more than three years. The teachers were selected based on the facts that their schools had been accredited and they had more than five years of teaching experience. Every school level was represented by on Biology teacher.

A semi-open questionnaire was developed to collect the data. The participants' understanding of metacognitive skills was measured based on nine components: (1) recognition of metacognition concept; (2) understanding of the importance of metacognitive skills for students; (3) comprehension of the parameters of metacognitive skills; (4) knowledge about the characteristics of students who master metacognitive skills; (5) promotion of students' metacognitive skills in the classroom; (6) understanding the advantages of empowering students' metacognitive skills; (7) understanding the correlation between metacognitive skills and learning achievement; (8) knowing the correlation between metacognitive skills and thinking skills; and (9) difficulties in empowering students' metacognitive skills. Before the questionnaire was distributed to the participants, it was validated by a group of experts (construct validity).

The study was carried out from December-August. The data were analyzed using a descriptive quantitative analysis, and the conclusion was drawn based on percentages with the assistance of Excel for Windows. Besides, an interview was also conducted to the representatives of the participating universities and schools to obtain more detailed information on the aspects related to metacognitive skills. The components of the interview covered (1) the constraints that the teachers/lecturers faced in implementing metacognitive skills; (2) the efforts that teachers/lecturers did to improve students' metacognitive skills in the classroom; (3) learning strategy and learning methods that the teachers/lecturers often used in the classroom; (4) the teachers/lecturers self-reflection on their pedagogic competence.

FINDINGS

The results related to the teachers and lecturers' understanding of metacognitive skills can seen in Table 1.

TABLE 1. Teachers and Lecturers' Understanding about Metacognitive Skills

No	Variable Components	Understanding of Metacognitive Skills		
		Teacher (%)	Lecturer (%)	Average (%)
1	Recognition of metacognition concept.	20.83	28.26	24.55
2	Understanding of the importance of metacognitive skills for students.	16.67	26.09	21.38

No	Variable Components	Understanding of Metacognitive Skills		
		Teacher (%)	Lecturer (%)	Average (%)
3	Comprehension of the parameters of metacognitive skills.	14.58	23.91	19.25
4	Knowledge about the characteristics of students who master metacognitive skills.	12.50	23.91	18.21
5	Efforts to promote students' metacognitive skills in the classroom.	12.50	19.57	16.03
6	Understanding the advantages of empowering students' metacognitive skills.	10.42	19.57	14.99
7	Understanding the correlation between metacognitive skills and learning achievement.	8.33	17.39	12.86
8	Knowledge about the correlation between metacognitive skills and thinking skills.	8.33	17.39	12.86
9	Difficulties in empowering students' metacognitive skills.	12.50	19.57	16.03
	Average	12.96	12.96	21.74

The recapitulation of the survey related to the learning methods used at the universities and schools participating in this study is presented in Figure 1.

