Book of Abstracts

International Conference on Mathematics and Science Education

ICoMSE 2019

Malang, East Java Indonesia
on 27th-28th August 2019
at Santika Hotel Malang
http://icomse.fmipa.um.ac.id

ICoMSE

PREFACE

Following the footsteps of the last highly interesting conferences in 2017 and 2018, the conference entitled The 3rd International Conference on Mathematics and Science Education (ICoMSE) 2019 organized by Chemistry Department, Faculty of Mathematics and Natural Sciences, Universitas Negeri Malang (UM) aims to provide an opportunity to share knowledge and experiences relating to the important issues in mathematics and science education disciplines (chemistry education, physics education, biology education) in all educational levels.

To celebrate the 65th commemoration of Universitas Negeri Malang and the 13th lustrum, our faculty, has the opportunity to carry out this conference. Five fabulous keynote speakers including Dr. Kim Chwee Daniel Tan from Nanyang Technological University, Singapore; Dr. Saeed Almuntasheri from Albaha University, The Kingdom of Saudi Arabia; Prof. Peter Grootenboer from Griffith University, Australia; Prof. Lilia Halim from Universiti Kebangsaan Malaysia, Malaysia; Dr. Hadi Suwono, M.Si from mathematics and natural sciences faculty, Universitas Negeri Malang, Indonesia and over 300 participants with 313 orally presented articles joined to this conference.

The future contemporary and global society rises a massive challenge to all parties including mathematics and science education community to provide a significant impact to the society. Therefore, the conference theme "strengthening mathematics and science education research for the challenge of global society" points out the need for continuous reconsideration of the links between mathematics and science education research and the contemporary professional, social and scientific challenges.

There is often a gap between mathematics and science education and research in mathematics and science. We need to improve and inspire mathematics and science education by taking into account research data in the relevant field. The development of mathematics and science education research should be grounded by the mathematics and science research results. Mathematics and science education research also brings those results to be more functional, well disseminated and well informed to the wider community. Therefore, although mathematics and science education research is the core of this conference, several mathematics and science papers are also welcomed.

Over 300 abstracts including some with Malaysia, Australia, Nigeria, Netherlands, Germany dan the UK universities affiliations have been submitted. Hundreds of participants have shared their experiences in their presentations offering their insights, pointing up the challenges and suggesting new solutions regarding the following conference topics:

- Curriculum and policy in mathematics and science education
- Assessment in mathematics and science education
- Learning model, strategy and method in mathematics and science education

- Media, ICT and teaching material in mathematics and science education
- Students' conception, HOTS, mental model and deep issues in mathematics and science education
- Mathematics and science

The results of research in mathematics and science education should be adapted to the needs of mathematics and science educators and should be transferred and disseminated effectively to the teaching community in order to empower the development of mathematics and science knowledge and its contribution to the better civilization. Finally, I do hope that this book of abstract may contribute to disseminating research results in the relevant area.

Malang, August 2019

Habiddin, PhD
Chairman

Table of Content

The venue of ICoMSE 2019

Santika Hotel Malang

Scan this QR code to find the location

CONFERENCE SCHEDULES

Tuesday, 27 August 2019

Time	Program	Venue
07.30 – 08.00	Registration	Ballroom Lobby
	Opening Ceremony	
08.00 – 08.10	Pray Session by Drs. Ridwan Joharmawan, M.Si	Ballroom
08.10 – 08.20	Indonesian National Anthem "Indonesia Raya"	Ballroom
08.20 – 08.30	**Chairman's Report** Chair of ICOMSE 2019: Habiddin, S.Pd., M.Pd., Ph.D.	Ballroom
08.30 – 08.40	**Welcoming Speech** Rector UM: Prof. Dr. Ahmad Rofiuddin, M.Pd	Ballroom
08.40 – 09.00	Coffee Break I	Front of Ballroom
09.00 – 09.50	**Keynote Speaker I:** Dr. Kim Chwee Daniel Tan (National Institute of Education, Nanyang Technological University, Singapore) **Moderator:** Dr. Sc. Anugrah Ricky Wijaya, S.Si., M.Sc.	Ballroom
09.50 – 10.40	**Keynote Speaker II:** Prof. Lilia Halim (Universiti Kebangsaan Malaysia, Malaysia) **Moderator**: Nani Farida, S.Si., M.Si, Ph.D	Ballroom
10.40 – 11.20	**Invited Speaker-1:** Dr. Noor Azean (Universiti Teknologi Malaysia, Malaysia) **Moderator**: Dra. Surjani Wonorahardjo, Ph.D	Ballroom
11.20 – 12.00	**Invited Speaker-2:** Marlina Ali (Universiti Teknologi Malaysia, Malaysia) **Moderator**: Dra. Surjani Wonorahardjo, Ph.D	Ballroom
12.00 – 13.00	Lunch and Prayer	Ballroom Lobby
13.00 – 16.20	Pararel Session	Pararel room
16.20 – 17.00	Coffee break II and Prayer	Ballroom Lobby

Wednesday, 28 August 2019

Time	Program	Venue
08.00 – 09.00	**Keynote Speaker III:** Prof. Peter Grootenboer (Griffith University, Australia) **Moderator:** Latiful Anwar, S.Si., M.Sc.	Ballroom
09.00 – 09.30	Coffee Break I	Front of Ballroom
09.30 – 10.30	**Keynote Speaker IV:** Dr. Saeed Almuntasheri (School of Education, Albaha University, The Kingdom of Saudi Arabia) **Moderator**: Prof. Dra. Sri Rahayu, M.Ed., Ph.D.	Ballroom
10.30 – 11.30	**Keynote Speaker V:** Dr. Hadi Suwono, M.Si (Universitas Negeri Malang) **Moderator**: Khusaini, S.Pd., M.Pd	Ballroom
11.30 – 13.00	Lunch and Prayer	Ballroom Lobby
13.00 – 16.20	Pararel Session	Pararel room
16.20 – 17.00	Coffee break II and Prayer	Ballroom Lobby

PARALLEL ROOM SESSION (TUESDAY, 27 AUGUST 2019)

ROOM : 1

MODERATOR : Safwatun Nida, S.Pd., M.Pd

Time	Presenter Name	Code	Title
13.00 – 13.10	Yusi Arisandi	CE-008-052-DSA-AA47	The Relevance Of Learning Chemistry In Vocational High School
13.10 – 13.20	Nina Adriani	CE-018-115-DGA-AA70	How the Nature of Science (NOS) was introduced by High School Chemistry Textbooks
13.20 – 13.30	Safwatun Nida	CE-029-198-DGA-AA134	The Palm Oil Controversy: an Example of a Socio-scientific Issue as a Context in Teaching Science Concepts and Educating Future Citizen in a Global World
13.30 – 13.40	Zamakhsyari	CE-034-219-DSA-AA167	Fostering Ill-structured Problem Solving Skill of Chemistry Students using Socioscientific Issues as Learning Contexts
13.40 – 13.50	Margaret Pandaleke	CE-048-346-DGA-AA343	Flipped Classroom: New Way for Increase Critical Thinking Skill in Chemistry Courses
13.50 – 14.00	Ediyanto	SE-009-099-ISA-AA114	The Challenges of Indonesian Science Teachers in Teaching Students With Special Educational Needs in Inclusive School
14.00 – 14.10	Mohammad Amiruddin	SE-030-225-DGA-AA170	The Work of Informal Environment in Language Learning
14.10 – 14.20	Faisal	BE-001-012-ISA-AA137	Analysis of Government Funded Research in Indonesia from 2014-2018: Implications for Research Trends in Science Education
14.20 – 14.30	Ahmad Kamal Sudrajat	BE-017-104-DSA-AA78	Is it Important to Develop Critical Thinking and Collaboration Skills for Prospective Teacher-Students?: Students' Perspective
14.30 – 14.40	Herawati Susilo	BE-025-129-DGA-AA73	Development of 21st Century Skills at the Senior High School: Teachers' Perspective
14.40 – 14.50	Eka Imbia Agus Diartika	BE-056-262-DSA-AA252	Study of Learning Problems in Waste Management Topic (Case Study in Biology Study Program, State University of Malang)
14.50 – 15.00	Rifka Fachrunnisa	BE-041-185-DGA	Spaces to Spur Renewable Energy-Literate Students in the Indonesian Junior and Senior Secondary Schools' Science Curriculum: A Meta-Analysis
15.00 – 15.10	Musah Aminu	BE-076-363-IGA-AA333	The Role of Extensive Biology in Nigerian Colleges of Education Curriculum Among Undergraduates; A Case Study of F.C.E (T) Potiskum, Yobe State
15.10 – 15.20	Syaiful Hamzah Nasution	ME-003-008-DGA-AA211	Mathematical Writing Communication Skills with Open-Ended Approach through Interaction Design on the Peer Assessment Learning Model
15.20 – 15.30	Wasilatul Murtafiah	ME-017-060-DGA-AA87	Exploring the Types of Problems Task by Mathematics Teacher to Develop Students HOTS
15.30 – 15.40	Cholis Sa'dijah	ME-067-230-DSA-AA183	Analysis of Mathematical Literacy Test as a Problem-Solving Ability Assessment of Junior High School Students