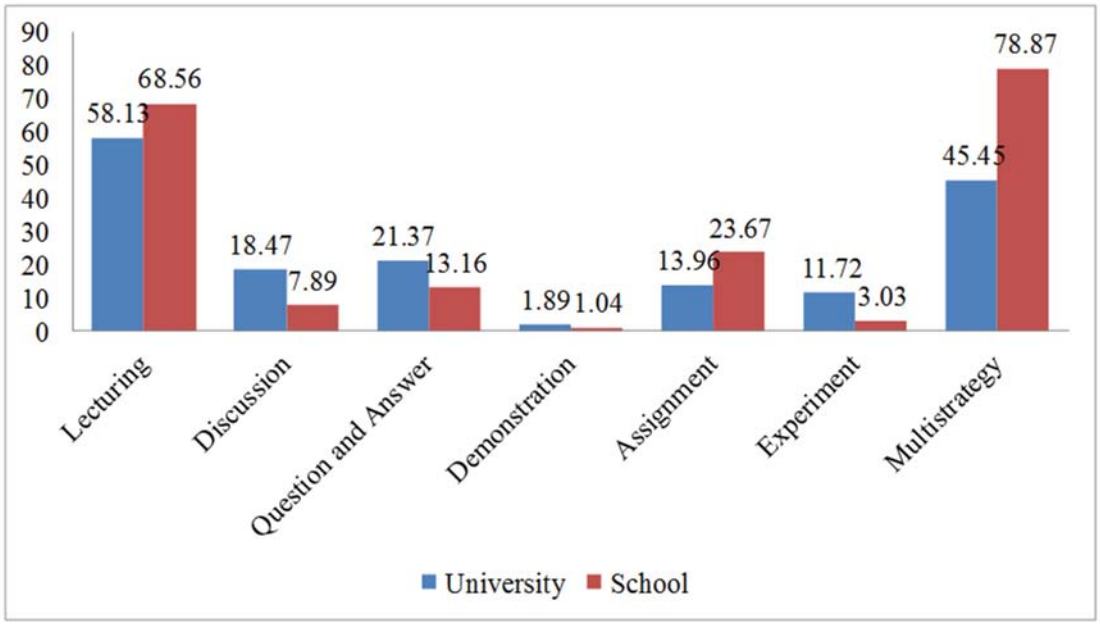

FIGURE 1. The Result of the Survey on Learning Methods Used in the Clasrooms

Factors that affect the participants' understanding of metacognitive skills are recorded in Table 2.

TABLE 2. Factors Affecting Biology Teachers and Lecturer's Understanding of Metacognitive Skills

No	Aspects	Factors Affecting Understanding		
		Teacher (%)	Lecturer (%)	Average (%)
1	Actively involved in training, national/international seminars or scientific forums related to metacognitive skills and learning innovation.	20.83	60.87	40.85
2	Implementing a variety of learning models, strategies, methods in the classroom.	16.67	41.30	28.99
3	Using authentic assessment to evaluate students' achievement.	35.42	39.13	37.27
4	Reflecting on the students' learning activities in a learning journal.	12.50	21.74	17.12
5	Monitoring the students' learning progress and thinking development.	31.25	52.17	41.71
6	Training the students' questioning skills in the learning process.	43.75	63.04	53.40
	Average	26.74	46.38	36.56

DISCUSSION AND RESULTS

The results showed that the teachers and lecturers had poor comprehension of metacognitive skills because metacognitive skills were rarely empowered through classroom activities. Most of the teachers did not understand the concept of metacognition. This has impacted their choice of learning strategies to be implemented in the biology classrooms which are mostly dominated by multistrategy learning. As a result, the students' metacognitive skills and other thinking skills are not well-developed. Educators need to develop a complex understanding of metacognitive concept and metacognitive thinking strategies in order to be able to teach their students how to improve their metacognitive skills [15].

The metacognitive skills must undergo habituation which means the skills must be trained regularly through learning. The habituation process requires full self-awareness and self-control [35]. Therefore, as a learning facilitator, teachers and lecturers have an important role in helping the students develop the habit. An effective pedagogical approach to raise students' awareness of metacognition and self-regulation in learning should be designed properly [36]. Students who can regulate themselves are more likely to perform better in metacognition [37]. Metacognitive skills can be used in problem-solving, experiment design, and investigation [20].

The finding is in line with the results of a survey conducted by Warouw [38], showing that 36.58% teachers are not familiar with metacognitive learning; 97.56% do not yet know the meaning of metacognitive skills and have not developed the skills; 100% do not yet know the importance of empowering metacognitive skills in learning. Other research findings have also indicated that science teachers from junior high schools in Jember [39] and science teachers from senior high schools in Jeneponto [40] have poor metacognitive skills. Despite the "sad" empirical evidence, teachers and lecturers still have many opportunities to help their students develop metacognitive skills by participating in metacognition training. If the educators are aware of that, the quality of Biology learning can improve accordingly.