15.40 – 15.50	Hendro Permadi	ME-076-269-DGA-AA216	Building Student Critical Thinking Ability Through the Peer Assesment Learning Model on Calculus with the Open-Ended Approach
15.50 – 16.00	Hendro Permadi	ME-076-269-DGA-AA217	Application of Peer Assessments Learning Model to Build Student's Creative Thinking Skills in Calculus Materials with the Open-Ended Approach
16.00 – 16.10	Hendro Permadi	ME-076-269-DGA-AA218	Oral Mathematic's Communication Skill in The Application of Peer Assessment Learning Model
16.10 – 16.20	Purwanto	MA-016-299-DGA-AA258	Negative Scoring of Multiple Choice Tests

ROOM : 2

MODERATOR : Dr. Muntholib, M.Si

Time	Presenter Name	Code	Title
13.00 – 13.10	Muntholib	CE-021-146-DGA-AA95	Development And Implementation Of Multiple-Choice Chemical Literacy Survey In Acid-Base Chemistry
13.10 – 13.20	Hayuni Retno Widarti	CE-026-193-DSA-AA131	Implementation Questions of Learning Outcome Assessment Based on Curriculum 2013 in Chemistry Twelve Classes for Senior High School in Malang
13.20 – 13.30	Muntholib	CE-032-209-DSA-AA146	The Development of Higher Order Thinking Skills Oriented Test on Acid-base Chemistry for 11th Grade Students
13.30 – 13.40	Parlan	CE-040-259-DGA-AA230	Development of Four-Tier Diagnostic Test for Identifying Misconceptions in Chemical Equilibrium
13.40 – 13.50	Muntholib	CE-022-167-DGA-AA281	Development of Multiple Choice Tes to Assess Senior High School Students' Chemical Literacy on Topic of Properties of Salts
13.50 – 14.00	Das Salirawati	CE-047-343-DGA	The Quality Analysis of Chemistry Item In Final Semester Examination for Tenth Graded Vocational Student Majoring in Computer and Networking Engineering in Bantul Regency
14.00 – 14.10	A Halim	PE-041-245-DGA-AA203	Development of Diagnostic Concept Maps for Identification of Students' Misconceptions
14.10 – 14.20	Khusaini	PE-056-329-ISA-AA300	An Investigating of the Factors Affecting Physics Performance Indonesian Students Based on TIMSS 2011 Dataset
14.20 – 14.30	Ediyanto	SE-009-099-ISA-AA115	Post-Learning Cycle A Web-Based Formative Assessment Model on Physics Learning Temperature And Heat Matter for Vocational School Students
14.30 – 14.40	Rinta Dian Pratiwi	SE-025-186-DSA-AA124	Analysis and Profile of Students' Creative Thinking Skills Using Open-Ended Multiple-Choice Test
14.40 – 14.50	Mahda Yulia Astary	SE-037-303-DSA-AA262	Web-Based Formative Assessment Integrated in Science Learning to Improve Students' Concept Understanding

14.50 – 15.00	Izmi Latifa Navida	BE-014-088-DSA-AA165	Developing of Cognitive Test Instruments Based on Scientific Literacy on 'Coordination System' Learning Material in SMAN 1 Kepanjen
15.00 – 15.10	Rachma Ayu Fauziah	BE-028-133-DSA-AA156	The Development of Performance Assessment to Measure Science Literacy Skills on Circulatory System's Lesson in XI Grade of Senior High School 5 Malang
15.10 – 15.20	Koko Murdianto	BE-013-079-DGA-AA222	Explaining the Application of Illinois Critical Thinking Essay Test in Inquiry-Based Learning to Measure Student's Critical Thinking Skills: A Classroom Action Research
15.20 – 15.30	Lelly Luckitasari	BE-013-079-DGA-AA224	Developing Of Assessment Instruments Based On Science Literacy In Guided Inquiry Learning On Plant Diversity Materials To Measure Student Learning Outcomes At Senior High School 1 Srengat
15.30 – 15.40	Andriyani	ME-013-036-DGA-AA24	The Development of a Braille Geometry Module Based on Visual Impairment Students Synthetic Touch Skill with RMT Approach
15.40 – 15.50	Taufina	ME-014-039-DGA-AA26	Teaching Materials Based Development of Statistics RME
15.50 – 16.00	Abd. Qohar	ME-018-066-DSA-AA17	Developing Interactive Multimedia on Polyhedron Material for Class 8 Junior High School Students
16.00 – 16.10	Abd. Qohar	ME-019-067-DSA-AA29	Developing Ethnomathematics-Based Mathematics Learning Module on Quadrilateral Material for Class VII Junior High School Students
16.10 – 16.20	Feriyanto Feriyanto	ME-029-093-DGA-AA66	Developing Mathematics Module Based on Literacy and Higher Order Thinking Skills (HOTS) Questions to Train Critical Thinking Ability of High School Students in Mojokerto

ROOM : 3

MODERATOR : Syaiful Hamzah Nasution, S.Pd., M.Pd

Time	Presenter Name	Code	Title
13.00 – 13.10	Abdul Mu'in	ME-049-171-DGA-AA135	Development of Non-Routine Mathematical Problems in Equation and Equation Materials of Absolute Value
13.10 – 13.20	Zuida Ratih Hendrastuti	ME-060-207-DGA-AA188	Developing Math Learning Kits Using RME Approach Oriented to Mathematical Connections Ability and Self-Confidence
13.20 – 13.30	Cholis Sa'dijah	ME-066-229-DSA-AA184	Practicality and Effectiveness of Realistic Mathematical Learning Materials to Support Mathematical Literacy Skill of Junior High School Students
13.30 – 13.40	Jefri Marzal	ME-068-235-DGA-AA191	Infusing E-Book to Solve Plane Problem in Geometry with TPACK Framework for Upgrading Mathematical Communication Ability for Junior High School Student
13.40 – 13.50	Tjang Daniel Chandra	ME-073-260-DGA-AA269	Development of Rokumatika Educational Game (Sugoroku Mathematics) to Improve the Skills of

			Grade 8th Middle School Students in Solving Mathematical Problems on Circle.
13.50 – 14.00	Diah Kismonowati	ME-078-288-DGA-AA246	DiAh Formula as an Alternative for Solving the Measures of Dispersion Problem in Basic Statistical Subject in High School and University Level
14.00 – 14.10	Syaiful Hamzah Nasution	ME-003-008-DGA-AA329	Development of Game "Alop's Adventure" on Algebraic Expression
14.10 – 14.20	Eka Purnama Sari	CE-005-042-DSA-AA12	The Development of Learning Media KONELA (Configuration Electron Aufbau) in learning chemistry
14.20 – 14.30	Andari Puji Astuti	CE-013-081-DGA-AA79	The Use of Augmented Reality-Based Learning Media to Develop the Technology Literacy of Chemistry Teachers in the 21st Century
14.30 – 14.40	Munzil	CE-039-254-DGA-AA207	The Effect of Quality of Chemical Multimedia Reviewed from the Ability of Students in Chemistry
14.40 – 14.50	Ageng Tri Rahayu	CE-037-246-DGA-AA294	Song Innovation in Multimedia on Stoikiometry Chemical Learning
14.50 – 15.00	Bahrul Rizky Kurniawan	PE-009-070-DGA-AA19	Development of Android-based Assessment to Improve Understanding of Student Concepts on Vector Topics
15.00 – 15.10	Dinda Putri Handayani	PE-012-082-DSA-AA32	Development of KOKAKELO (Local Wisdom Physics Comics) as an Android-Based Media of Physics Learning
15.10 – 15.20	Ahmad Suryadi	PE-014-089-DSA-AA34	Development of Interactive Multimedia Based On Resource Theory In Heat Concept
15.20 – 15.30	Faruq Haroky	PE-016-092-DSA-AA67	Creating Physics Comic Media A Local Wisdom Dol Musical Instrumen In Chapter of Sound Wave
15.30 – 15.40	Muh. Rozaqul Fadlli	PE-005-055-DSA-AA112	the effectiveness of computer-assisted recitation programs to enhance student's understanding of Newton's Laws
15.40 – 15.50	Rendy Priyasmika	PE-032-212-DGA-AA152	Developing Interactive Tutorial Method Animation using Adobe Flash Professional CS6 on Electrical Subject for Senior High School
15.50 – 16.00	Firda Ulya Nur Rosyidah	PE-042-250-DSA-AA206	Faraday Flashlight Project-Based Science Technology Engineering and Mathematics to Enhance Students' Problem-Solving Skill
16.00 – 16.10	Fakhrun Nisa	MA-021-362-DGA	On Ramsey (P_3,C_6)-Minimal Graphs
16.10 – 16.20	Hanik Setyaning Rahayu	MA-022-374-DGA	Degree of a Vertex in Bipolar Anti Fuzzy Graph

ROOM : 4

MODERATOR : Muhammad Fajar Marsuki, S.Pd., M.Sc

Time	Presenter Name	Code	Title
13.00 – 13.10	Edi Supriana	PE-044-271-DGA-AA226	Development of Integrated Kit Of Hookes Law as Learning Media for Students' Conceptual Mastery And Problem Solving Skill

13.10 – 13.20	Edi Supriana	PE-044-271-DGA-AA228	The innovation of Integrated Ticker Timer Learning Media to Support Inquiry-Based Physical Learning In Kinematics
13.20 – 13.30	Chusnana Insjaf Yogihati	PE-045-274-DGA-AA231	The Role of PhET-Based Learning Material In Scientific Approach
13.30 – 13.40	Nugroho Adi Pramono	PE-047-279-DGA-AA238	Development Physics Learning Regarding Temperature With Designing Web-based Sensor Delivery System in Real Time Using Python and Raspberry Pi
13.40 – 13.50	Sujito	PE-043-256-DGA-AA275	Investigation of Mathematical Method For Physics Lecture And Opportunities to Implement Computer-Aided Design
13.50 – 14.00	Agus Suyudi	PE-046-275-DGA-AA284	Games-Edu Space On Development of Flipbook Teaching Materials Based Inquiry Lesson
14.00 – 14.10	Rani Wahyu Andani	PE-054-298-DSA-AA256	Development of Macromedia Flash Technology-Assisted Indonesian Traditional Game “GATA-Fisika” as Physics Learning Innovation
14.10 – 14.20	Ulul Albab	PE-058-335-DSA-AA309	Application of Light Reflection Concept in Math-Hoodie Learning Media
14.20 – 14.30	Vita Oktaviani	PE-060-354-DSA	The Effectiveness of Multi-Modal Representation Textbooks to Improve Students' Scientific Literacy of Senior High School on the Topic Sound and Light
14.30 – 14.40	Erni Nelsiastri Feoh	PE-061-355-DSA-AA338	The Effectiveness of Multiple Representation Electronic Books Based Android to Improve Critical Thinking Skills of Senior High School Students on the Topic of Optical Instruments
14.40 – 14.50	Dwitri Pilendia	SE-007-048-DGA-AA20	The Development of PowerPoint Optimization Training Module as Learning Media: a Validation Study
14.50 – 15.00	P D Amrita	SE-012-137-DGA-AA93	Developing Android Based Mobile Learning Media to Facilitating ICT Literacy of Junior High School Student
15.00 – 15.10	Siti Rahmawati	SE-013-138-DSA-AA96	Analysis of Science Teaching Materials Based on Critical Thinking Skill Indicators on the Topic Classification of Materials and Its Properties
15.10 – 15.20	Savira Mahdia	SE-034-276-DGA-AA233	Developing Science Teaching Book with a Scientific Approach to Analyze The Concept of Energy in The 7th Grade Junior High School
15.20 – 15.30	Muhammad Fajar Marsuki	SE-035-281-DGA-AA305	Development of Digital Learning Media Based on Android Games With Joyful Inquiry Model to Increase Science Literacy Skills for Second Year Students of Junior High School In Subject Matter of Vibration
15.30 – 15.40	Indah Setyo Wardhani	SE-049-360-DSA-AA344	Development of Entrepreneurship E-Module for Elementary School Students Based on Local Wisdom in Madura Island
15.40 – 15.50	Delonix Regia	BE-003-023-DSA-AA59	Development of Problem-based Learning Module Based on The Allium sativum’s Potency in Hyperlipidemic Mice Research to Improve Student’s Critical Thinking Skills and Cognitive Learning Outcomes

15.50 – 16.00	Triastono Imam Prasetyo	BE-004-033-DGA-AA16	Module Development for High School Remedial Learning In Biology Subject
16.00 – 16.10	Wiwik Kusmawati	BE-005-035-DGA-AA104	Validation of Textbooks on Animal Embryology and Reproductions Based on Research on the Development of Mice Embryos by Adding DEET (Diethyltoluamide)
16.10 – 16.20			

ROOM : 5

MODERATOR : Dr.Sc. Anugerah Ricky Wijaya, M.Si

Time	Presenter Name	Code	Title
13.00 – 13.10	Nosi Qadariah	BE-009-063-DSA-AA187	Development of Guided Inquiry Module Based on Research Result to Improve Science Process Skills and Cognitive Learning Outcomes
13.10 – 13.20	Christine Apriyani	BE-011-065-DGA-AA23	The Development of Interactive Multimedia on Nervous System, Endocrine System, and Sense Organs Materials to Improve Students' Critical Thinking Skills of Class XI SMAN 1 Lawang
13.20 – 13.30	Abdullah Muamar	BE-012-076-DSA-AA51	Effectiveness Analysis of Development of Genetic Books with Mind Mapping Model Using Argument Map Methods to See Self-Efication and High-Level Students
13.30 – 13.40	Mistianah	BE-016-100-DGA-AA105	Needs Analysis of Development Genetics Flash Flip Book Multimedia Based on Improve Learning Models In University
13.40 – 13.50	Iwan	BE-030-145-DGA-AA138	The Development of Teaching Materials Oriented Problem-Based Learning Integrating Tifa Local Wisdom to Train Student Critical Thinking Skill
13.50 – 14.00	Iin Murtini	BE-042-213-DSA-AA180	Effectiveness of Research-based Cell Division Control Module on Students' Critical Thinking Skills
14.00 – 14.10	Badriyatur Rahma Fidiya	BE-044-228-DSA-AA186	Development of Problem Solving Module Based on Result of Black Soybean Tempe Extract in Hematology Aspect on Type 2 Diabetes Mellitus Rat to Improve Problem Solving Skills
14.10 – 14.20	May Hastuti Lubis	BE-045-231-DSA-AA182	The Development Problem Solving Module Based on Research at the Level of Advanced Glycation End Products (AGEs) of Hyperlipidemic Mice Model to Improve Student Critical Thinking Skills and Cognitive Learning Outcomes
14.20 – 14.30	Luthfianti Fanani	BE-047-242-DSA-AA200	Practice Guidelines As An Efforts to Foster Students' Psychomotoric Aspects And Critical Thinking for SMK
14.30 – 14.40	Sari, M.S	BE-049-253-DGA-AA209	Android-based Mobile Learning Media on Material of Plant Cell Structure & Function: Meaningful Learning Strategy
14.40 – 14.50	Citra Mustika Delima	BE-050-255-DSA-AA208	Developing Environmental Change Module Based on Problem-Based Learning and Its Effect on Students' Environmental Care in X Grade SMA Brawijaya Smart School