Teachers' pedagogical competency is also a determinant factor that influence the students' success in academics. The educators' capability in implementing various learning models, approaches, strategies, methods and techniques in the classroom has a significant effect on the students' learning experience, which is expected to be able to improve their metacognitive skills. The development of metacognition skills and the variation of learning models/strategies can strengthen students' potentials [29]. Teachers' pedagogical competence can be improved through training, seminars, workshops, held by either MGMP (Subject Teacher Consultation), Department of Education, or the cooperation between the ministry and other institutions. However, all these efforts have not been apparently carried out on the field. The training activities so far tend to emphasize on the aspects of education and learning in general and have not discussed metacognition learning [39].

The interviews have also revealed some obstacles in empowering teacher's metacognitive skills. The first obstacle is that because training, seminars, and workshops attended by the participants did not focus on metacognitive skills. In addition, the role of the supervisor in monitoring the empowerment of metacognitive skills in the classroom was not very active. School principals and school supervisors did not directly monitor the classroom learning. Teaching supervision was not regularly conducted. Instead, the focus of school assessment was normally put on administrative matters, such as the adequacy of learning media [41]. The lack of the supervision activity results in maintaining the habits of teachers to implement conventional methods in the classroom [27].

Furthermore, the observation indicate that the learning models, strategies, methods used in the classrooms are not varied (figures showed 16.67%). As a result, students' learning independence cannot be established. The activation of students' metacognitive skills could stimulate students' learning autonomy and improve students' learning achievement [42] and learning competences [43]. Independent learners are equipped with metacognitive skills. It is believed that they will become more successful in learning and in the workplace in the future [37], [44].

Students' needs are not limited only to cognitive domains, but also other domains related to the ability to control and communicate learning results individually to develop understanding and learning attitude [45]. Research conducted by Dipalaya [46] showed that most of schools in Makassar only concentrated on developing and testing students' memory of Biology concepts [47] observed that most biology teachers spent half of the lesson explaining theories and ignore other practical aspects that have the potential to develop students' objective reasoning ability. Teachers often used the expository model, so that biology learning became less meaningful [48]. Meanwhile, at the university level, 58.13% learning was still dominated by lecturing method [49]. It, thus, can be concluded that the empowerment of the students' metacognitive skills in the classrooms was still at its slightest. Teachers and lecturers should be able to help students develop their metacognitive knowledge through the implementation of learning strategies, and help them understand how to apply the procedural knowledge into real-life situations [21].

Another important issue to address is that teachers and lecturers need to monitor the development of students' thinking skills. They have to increase their involvement in the empowerment of students' metacognitive skills. Livingston [50] states that metacognitive activities, such as problem-solving, comprehension control, and progress monitoring can be beneficial for students' cognitive processes. When students' metacognitive skills have improved, the students' awareness to learn, to control the learning process, to evaluate self-efficacy, and to evaluate their strengths and weaknesses will also experience progress [42]. This will also help teachers and lecturers to assess the students' learning achievement through authentic assessment. However, before establishing a learning environment and implementing an appropriate learning strategy that can accelerate the development of students' metacognitive skills, the principles and conditions that determine metacognitive behaviors must first be determined [51].

Blakey [52] put forward the steps to improve students' metacognitive skills (behaviors), including: (1) identifying what is known and not known; (2) talking about thinking; (3) making a thinking journal; (4) making self-planning and regulation; (5) reporting the thinking process; (6) self-evaluation. However, the observation showed that Biology teachers and lecturers in Makassar rarely wrote a learning journal to reflect on the process of learning. Writing a journal can increase retention, while analysis of writing can improve students' thinking ability [53].

Students should be involved in reflecting learning behaviors to increase their metacognitive awareness [36], [54]. The quality and the quantity of students' involvement in structured assignments should be increased. Specific individual tasks should be given to students. Metacognition can also be integrated into students' daily activities [55]. The role of teachers and lecturers in teaching and facilitating ideas and activities provides positive acceptance for students in training their metacognitive skills [56].

Students' metacognitive skills can also be improved through writing tasks [53]. Students need to be actively engaged in the classroom discussion where they are given an opportunity to answer and ask questions. Research reports that 43.75% teachers and 63.04% lecturers train their students' questioning skills in the learning process. Teachers and lecturers should be able to increase interaction through discussion and evaluate the learning process [13], [57]. The right questioning technique can provide a more meaningful learning experience for students and establish a direct interaction between teacher and students [2], [58]. Students' metacognitive skills can also be empowered by training the students' questioning skills. Research conducted in Turkey, Singapore, Japan showed a relationship between problem problem ability with students' metacognition skills [59]. Metacognitive skills have an important role in controlling the cognitive processes of students in order to think reflectively, effectively and efficiently [15], [60]. Learning should be equipped with a student monitoring and evaluation assessment component that supports metacognitive skills and scientific literacy [61], [62]. The higher the metacognitive skills of students, the better the ability for self-reflection [63].

The success of the empowerment of metacognitive skills at the university level highly depends on the lecturer's professionalism. Lecturers must be able to create activities that stimulate students' metacognitive skills. The results

of the interviews conducted with Biology lecturers from Makassar have uncovered five major obstacles to improving students' metacognitive skills. The first one is the lecturer's lack of understanding of metacognitive process. They also admitted that classroom management and monitoring were two important skills that had to be mastered by the lecturers. In addition, lack of supervision and evaluation of lecturers' performance might result in the lecturer's poor understanding of students' metacognitive skills. It was also difficult for the lecturers to monitor students' metacognitive skills with a non-standardized instrument. The diversity of student backgrounds (age, gender, culture, academic, social, and economic level) was also an issue. Based on these findings, it is obvious that the stakeholders need to facilitate the development of lecturer professionalism.

All in all, it can be concluded that teachers and lecturers' lack of knowledge of metacognitive skills may result in selecting inappropriate strategies to develop students' metacognitive skills. Although some of them have already possessed a good understanding of the concept of metacognition, most of them have not empowered students' metacognitive skills during the learning process. Therefore, it is recommended for the teachers and lecturers to always improve their pedagogical and professional competence as educators.