14.50 – 15.00	Ulfa Maulida Farid	BE-051-258-DGA-AA210	The Development of Problem Solving Module According to Results of The Effect of Black Soybean Tempe Extract to Type 2 Diabetes Mellitus Rat Interleukin 6 Level Research to Enhance Student's Critical Thinking Skills
15.00 – 15.10	Melati Insani Putri	BE-020-112-DSA-AA65	The Development of Problem Solving Module Based on The Research Results of Potential Purple Sweet Potatoes in T2DM Mice Models to Improve Student Cognitive Learning Outcomes
15.10 – 15.20	Gandhes Cintya Dewi	BE-027-132-DGA-AA81	The Development of Android-Based Interactive Multimedia in Respiratory System Materials to Improve Science Literacy Ability of Class XI Students in SMAN 02 Batu
15.20 – 15.30	Dwi Darmayanti	BE-013-079-DGA-AA220	Development of Learning Devices Based on Guided Inquiry of Plant Diversity Material to Improve Science Process Skills and Learning Outcomes in Grade X Students at SMAN 1 Gondanglegi
15.30 – 15.40	Gissa Adela Putrining Waloyo	BE-013-079-DGA-AA221	Development of Biology Learning Devices with Guided Inquiry Model on Plant Diversity Material to Measure Science Process Skills and Critical Thinking in Grade X Students at SMAN 9 Malang
15.40 – 15.50	Indra Lusmana	BE-055-270-DSA-AA223	Developing Biology Learning Devices On "Fungi" Material Using Discovery Learning Model To Promote Students' Critical Thinking Skills And Cognitive Learning Outcomes Of Grade X SMAN 6 Malang
15.50 – 16.00	Firman Aji Pamasyah	BE-057-284-DSA-AA244	Developing Webtoon Based on Reciprocal Teaching on the Immune System and Its Effect of Scientific Literacy Students
16.00 – 16.10	Nizar Azizatun Nikmah	BE-063-302-DSA-AA279	Developing of Problem-Based Learning Ecology Teaching Materials on Flora Community in Savana Bekol Baluran National Park to Improve Students' Critical Thinking Skill
16.10 – 16.20	Maisuna Kundariati	BE-071-324-DGA-AA298	Exploration of Invertebrate and Vertebrate Animals in Malang Regency as an Animal Diversity Learning Resource for Biology Student at the Universitas Negeri Malang

ROOM : 6

MODERATOR : Oktavia Sulistina, S.Pd., M.Pd

Time	Presenter Name	Code	Title
13.00 – 13.10	Arwinda Probowati	BE-072-326-DGA-AA296	Developing Digestive System Guided Inquiry Research-Based Module on the Effect of Purple Sweet Potato's Extract towards DMT2 Rat's MDA Levels.
13.10 – 13.20	Maisuna Kundariati	BE-071-324-DGA	Exploration of Invertebrate and Vertebrate Animals in Malang Regency as an Animal

			Diversity Learning Resource for Biology Student at the Universitas Negeri Malang
13.20 – 13.30	Jessy Damayanti	BE-073-336-DSA	Need Analysis of Biology Teaching Material using Macrozoobenthic Diversity as Bioindicator Water Quality of Metro River Module for Junior High School
13.30 – 13.40	Rostien Puput Anggoro	ME-037-120-DGA-AA129	The Effectiveness Of Cooperative Learning Model Type STAD And Jigsaw Based HOTS On Mathematical Problem Solving Abilities
13.40 – 13.50	Sumargiyani	ME-042-140-DSA-AA185	Increased Motivation to Learn by Using Learning Model Learning Community Students Mathematics Education
13.50 – 14.00	Venissa Dian Mawarsari	ME-044-143-DGA-AA84	The Readiness of Mathematics Teachers in Utilizing Technology in the 21st Century Learning Process
14.00 – 14.10	Yoga Umar Ruhul Iman	ME-045-144-DSA-AA89	The Influence of PAIKEM Based Learning with Educational Songs on Student Learning Motivation
14.10 – 14.20	Gatot Muhsetyo	ME-054-179-DGA-AA123	The Implementation of Constructivistic Strategy for Delivering High School Mathematics: a Study to Know the Misused of Mathematics Education Students in Peer Teaching Practice
14.20 – 14.30	Kamid	ME-062-220-DGA-AA163	Exploring of TPACK Framework For Optimizing Critical Thinking In Learning Social Arithmetic Material For Yunior High School Student
14.30 – 14.40	Ukhti Raudhatul Jannah	ME-063-224-DGA-AA169	Islamic Values in Mathematics Learning through the Realistic Mathematics Education (RME) Model in Arithmetic Sequence and Series Subject Class XI MA Matsaratul Huda
14.40 – 14.50	Ety Tejo Dwi Cahyowati	ME-077-273-DGA-AA229	Application of Open-Ended Approach with TPS (Think Pair Share) to Improve Creative Thinking Skills for Student of Class VII-B of SMP Negeri 9 Malang
14.50 – 15.00	Indriati Nurul Hidayah	ME-079-304-DSA-AA266	Application of Cooperative Learning Type Teams Games Tournament (TGT) to Increase the Student's Activity
15.00 – 15.10	Endang Budiasih	CE-007-049-DSA-AA14	Mind Mapping in Argument-Driven Inquiry (ADI) Model to Improve Students' Critical Thinking Skills with A Different Prior Knowledge in The Topic of Reaction Rate
15.10 – 15.20	Aceng Haetami	CE-010-061-DGA-AA15	The Effects Of Instructionals Models And Logic Mathematical Intelligence Toward The Chemistry Learning Outcome By Controlling Students' Initial Competence
15.20 – 15.30			
15.30 – 15.40	Endang Budiasih	CE-014-095-DSA-AA35	The Different of Scientific Argumentation Skills in the Reaction Rate Topic as a Result of ADI-S and ADI Learning Models with a Different Scientific Reasoning Ability
15.40 – 15.50	Endang Budiasih	CE-015-103-DSA-AA39	The Effectivity of *Guided Discovery* with Contextual Approach in Reaction Rate Learning Towards Scientific Literacy Skill
15.50 – 16.00	Oktavia Sulistina	CE-009-059-DGA-AA98	The Effect of the Explanation Driven Inquiry (EDI) Learning Model and Initial Ability on the

			Scientific Explanation Skills of Senior High School students in the Chemistry Class
16.00 – 16.10	Herawati	CE-025-188-DSA-AA127	The Effectiveness of Inquiry with Multiple representations to Improve Critical Thinking Skill in Learning Electrochemistry
16.10 – 16.20	Binti Zulaihah	CE-027-194-DSA-AA153	Effects of the Metacognitive Learning Strategy on Students' Metacognitive Knowledge and Achievements in Electrolyte and Non-electrolyte Solution Materials

ROOM : 7

MODERATOR : Prof. Dr. Fauziatul Fajaroh, M.S

Time	Presenter Name	Code	Title
13.00 – 13.10	Klaudia E.N. Bambut	CE-031-206-DSA-AA159	What are the Patterns of Discussion to Teach Argumentation Skills in Chemistry Learning?
13.10 – 13.20	Sutrisno	CE-035-221-DGA-AA166	Responding to the Integrated Model of Entrepreneur Characteristic with Stem to Enhance Students Creativity
13.20 – 13.30	Sutrisno	CE-036-234-DSA-AA190	Difference Student's Cognitive Skills (HOTS and LOTS) through Inquiry-Based Learning with OE_3R Strategy in Concept of Molecular Shape
13.30 – 13.40	Fauziatul Fajaroh	CE-041-262-DGA-AA236	The Effect of Guided Inquiry Learning that is Enriched with Problem Solving in Buffer Solution Materials on Cognitive Learning Outcomes of SMAN 1 Lawang Students
13.40 – 13.50	Mohd Shafie bin Rosli	CE-044-306-IGA-AA265	Technology-Assisted Cognitive Augmentation: an OLE Prototype to Nurture Cognitive Skills in Chemistry
13.50 – 14.00	Siti Marfu'ah	CE-045-321-DGA-AA291	The Influence Of Problem Solving on The Effectiveness Of Guided-Inquiry in Learning Buffer Solutions Based On The Students' Scientific Argumentation Ability
14.00 – 14.10	Nur Candra Eka Setiawan	CE-049-350-DGA-AA328	The Influence of Hypothetical-Deductive Learning Cycle on Students' Learning Achievement and Higher-Order Thingking Skill
14.10 – 14.20	Shelly Efwinda	PE-010-074-DGA-AA30	Pedagogical Content Knowledge Ability in Reflecting Project-Based Learning on Physics Concepts
14.20 – 14.30	Maria Yosefina Pranita	PE-018-121-DSA-AA62	Problem Solving Skills of Student's on Work and Energy Material Within Inquiry-Based Authentic Learning for STEM Education
14.30 – 14.40	Ratna Hapsari E.P	PE-021-130-DGA-AA63	Problem Based Learning Model Accompanied by Eksperimen and Project Method In Term Of Creativity on Physics Learning
14.40 – 14.50	Intan Mustika Noor Sasono Putri	PE-022-156-DSA-AA102	The Profile of Teachers' Problem Related to Inquiry Learning Set Based on Level of Inquiry In Physics Learning in Madrasah Aliyah (MAN)
14.50 – 15.00	Rian Priyadi	PE-023-164-DSA-AA103	Using Argument-Driven Inquiry Learning to Improve Students' Mental Models