REFERENCES

1. Corebima A. D., Pelatihan PBMP (Pemberdayaan Berpikir Melalui Pertanyaan) pada Pembelajaran Bagi Para Guru dan Mahasiswa Sains Biologi dalam rangka RUKK VA, (2015).
2. Amin A. M., Corebima A. D., Zubaidah S., and Mahanal S., The Correlation between Metacognitive Skills and Critical Thinking Skills at the Implementation of Four Different Learning Strategies in Animal Physiology Lectures. Eur. J. Educ. Res., vol. 9, iss. 1, pp. 143–163 (2020).
3. Setiawan D. and Susilo H., "Peningkatan Keterampilan Metakognitif Mahasiswa Program Studi Biologi Melalui Penerapan Jurnal Belajar Dengan Strategi Jigsaw Dipadu PBL Berbasis Lesson Study pada Matakuliah Biologi Umum" in *Prosiding Seminar Nasional Pendidikan Biologi*, (Prodi Pendidikan Biologi FKIP Universitas Muhammadiyah Malang, Malang, 2015), pp. 359–369.
4. Doganay A. and Demir O., Comparison of the Level of Using Metacognitive Strategies during Study between High Achieving and Low Achieving Prospective Teachers. Educ. Sci. Theory Pract., vol 11, iss. 4, pp. 2036–2043 (2011).
5. Hernandez Barrios A. and Camargo Uribe Á., Adaptación y validación del Inventario de Estrategias de Autorregulación en estudiantes universitarios. Suma Psicol., vol. 24, iss. 1, pp. 9–16 (2017).
6. Hacker D. J., Dunlosky J., Graesser A. C., Zimmerman B. J. and Moylan A. R., Self-Regulation from: Handbook of Metacognition in Education Routledge **11531**, 1 (2009).
7. Ozsoy G. and Ataman A., An Investigation of the Relationship between Metacognition and Mathematics Achievement. Asia Pacific Educ. Rev., vol. 12, iss. 2, pp. 227–235 (2011).
8. Hinojosa M., Rodriguez M. C. and Paez C. A. O., Measurement of Metacognition: Adaptation of Metacognitive State Inventory in Spanish to Mexican University Students Eur. J. Educ. Res., vol. 9, iss. 1, pp. 413–421 (2020).
9. Imel S., Metacognition Skills for Adult Learning. Trends and Issues Alert, *ERIC Clearinghouse on Adult, Career, and Vocational Education, Columbus, OH.* (2002).
10. Tachie S. A., Meta-cognitive Skills and Strategies Application: How this Helps Learners in Mathematics Problem-Solving. Eurasia J. Math. Sci. Technol. Educ., vol. 15, iss. 5, pp. 2–12 (2019).
11. Kim B., Zyromski B., Mariani M., Lee S. M. and Carey J. C., Establishing the Factor Structure of the 18-Item Version of the Junior Metacognitive Awareness Inventory. Meas. Eval. Couns. Dev., vol. 50, iss. 1-2, pp. 48–57 (2017).
12. Mihalca L., Mengelkamp C. and Schnotz W., Accuracy of Metacognitive Judgments as a Moderator of Learner Control Effectiveness in Problem-Solving Tasks. Metacognition Learn, vol. 12, iss. 3, pp. 357–379 (2017).
13. Ya-Hui W., A study on Metacognition of College Teachers. J. Hum. Resour. Adult Learn, vol. 8, iss. 1, pp. 80–91 (2012).
14. Sukarelawan M. I., Sulisworo D., Jumadi Kuswanto H., and Rofiqah S. A., Heat and Temperature Metacognition Awareness Inventory: A Confirmatory Factor Analysis. Int. J. Eval. Res. Educ., vol. 10, iss. 2, pp. 389–395 (2021).
15. Wilson N. S. and Bai H., The Relationships and Impact of Teachers' Metacognitive Knowledge and Pedagogical Understandings of Metacognition. Metacognition Learn., vol. 5, iss. 3, pp. 269–288 (2010).
16. Sriyanto and Sukarelawan M. I., Mapping of Profile Students' Metacognitive Awareness in Yogyakarta, Indonesia. J. Ris. dan Kaji. Pendidik. Fis., vol. 6, iss. 2, pp. 56–62 (2019).

17. Amin A. M. and Adiansyah R., "Lecturers ' Perceptions of the Empowerment o f Students ' Argumentation Skill and the Challenges of Teaching the Skill to Students" in *5th International Conference on Research, Implementation and Education of Mathematics and Science (ICRIEMS),* (Universitas Yogyakarta, Yogyakarta, 2018), pp. 111–116.
18. Amin A. M. and Adiansyah R., Identifikasi Gaya Belajar dan Respon Mahasiswa untuk Menentukan Strategi Pembelajaran pada Perkuliahan Fisiologi Hewan. J. Biol. Pembelajarannya, vol. 5, iss. April, pp. 1–9 (2018).
19. Harrison G. M. and Vallin L. M., Evaluating the metacognitive awareness inventory using empirical factor-structure evidence. Metacognition Learn, vol. 13, iss. 1, pp. 15–38 (2018).
20. Huriye D. C., Development of metacognitive skills: designing problem-based experiment with prospective science teachers in biology laboratory. Educ. Res. Rev., vol. 10, iss. 11, pp. 1487–1495 (2015).
21. Stanton J. D., Neider X. N., Gallegos I. J., and Clark N. C., Differences in Metacognitive Regulation in Introductory Biology Students: When Prompts are Not Enough. CBE Life Sci. Educ., vol. 14, iss. 2, pp. 1–12 (2015).
22. Ismanto B. N., Pramesti G., Suwarsi T. U. and Chrisnawati H. E., "The Impovement of the Understanding of the Concepts and Students Activities Using Discovery Learning with Recitation" in AIP Conference Proceedings, (American Institute, New York, 2019), pp. 2194.
23. Prayitno B. A., Pengembangan Perangkat Pembelajaran IPA Biologi SMP Berbasis Inkuiri Terbimbing Dipadu Kooperatif STAD Serta Pengaruhnya terhadap Kemampuan Berpikir Tingkat Tinggi, Metakognisi, dan Keterampilan Proses SAINS pada Siswa Berkemampuan Akademik Atas dan Bawah, Unpublished dissertation. (Malang, PPs UM, 2011).
24. Suratno, Pengaruh Strategi Kooperatif Jigsaw dan Reciprocal Teaching Terhadap Keterampilan Metakognisi dan Hasil Belajar Biologi Siswa SMA Berkemampuan Atas dan Bawah di Jember, Unpublished dissertation. (Malang, PPs UM, 2009).
25. Afandi Sugiyarto and Sunarno W., Pembelajaran Biologi Menggunakan Pendekatan Metakognitif Melalui Model Reciprocal Teaching Dan Problem Based Learning Ditinjau Dari Kemandirian Belajar Dan Kemampuan Berpikir Kritis Mahasiswa. Jurnal Pendidikan Matematika, vol. 1, iss. 2, pp. 86–92 (2012).
26. Lutfiyah R. A., Chrisnawati H. E., Pramesti G. and Kuswadi Y., "Development of Teaching Materials to Improve the Student's High Order Thinking Skills" in AIP Conference Proceedings, (American Institute, New York, 2019).
27. Sele Y., Corebima D., and Indriwati S. E., The Analysis of the Teaching Habit Effect Based on Conventional Learning in Empowering Metacognitive Skills and Critical Thinking Skills of Senior High School Students in Malang, Indonesia. Int. J. Acad. Res. Dev., vol. 1, iss. 5, pp. 64–69 (2016).
28. Theodosiou A., Mantis K. and Papaioannou A., Student Self-Reports of Metacognitive Activity in Physical Education Classes. Age-Group Differences and the Effect of Goal Orientations and Perceived Motivational Climate. Educ. Res. Rev., vol. 3, iss. 12, pp. 353–364 (2008).
29. Veenman M. V. J., Wilhelm P. and Beishuizen J. J., The Relation between Intellectual and Metacognitive Skills from a Developmental Perspective. Learn. Instr. **14,** 89–109 (2004).
30. Al-Shabibi A. A. and Alkharusi H., Cypriot Journal of Educational. Cypriot J. Educ., vol. 13, no. 2, pp. 149–159 (2018).
31. Roeschl-Heils A Schneider W and Van Kraayenoord C E, Reading, Metacognition and Motivation: A follow-up Study of German Students in Grades 7 and 8. Eur. J. Psychol. Educ., vol. 18, iss. 1, pp. 75–86 (2003).
32. Sanabria L., Ibáñez J. and Valencia N., Ambiente Metacognitivo Digital Para Apoyar el Aprendizaje de las Matemáticas. Rev. Papeles, vol. 7, iss. 14, pp. 42–54 (2015).
33. Kuiper R., Enhancing Metacognition through the Reflective Use of Self-Regulated Learning Strategies. J. Contin. Educ. Nurs., vol. 33, iss. 2, pp. 78–87 (2002).
34. Garzon D. F. M., Bustos Bustos A. P. H. and Lizarazo J. O. U., Relationship between Metacognitive Skills, Gender, and Level of Schooling in High School Students. Suma Psicol., vol. 27, iss. 1, pp. 9–17 (2020).
35. Demir O., A Validation and Reliability Study of the Metacognition Scale in Turkey *Glob.* J. Hum. Soc. Sci. Res., vol. 13, iss. 10, pp. 26–35 (2013).
36. Isaacson R. M. and Fujita F., Metacognitive Knowledge Monitoring and Self-Regulated Learning: Academic Success and Reflections on Learning. J. Scholarsh. Teach. Learn., vol. 6, iss. 1, pp. 39–55 (2006).
37. Arslan S., An Investigation of the Relationships between Metacognition and Self-Regulation with Structural Equation. Int. Online J. Educ. Sci., vol. 6, iss. 3, pp. 603–611 (2014).
38. Warouw Z. W. M., Pembelajaran Cooperative Script Metakognitif (CSM) Untuk Meningkatkan Hasil Belajar Biologi Siswa SMP di Manado. BIOEDUKASI (Jurnal Pendidik. Biol.), vol. 1, iss. 2, pp. 1–9 (2010).