15.00 – 15.10	Daniar Pangastiningasih Etikamurni	PE-004-054-DSA-AA139	Enhancement of Student's Problem Solving Skill of Heat And Temperature Topic Through Modeling Instruction
15.10 – 15.20	Edi Supriana	PE-015-090-DSA-AA181	The Increase of Student's Conceptual Understanding in the Topic of Heat and Temperature through Blended Learning
15.20 – 15.30	Purbo Suwasono	PE-026-173-DGA-AA110	The Use of Blended Learning as An Attempt to Improve Students' Higher Order Thinking Skills
15.30 – 15.40	Uulia 'Iffa	PE-027-191-DSA-AA128	Improvement of Force Diagram Ability With Free Body Diagram Based Learning
15.40 – 15.50	Lia Yuliati	PE-029-200-DSA-AA174	Exploration of Problem Solving Ability With Inquiry-Based Authentic Learning for The STEM Program
15.50 – 16.00	Ina Yuliana	PE-030-203-DSA-AA142	Exploration of Students' Problem Solving Ability in Learning Cycle 5E with Formative e-Assessment
16.00 – 16.10	Umi Azizah	PE-033-215-DGA-AA194	Effect of STEM-based 7E Cycle learning on Concepts acquisition and Creative Thinking on Temperature and Heat
16.10 – 16.20	Tsania Nur Diyana	PE-038-237-DSA-AA195	Implementation of Conceptual Problem Solving (CPS) in 5E Learning Cycle to Improve XIth Students Understanding of Archimedes Principle

ROOM : 8

MODERATOR : Khusaini, S.Pd., M.Ed

Time	Presenter Name	Code	Title
13.00 – 13.10	Desi Rahmadani	MA-019-344-DGA	On Ramsey (P4,P4)-minimal graphs for small-order
13.10 – 13.20	Toto Nusantara	MA-020-352-DGA-AA330	Products of Fuzzy Graphs on Complete, Strong, and Regular Fuzzy Graphs
13.20 – 13.30	Mohammad Agung	MA-017-332-DGA	Some Properties of Indigent Module
13.30 – 13.40	Rudy Syah Putra	CH-002-118-DSA-AA76	Enhancement of Electroflotation using Papaya Seeds (*Carica papaya*) for Chemical Laboratory Wastewater Treatment
13.40 – 13.50	Yudhi Utomo	CH-003-322-DSA-AA295	Effectiveness of Anthocyanin Extraction in Purple Cabbage *(Brassica oleraceae)* Using The Ultrasonic Bath Method was Reviewed in physicochemistry
13.50 – 14.00	Yudhi Utomo	CH-004-349-DSA-AA327	Characterization of Adsorbent from Pine Strobilus Active Charcoal (*Pinus merkusii*) and Its Performance in Adsorption of Methylene Blue
14.00 – 14.10	Anissa Rakhma Putri	PE-031-210-DSA-AA157	Static Fluid Conceptual Change trough Authentic based on Phenomena
14.10 – 14.20	Yogi Bachtiar	SE-004-018-DGA-AA3	Determining Promotion Route of Indraprasta University Using Greedy Algorithm

14.20 – 14.30	Fauzan Prasetyo	SE-006-032-DGA-AA8	Optimation Mobile Ad Hoc Network DSDV and OLSR Using Evolutionary Algorithm
14.30 – 14.40	Nurul Wulandari (Endry)	SE-016-157-DSA-AA162	The Effect of Washing Methods On Hygienic And Quality Level of Industrial Moringa Oleifera Leaves
14.40 – 14.50	Muhammad Taufiq Hidayat (Endry)	SE-017-158-DSA-AA136	Immobilization of Bacillus sp. SLII-1 on Chitosan-Alginate Hybrid Material for Promising Feedstock Supplement
14.50 – 15.00	Mifta Dinar Ningtyas (Endry)	SE-018-159-DSA-AA145	Microbial Consortium Synergism for Promising Freshwater Culture Probiotic
15.00 – 15.10	Nidatul Hikmah Mavrianingtyas (Endry)	SE-019-160-DSA-AA147	The Effect of Drying Methods on Hygienic and Quality Level of Industrial Moringa oleifera Leaves
15.10 – 15.20	Gina Fachniar (Endry)	SE-020-161-DSA-AA148	Effect of Laccase Oxidation On Phenol Content And Antioxidant Capacity of Roasted Coffee
15.20 – 15.30	Violisa Linanda (Endry)	SE-021-162-DSA-AA173	Effect of laccase from White Rot Fungus Trametes versicolor on Roasted Cocoa Bean
15.30 – 15.40	Kun Rohmatan Nazilah (Endry)	SE-022-163-DSA-AA144	Effect of Laccase Oxidation Pretreatment On Coffee (Coffea Arabica) Bean Processing Waste for Composting Substrate
15.40 – 15.50	Anggi Rio Manurung (Endry)	SE-027-192-DSA-AA161	Enzymatic Conversion of Brewer's Spent Yeast as Raw Material for Glutamic Acid Production
15.50 – 16.00	Raka Yusuf	SE-044-325-DSA-AA293	Three-Tier Web Applications Modeling on Cloud for Budgeting Efficiency
16.00 – 16.10	Diah Ayu Fadhilah	BE-070-320-DGA-AA290	Enzymatic Pretreatment of Paper Printing Waste for Biogas Substrate
16.10 - 16.20	Sentot Kusairi	SE-036-287-DSA-AA346	Analysis Creativity Of Students With Global Heating STEM Learning

PARAREL SESSION (WEDNESDAY, 28 AUGUST 2019)

ROOM : 1

MODERATOR : Dr. Fariati, M.Sc

Time	Presenter Name	Code	Title
13.00 – 13.10	Sugiyanto	SE-041-314-DGA-AA277	The Effect of 5E Cycle Learning Model Implementation to Students' Critical Thinking Ability on The Activities Analyzing Environmental Pollution
13.10 – 13.20	Puteri Lailatul Fitriyah	SE-045-327-DGA-AA299	The Improvement of Higher Order Thinking Skills through Learning Cycle 7E on Analyzing Human Excretion
13.20 – 13.30	Vita Ria Mustikasari	SE-032-264-DGA-AA301	Improving Science Learning Outcomes of Middle School Students through Learning Joyful-Inquiry

			Interactive Demonstration Assisted by an Android Game
13.30 – 13.40	Ana Fitria Azzmi	SE-046-330-DSA-AA308	Influence of STEM Based Learning Cycle toward Students' Critical Thinking Ability
13.40 – 13.50	Anugrah Ayumaharani Widianingsih	BE-007-051-DGA-AA41	The Relevance of the Use Metacognition Strategies Towards the Achievement of Student Biology Learning Outcomes of High School Students
13.50 – 14.00	Rido Sigit Wicaksono	BE-010-064-DGA-AA151	A Brief Explanation of Problem-Based Learning by Its Advantage, Disadvantage and Effect Upon Student's Scientific Literacy: An Experimental Research
14.00 – 14.10	Diana Husna	BE-015-098-DSA-AA69	Integration of Inquiry and Characteristic Values Teaching Model Effects towards Science Process Skills on Gender Differences of SMAN 7 Malang Student
14.10 – 14.20	Arika Masruroh	BE-018-109-DSA-AA57	The Influence of Inquiry Learning Integrated Nature of Science Toward Critical and Creative Thinking Skills
14.20 – 14.30	Nor Azizah	BE-039-180-DGA-AA118	The Effect of RICOSRE on Student Critical Thinking Skills in Biology
14.30 – 14.40	Shela Emilia Permatasari	BE-039-180-DGA-AA119	Science Process Skills and Cognitive Achievement: An Examination of Two Different Models of Learning Biology at the Tenth-Grade Level
14.40 – 14.50	Sari Rahayu Rahman	BE-046-240-DGA-AA199	RQA Learning Model in the Biology Classroom, and Its Effect on Students Metacognitive
14.50 – 15.00	Tarwiyani	BE-019-110-DSA-AA60	The Influence of Science Learning Based on Inquiry Integrated with Nature of Science (NOS) towards Students' Attitudes and Interests in Science
15.00 – 15.10	Arinda Eka Lidiastuti	BE-021-113-DGA-AA88	Analysis The Development of EXAIR Learning Model based on BBL (Brain-Based Learning) and its Effect on Learning Outcome on Secondary School in Coastal Area
15.10 – 15.20	Utaria Mutasam	BE-022-116-DSA-AA61	The Impact of Science Learning Based on Inquiry Integrated with Nature of Science towards Communication and Collaboration Skills
15.20 – 15.30	Shoimatun Febriyani	BE-024-128-DSA-AA72	Guided Inquiry Combined with Edutainment in Increasing Junior High School Students' Learning Interest
15.30 – 15.40	Kharirrotun Nafiah	BE-026-131-DSA-AA68	The Effectiveness of Teaching Materials About Management Invasive Alien Species Acacia Nilotica (L.) Willd. Ex Del. Through Problem Based Learning (PBL) Toward Students Scientific Literacy and Cognitive Learning Outcomes
15.40 – 15.50	Siti Nurhalizah	BE-039-180-DGA-AA120	RICOSRE for the Empowerment of Student Creative Thinking Skills
15.50 – 16.00	Yulista Trias Rohayati	BE-039-180-DGA-AA121	The Correlation between Student Scientific Argumentation Skills and Cognitive Achievement on Two Learning Models in Biology Classes
16.00 – 16.10	Robiatul Adawiyah	BE-052-265-DGA-AA213	Improving Collaboration Skill through Discovery Learning Model Combined with Jigsaw II
16.10 – 16.20	Ida Fitria Rahmawati	BE-053-267-DSA-AA214	Implementation of Problem Based Learning (PBL) Model Assisted Mind Map to Enhance Student's Critical Thinking Skill and Learning Outcome in the Biology Classroom SMAN 8 Malang