39. Dewi J. A., "Penguasaan tentang Keterampilan Metakognitif Guru IPA SMP di Jember" in Proceedings of Seminar Nasional ke-2 Biologi/IPA dan Pembelajarannya, (FMIPA Universitas Negeri Malang, Malang, 2015).
40. Bachtiar S., Zubaidah S., Corebima A. D. and Indriwati S. E., "Persepsi Guru SMAN Jeneponto terhadap Problem Based Learning (PBL), Numbered Heads Together (NHT), Motivasi, Keterampilan Berpikir Kritis, dan Metakognitif [The Perception of SMAN Jeneponto Teachers of Problem Based Learning (PBL), Numbered Heads Together" in Proceedings of Seminar Nasional ke-2 Biologi/IPA dan Pembelajarannya, (FMIPA Universitas Negeri Malang, Malang, 2015).
41. Sutarjo, Supervisi Pengawas Dan Kepala Sekolah Dalam Peningkatan Mutu Pembelajaran (Studi Kasus Pada SMA Negeri Di Kabupaten Karawang). J. Pendidik. Unsika. vol. 2, iss. 1, pp. 105–117 (2014).
42. Bahri A. and Corebima A. D., The Contribution of Learning Motivation and Metacognitive Skill on Cognitive Learning Outcome of Students within Different Learning Strategies. J. Balt. Sci. Educ., vol. 14, iss. 4, pp. 487–500 (2015).
43. Petters E., Connecting Inquiry to the Nature of Science as Metacognitive Resource. Sci. Educ., vol. 10, iss. 5, pp. 101–104 (2006).
44. Amin A. M. and Adiansyah R., Lecturers' Perception on Students' Critical Thinking Skills Development and Problems Faced by Students in Developing their Critical Thinking Skills. J. Pendidik. Biol. Indones., vol. 4, iss. 1, pp. 1–10 (2018).
45. Lukitasari M., Susilo H., Ibrohim I. and Duran Corebima A., Lesson Study in Improving the Role of E-Portfolio on the Metacognitive Skill and Concept Comprehension: A Study on Cell Biology Subject in IKIP PGRI Madiun, Indonesia. Am. J. Educ. Res., vol. 2, iss. 10, pp. 919–924 (2014).
46. Dipalaya T., Susilo H., Ibrohim and Corebima A. D., "Pengaruh Strategi Pembelajaran PDEODE (Predict-Discuss-Explain-Observe-Discuss-Explain) pada Kemampuan Akademik Berbeda terhadap Hasil Belajar Siswa SMA di Kota Makassar" in Proceedings of Seminar Nasional II Tahun 2016, Kerjasama Prodi Pendidikan Biologi FKIP dengan Pusat Studi Lingkungan dan Kependudukan (PSLK), (Universitas Muhammadiyah Malang, Malang, 2016).
47. Nwagbo C. R., Developing Observational and Drawing Skills in Teachers for Effective Conduct of Biology Practicals in Science Teachers'Association of Nigeria. Biology Panel series, 1-9 (2007).
48. Ikayanti R. and Suhartatik., "Pengaruh Implementasi Model Pembelajaran Inkuiri Terbimbing terhadap Kemampuan Pemahaman Konsep dan Keterampilan Proses Sains Siswa Kelas IX SMPN 1 Lumajang" in Proceedings of Seminar Nasional II Tahun 2016, Kerjasama Prodi Pendidikan Biologi FKIP dengan Pusat Studi Lingkungan dan Kependudukan (PSLK), (Universitas Muhammadiyah Malang, Malang, 2016), pp. 187–197.