ROOM : 2

MODERATOR : Husni Wahyu Wijaya, Ph.D

Time	Presenter Name	Code	Title
13.00 – 13.10	Mutia Nandani	BE-055-270-DSA-AA225	Implementation of Discovery Learning Model combined with Think Pair Square Share (TPSS) to Improve Critical Thinking Skills of Class XI MIPA 3 Student's of SMAN 1 Tulungagung
13.10 – 13.20	Rifka Fachrunnisa	BE-041-185-DGA-AA254	Life-Based Learning: Two Trajectories of Students in Biology Education Program
13.20 – 13.30	Iqbal Bilgrami Biruni	BE-059-293-DSA-AA253	Fostering Student' Critical Thinking Skills in Respiratory and Excretory System Classroom through 5E's Learning Cycle in 11th Grade SMAN 2 Malang
13.30 – 13.40	Della Putri Irma Suryani	BE-061-300-DSA-AA260	Implementing Group Investigation (GI) Learning Model combined with Socio Scientific Issue (SSI) to Improve Students' Problem-Solving Skills in XI Grade IPA 4 SMAN 2 Malang
13.40 – 13.50	Nurul Ma'rifah	BE-062-301-DSA-AA259	A Comparison of the Effects of Problem-Based Learning and Think Pair Square on Students' Critical Thinking Skills and Learning Outcomes in Biology Classroom
13.50 – 14.00	Rifka Fachrunnisa	BE-041-185-DGA-AA278	Teaching Creative Thinking Skills: Promoting Creativity More Visible in Undergraduate Students of Biology Education
14.00 – 14.10	Asma'ul Khusna	BE-068-311-DSA-AA272	Effect of Problem-Oriented Project Based Learning (POPBL) towards Student's Problem-Solving Skills in X Grade SMA Negeri 8 Malang
14.10 – 14.20	Baiq Sri Handayani	BE-075-353-DGA	The Effectiveness of Brain-Based Learning Model (BBL) Integrated With the Whole Brain Teaching (WBT) Model on The Students' Metacognitive Skills of Public Junior High Schools in Malang on Science Lesson in 2017/2018 Academic Year
14.20 – 14.30	Achmad Sarwandianto	ME-015-044-DGA-AA10	Relationship between Creativity and Learning Style and Mathematics Learning Achievement of Students of SDN in Surakarta
14.30 – 14.40	Pancayani Dinihari	CE-012-072-DSA-AA21	The Effect of Learning Cycle 4ERE on the Vocational High Students' Learning Motivation in Adaptive Chemistry
14.40 – 14.50	Rosdiana	ME-021-073-DSA-AA22	Problem Solving Geometry of Primary School Teacher Education Student's Through Polya Stage: Devising a Plan in terms of Mathematical Capabilities
14.50 – 15.00	Laras Faralia	ME-023-078-DSA-AA27	How Occlusion and Unlearning Caused Students' Retroactive Interference in Solving LCM and GCF Problems?
15.00 – 15.10	Fajriyah Rachmatika	ME-025-084-DSA-AA31	Student's Quantitative Reasoning in Problem Solving Based on the Cognitive Style
15.10 – 15.20	Sukoriyanto	ME-026-086-DGA-AA33	Students' Errors Analysis in Solving the Geometry Word Problem Base on Newman Stage

15.20 – 15.30	Wasilatul Murtafiah	ME-028-091-DGA-AA82	Exploring the Creative Mathematical Reasoning of Mathematics Education Student through Discovery Learning
15.30 – 15.40	A Fuady	ME-030-094-DSA-AA50	Student Reflective Abstraction of Impulsive and Reflective in Solving Mathematical Problem
15.40 – 15.50	Fajar Maulana R	ME-032-101-DSA-AA38	Student Mathematical Problem Solving Analysis in Polya Stages based Mind Map and Newman Error
15.50 – 16.00	Erry Hidayanto	ME-033-102-DGA-AA106	Characteristics of Student Statistical Reasoning in Mathematical Problem Solving
16.00 – 16.10	Erry Hidayanto	ME-033-102-DGA-AA240	Intrinsic Cognitive Load of Students in Solving Problems Linear Program

ROOM : 3

MODERATOR : Latifah Mustofa Lestyanto, S.Si., M.Pd

Time	Presenter Name	Code	Title
13.00 – 13.10	Agus Setiawan	ME-034-107-DSA-AA40	Analysis of Students Errors in Mathematical Reasoning on Geometry by Sex
13.10 – 13.20	Ika Santia	ME-035-114-DSA-AA49	Analysis of Students' Mathematical Representation in Well-Structured and Ill-Structured Problem Solving
13.20 – 13.30	Tatik Retno Murniasih	ME-036-119-DSA-AA54	Pre-Service Mathematics Teacher Skills: a Number Line Representations Error Analysis at Fraction Number Sense Task
13.30 – 13.40	R Raya	ME-038-123-DSA-AA55	Probabilistic Thinking of Senior High School Students with Low Mathematical Abilities in Solving Probability Tasks
13.40 – 13.50	Sandie	ME-039-134-DGA-AA83	Student Difficulties when Constructing a Hidden Bridge to Solve Dynamic Event Problems
13.50 – 14.00	Fatqurhohman	ME-040-135-DGA-AA90	Understanding of Students in Resolving Word Problem on Mixed Fraction
14.00 – 14.10	Siti Dian Anugrah	ME-041-136-DSA-AA164	Analysis Of Students' Errors in Solving Higher Order Thinking Skills (HOTS) Problems for The Topic of Sequence
14.10 – 14.20	Shinta Wulandari	ME-043-141-DSA-AA74	Students' Difficulties in Completing Mathematical Tasks Based on Spatial Ability
14.20 – 14.30	Sapti Wahyuningsih	ME-047-169-DGA-AA108	Visual Thinking Profile of Mathematics Students in Graph- Theory Problem-Solving Process
14.30 – 14.40	Sapti Wahyuningsih	ME-047-169-DGA-AA282	Performance of Artificial Bee Colony Algorithm and its Implementation on Graph Theory Application Course
14.40 – 14.50	Susiswo	ME-048-170-DGA-AA107	Analysis of Layer of Primitive Knowing of High School Students in Linear Function Material: Study of Application of Student Activity Sheets based on Pirie Kieren Theory
14.50 – 15.00	Susiswo	ME-048-170-DGA-AA109	Analysis of Folding Back of Kepanjen Islamic High School Students in Solving the Problems of its Functions and Interventions
15.00 – 15.10	Latifah Mustofa Lestyanto	ME-051-175-DGA-AA143	The Level of Students' Reading Comprehension on Proof by Mathematical Induction

15.10 – 15.20	Cholis Sa'dijah	ME-052-176-DGA-AA113	Reflective Thinking in Solving of Open-Ended Problems in Plane Figure for Seventh Graders
15.20 – 15.30	Gatot Muhsetyo	ME-053-178-DGA-AA126	The Readiness of Mathematics Education Students About HOTS: the Best Practice to Explore and Describe Their Problems in Understanding the Content of Middle School Mathematics
15.30 – 15.40	Heri Apriyanto	ME-055-181-DSA-AA132	Analysis of Student's Mathematical Representation Errors in Solving Problem Solving Math Problem and Giving Scaffolding
15.40 – 15.50	Tjang Daniel Chandra	ME-055-181-DSA-AA219	The Analysis of Student's Mathematical Representation Errors in Solving Mathematical Problem-Solving Problems and Giving Scaffolding
15.50 – 16.00	Intan Mahyastuti	ME-056-189-DSA-AA192	Analytical Thinking to Solve Contextual Problems
16.00 – 16.10	Cholis Sa'dijah	ME-057-201-DSA-AA176	FI and FD Students: Their Mathematical Dispositions towards Solving HOTS Problems