49. Amin A. M., Corebima A. D., Zubaidah S. and Mahanal S., "Analisis Penguasaan Konsep dan Metode Pembelajaran dalam Pembelajaran Calon Guru Biologi Di Kota Makassar" in *Prosiding Seminar Nasional ke-3 Biologi, IPA, dan Pembelajarannya*, (Universitas Negeri Malang, Malang, 2016), pp. 1192–1200.
50. Livingston and Jennifer A., Metacognition : An Overview, (1997).
51. Hacker D., Dunlosky J. and Graesser A. C., *Metacognition in Educational Theory and Practice* Mahwah, (NJ: Lawrence Erlbaum, United States, 1998)
52. Blakey E. and Spence S., *Developing Metacognition*, (EIRC Clearinghouse on Information Resources Syracusa NY, New York, 1990)
53. Mynlieff M., Manogaran A. L., Maurice M. S. and Eddinger T. J., Writing Assignments with a Metacognitive Component Enhance Learning in a Large Introductory Biology Course. CBE Life Sci. Educ., vol. 13, iss. 2, pp. 311–321 (2014).
54. Amin M. A., Corebima A. D., Zubaidah S. and Mahanal S., Identifikasi Kemampuan Bertanya dan Berpendapat Calon Guru Biologi pada Mata Kuliah Fisiologi Hewan. Bioedukasi, vol. 15, iss. 1, pp. 24–31 (2017).
55. Tanner K. D., Promoting student metacognition. CBE-Life Sci. Educ. **11**, 113–120 (2012).
56. Rahman F,, Comparison of Teachers and Students Self Perception About Metacognition: Empirical Evidence From Pakistan, vol. **7**, iss. 2, p. 292–310 (2011).
57. Amin A. M. and Adiansyah R., Identification of Preservice Biology Teachers' Metacognitive Awareness and Metacognitive Skills. J. Phys. Conf. Ser., **1511 01202**, 1–8 (2020).
58. Amin A. M., Pre Service Biology Teachers' Argumentation Skills in Animal Physiology Laboratory. J. Pengajaran MIPA, vol. 22, iss. 2 (2017).
59. Kesici A. E., Derya G. and Küçükakça H., Metacognition Researches in Turkey, Japan and Singapore. Int. J. Eval. Res. Educ., vol. 10, iss. 2, p. 535–544 (2021).
60. Sophianingtyas F. and Sugiarto B., Identifikasi Level Metakognitif dalam Memecahkan Masalah Materi Perhitungan Kimia. UNESA J. Chem. Educ., vol. 2, iss. 1, p. 21–27 (2013).

61. Pamungkas Z. S., Aminah N. S. and Nurosyid F., Analysis of Students' Metacognition Level in Solving Scientific Literacy on theTopic of Static Fluid. J. Educ. Learn., vol. 13, iss. 1, p. 66–73 (2019).
62. Fauzi A. and Sa'diyah W., Students' Metacognitive Skills from the Viewpoint of Answering Biological Questions: Is it Already Good? J. Pendidik. IPA Indones., vol. 8, iss. 3, p. 317–327 (2019).
63. Metcalfe J. and Schwartz B. L., *The Ghost in the Machine: Self-Reflective Consciousness and the Neuroscience of Metacognition.* The Oxford Handbook of Metamemory, (2018).