ROOM : 4

MODERATOR : Latiful Anwar, S.Pd., M.Ed

Time	Presenter Name	Code	Title
13.00 – 13.10	Pramita Respati	ME-058-204-DSA-AA178	Profile of Students' Mathematical Problem Solving Skill Based on Students' Perception Toward Mathematics
13.10 – 13.20	Cholis Sa'dijah	ME-059-205-DGA-AA177	Analysis of Students' Errors in Completing Mathematics Problems Based on the Students Initial Mathematical Ability
13.20 – 13.30	Risna Widdy May Pamilu	ME-061-208-DSA-AA160	Higher-Order Thinking Process of Junior High School Students with Linguistic, Logical-Mathematical, and Visual-Spatial Intelligence in Solving Mathematical Problems
13.30 – 13.40	Cholis Sa'dijah	ME-064-226-DSA-AA175	Mathematical Creative Thinking Skill of Middle-Ability Students in Solving Contextual Problems
13.40 – 13.50	Widi Pradini	ME-065-227-DSA-AA179	Analysis of Junior High School Students Difficulty in Solving Linear Equation in Two Variables Word Problem
13.50 – 14.00	Hesti Ratna Juwita	ME-069-239-DGA-AA197	Children's Response Role in Mathematics Elementary School
14.00 – 14.10	Ariyani Muljo	ME-072-248-DSA-AA205	Communication Skill to Improve the Students' Ability in Algorithm Problem Solving Process: the Case of Number Pattern Test
14.10 – 14.20	Rustanto Rahardi	ME-074-261-DGA-AA212	Analysis of Students' Skills on Derivative of a Function
14.20 – 14.30	Slamet	ME-078-288-DGA-AA247	Analysis of Critical Thinking Skills Students of Grade X SMAN 1 Lawang in Solving Trigonometry Problem
14.30 – 14.40	Slamet	ME-078-288-DGA-AA264	Analysis of Critical Thinking Abilities in Solving Mathematical Problem Calculus for Prospective Teachers Departement of Mathematics FMIPA UM Malang

14.40 – 14.50	Sutarto	ME-080-316-DGA-AA285	An Analysis of Students' Difficulties in the Conjecturing Process of Pattern Generalization Problems
14.50 – 15.00	Hersiyati Palayukan	ME-082-334-DSA-AA307	Semiotics in Solving Problems Geometric Diagram Viewed from Peirce Perspective: Case Study
15.00 – 15.10	Rifdatul Karimah	ME-083-340-DSA	Students Higher Order Thinking Skills in Solving Geometry Problem
15.10 – 15.20	Soleman Saidi	ME-084-342-DGA	Categorization of Student Thinking Types Based on Dual Process Theory in Solving Cognitive Reflection Test Problems
15.20 – 15.30	Eka Mestiani	ME-081-323-DGA	Interpersonal intelligence to solving mathematical problem
15.30 – 15.40	Aning Wida Yanti	ME-086-347-DGA	Adaptive reasoning profile of students in solving mathematical problems viewed from field dependent and field independentcognitive style
15.40 – 15.50	Sutini	ME-085-345-DGA-AA333	Profile of Student Cognition Regulations in Solving Mathematical Problems of Mathematical Capabilities
15.50 – 16.00	Habiddin	CE-001-001-DGA-AA1	Chemistry Students' Attitude Towards Mathematical Knowledge
16.00 – 16.10	Yusran Khery	CE-004-029-DGA-AA7	Correlation between Understanding NOS, Conceptual Understanding, and Science Process Skill on General Chemistry Classroom

ROOM : 5

MODERATOR : Dr. Yahmin, S.Pd., M.Si

Time	Presenter Name	Code	Title
13.00 – 13.10	Hayuni Retno Widarti	CE-006-046-DGA-AA11	Analysis Of Higher Order Thinking Skill (Hot_s) In The National Examination Questions
13.10 – 13.20	Jusniar	CE-017-111-DSA-AA45	Misconceptions On Rate Of Reaction And It's Impact On Chemical Equilibrium
13.20 – 13.30	Muhammad Haris Effendi-Hasibuan	CE-011-069-DGA-AA48	Do Heavy Metals Disadvantage Human's Health? Using Students' Argumentation Skills on Socio Scientific Issues
13.30 – 13.40	M.Muchson	CE-022-167-DGA-AA111	Analysis of High School Students' Metacognitive Knowledge on The Topic of Solubility and Solubility Product
13.40 – 13.50	Herunata	CE-024-187-DGA-AA125	Critical Thinking Skills Analysis of MIA XI Class Students in Hydrocarbon Topic
13.50 – 14.00	Habiddin	CE-001-001-DGA-AA130	Does Students' Confidence In Chemistry Boost Their Understanding?
14.00 – 14.10	Rosyidah Syafaatur Rohmah	CE-030-202-DGA-AA141	Effect of Conceptual Change Texts on Physical Inorganic Chemistry Students' Misconceptions of Matter and Its Changes
14.10 – 14.20	Hayuni Retno Widarti	CE-033-211-DSA-AA149	Understanding of Acid-Base Concept-Based Multiple Representation in Cross Education Levels
14.20 – 14.30	Parlan	CE-040-259-DGA-AA292	Identification of Students' Conceptual and Algorithm Understanding on Buffer Solution
14.30 – 14.40	Haratua Tiur Maria Silitonga	PE-011-077-DGA-AA94	Implementation Of Students' Misconception Remediation Use Teaching Materials With A Refutation Text Structure On The Fluid

14.40 – 14.50	Ika Khoirun Nisa	PE-017-105-DSA-AA44	Conceptual Understanding and Difficulties Profile of Archimedes Principles between High School Students in City and Rural Area
14.50 – 15.00	Zahrotul Ula Irma	PE-020-126-DSA-AA71	Students' Creativity of Nature School and Conventional School: A Comparative Study
15.00 – 15.10	Nurul Hidayah	PE-006-056-DSA-AA154	The Improvement of the Students' Kinematics Concept Acquisition Through Multi-Representation Learning
15.10 – 15.20	Prima Mutiara Meidayanti	PE-034-216-DGA-AA155	Problem Solving Ability and Self-Efficacy of Students in Static Fluid Materials at Flipped Classroom Integrated STEM
15.20 – 15.30	M. Dewi Manikta Puspitasari	PE-036-223-DGA-AA168	Analyzed The Student's Epistemic Game based on The Physics Understanding
15.30 – 15.40	Ovita Ardanari	PE-035-222-DSA-AA193	Improve Scientific Literacy and Problem Solving Abilities in Newton's Law through E-Scaffolding Conceptual-Procedural in Hybrid Learning
15.40 – 15.50	Hartono Bancong	PE-056-331-ISA-AA306	Investigating the Purposes of Students in Conducting Thought Experiments While Solving Physics Problem
15.50 – 16.00	Ida Madyani	SE-014-147-DSA-AA99	Creative Thinking Skills on Junior High School Students in Science Learning by Gender
16.00 – 16.10			

ROOM : 6

MODERATOR : Dr. Parlan, M.Si

Time	Presenter Name	Code	Title
13.00 – 13.10	Ida Madyani	SE-014-147-DSA-AA100	Profile of Students' Creative Thinking Skills in Learning Science
13.10 – 13.20	Elmi Rahma Arif Fadilah	SE-026-190-DSA-AA140	Exploration of Student Creativity in Science, Technology, Engineering, Mathematics (STEM) Learning
13.20 – 13.30	Yessi Affriyenni	SE-033-266-DGA-AA239	Analysis of Students' Conceptual Understanding of Electricity in Fundamental Physics III Short-Term Program
13.30 – 13.40	Sri Rahayu	SE-040-313-DGA-AA273	The Views of Nature of Science (NOS) Expressed by Junior High School Students From East Java, Indonesia
13.40 – 13.50	Erni Yulianti	SE-042-315-DSA-AA274	Acquiring Scientific Reasoning from Guided Inquiry: How Students Integrate Key Concepts in Science
13.50 – 14.00	Yuni Pantiwati	SE-048-338-DGA-AA310	The Relationship between Capability Dimension and Cognitive Dimension Ability of Grade VII Middle School Students in Malang City
14.00 – 14.10	Sunarmi	BE-013-079-DGA-AA28	Ferns Misconception Study with Concept Approach in Biology High School Textbook
14.10 – 14.20	Sueb Zahra Zu Lina Muhamad Azizul Chakim	BE-038-174-DSA-AA116	Relationship Between Pro-Environmental Attitudes and Teaching Practice from The Students' Perception in Sidoarjo City

14.20 – 14.30	Septian Dwi Pramono	BE-048-243-DGA-AA202	The Profile of High School Students' Literacies of Science, Information, And Technology In Pasuruan
14.30 – 14.40	Arinda Eka Lidiastuti	BE-021-113-DGA-AA86	Analysis of Critical Thinking Ability of High School Students in Malang and Lumajang
14.40 – 14.50	Yuswa Istikomayanti	BE-023-117-DGA-AA80	Collegiality as the Key to Improving Student Learning in Sustainable Lesson Study Practices
14.50 – 15.00	Muhammad Fahrurrizal A	BE-029-139-DSA-AA91	Comparative Study of Three Levels Inquiry Viewed from Critical Thinking skills in the first grade class of Senior High School
15.00 – 15.10	Hadi Suwono	BE-058-289-DSA-AA250	Scientific Literacy Profile Of Science And Non-Science Students In Senior High Schools
15.10 – 15.20	Atiqah Miftakhul Jannah	BE-060-296-DSA-AA251	Profile and Factors Involved in Students' Scientific Literacy of Senior High Schools
15.20 – 15.30	Fitri Arsih	BE-039-180-DGA-AA280	Critical thinking skills of prospective biology teachers: A preliminary analysis
15.30 – 15.40	Firda Ama Zulfia	BE-065-307-DSA-AA268	Identification of Concepts for Class X Students Viral and Bacterial Material in East Java
15.40 – 15.50	Nurul Fajryani Usman	BE-069-317-DSA-AA287	Exploration of Biology Scientific Students Reasoning Ability at Universitas Negeri Malang
15.50 – 16.00	Triastono Imam Prasetyo	BE-004-033-DGA-AA16B	Variance, Amount and Distribution of Cognitive Levels Class 10 Biology Subjects in Curriculum 2013
16.00 – 16.10			

ROOM : 7

MODERATOR : Dahliatul Hasanah, S.Si., M.Sc

Time	Presenter Name	Code	Title
13.00 – 13.10	A. Yusuf	ME-001-006-IGA-AA2	Convergence to Walrasian prices in random matching Edgeworthian economies with bounded rationality
13.10 – 13.20	Hutomo Atman Maulana	ME-008-020-DGA-AA4	Prediction of Rainfall by using Ordinary Kriging near of Train Stations in Bogor
13.20 – 13.30	Nina Sariana	ME-011-026-DGA-AA97	Customer Service Application Simulation Credit Payment With Softcash Flat Method in Green Citayam City Company
13.30 – 13.40	Dicky Susanto	ME-016-047-DGA-AA13	Coordinating Multiple Composite Units as a Conceptual Principle in Time and Money Learning Trajectory
13.40 – 13.50	Selly Anastassia Amellia Kharis	ME-024-080-DGA-AA46	Multiclass Classification of Brain Cancer with Multiple Multiclass Artificial Bee Colony Feature Selection and Support Vector Machine
13.50 – 14.00	Siti Faizah	ME-071-247-DSA-AA204	The Construction of Implicit Warrant Derived from Explicit Warrant in Mathematical Proof
14.00 – 14.10	Dahliatul Hasanah	ME-074-261-DGA-AA245	Modified Fourier Transform for Solving Fractional Partial Differential Equations
14.10 – 14.20	Rm Aziz	MA-005-096-DGA-AA36	Hahslm 472319 In Allah Mathematics For Creating Universe

14.20 – 14.30	Nur Khusnussa' Adah	MA-004-043-DGA-AA53	A Generalized Statistical Convergence in *n*-Normed Spaces
14.30 – 14.40	Sagita Charolina Sihombing	MA-006-142-DGA-AA77	Prediction of Palm Oil Agricultural Production in Riau Province with Newton's Interpolation Approach
14.40 – 14.50	I Made Sulandra	MA-007-196-DGA-AA133	A Case Study on Ring: *g(x)*-nil-clean and Strongly *g(x)*-clean, but not Strongly *g(x)*-nil-clean
14.50 – 15.00	Mohamad Yasin	MA-011-272-DGA-AA227	A Web-Based Template Intelligent Tutoring System Design
15.00 – 15.10	Santi Irawati	MA-009-251-DSA-AA232	Existence of Nil Clean Ideal of a Matrix Ring over
15.10 – 15.20	Darmawan Satyananda	MA-013-278-DGA-AA234	Perturbation Operator Analysis on ILS-RVND Algorithm to Complete Capacitated Vehicle Routing Problem (CVRP)
15.20 – 15.30	A. Safitri	MA-012-277-DGA-AA235	Factors of Length Ratio and Mass at Chaos of Double Pendulum System
15.30 – 15.40	Trianingsih Eni Lestari	MA-014-294-DSA-AA248	Parameter Estimation of Poisson Inverse Gaussian (PIG) using the MLE Method and its Application to Maternal Mortality Rate in East Java in 2017
15.40 – 15.50	Nur Atikah	MA-015-295-DGA-AA249	Jackknife Ridge-Robust Regression use MM-Estimator with Welsch Weight Function to Handling Multicolinierity and Outlier
15.50 – 16.00	Purwanto	MA-016-299-DGA-AA257	Odd Star Decomposition of Complete Bipartite Graphs
16.00 – 16.10	Nur Atikah	MA-015-295-DGA-AA261	Parameter Estimation of Spatial Durbin Model (SDM) Using Moment Method
16.10 – 16.20	Vita Kusumasari	MA-018-333-DGA-AA304	Simulation of Hyperbolic Mean Curvature Flow with an Obstacle in The Closed Curve

ROOM : 8

MODERATOR : Rini Retnosari, S.Pd., M.Si

Time	Presenter Name	Code	Title
13.00 – 13.10	Una Desy Azarine	PE-039-238-DSA-AA198	The Effect of Integrated STEM with Project-Based Learning Model on Creative Thinking Skills and Understanding Concept in Static Fluid
13.10 – 13.20	Endang Purwaningsih	PE-049-283-DSA-AA241	Improving Students' Critical Thinking Skills in Senior High School through STEM-Integrated Modelling Instruction
13.20 – 13.30	Mimi Rohazal Yaumi	PE-008-058-DSA-AA283	Modelling Instruction on Kinetic Theory of Gasses to Enhance Conceptual Understanding
13.30 – 13.40	Agus Suyudi	PE-048-280-DGA-AA286	The effect of TAPPS method on the guided inquiry learning model towards the physics learning achievements for 10^{th} grade students
13.40 – 13.50	Endang Purwaningsih	PE-049-283-DSA-AA341	Improving Student's Creative Thinking Skills in Optic Material through The Development of STEM-Integrated *Unit Kegiatan Belajar Mandiri*

13.50 – 14.00	Nora Indrasari	PE-050-285-DGA-AA242	Designing and Implementing - STEM-based Teaching Materials of Static Fluid to Increase Scientific Literacy Skills
14.00 – 14.10	Aulia Siska Yuliana	PE-051-286-DSA-AA243	Application of Teaching Materials Based on 7E-STEM Learning Cycle to Improve Student's Problem Solving Skills
14.10 – 14.20	Suyudi, A.	PE-053-291-DGA-AA288	The effect of argument-driven inquiry towards physics problem-solving skill in momentum and impulse topic
14.20 – 14.30	Supriyono Koes-H	PE-055-318-DSA-AA289	The Influence of Flipped Classroom in Inquiry Learning to Student's Critical Thinking Skills in Impulse and Momentum
14.30 – 14.40	Ratu Dewi Sri Lestari	PE-062-356-DSA	The Effectiveness of STEM-Based Workbooks by Using Multi-Modal Representations to Provision Vocational High School Students Technology Engineering Literacy on the Topic of Direct Current Electricity
14.40 – 14.50	Ogunmade Taiwo Oludare	SE-005-022-IGA-AA5	A Study of Exemplary Teaching Practices in Chemistry Classroom in Lagos State, Nigeria
14.50 – 15.00	Ridha Fitri Andansari	SE-008-085-DSA-AA56	Application of Learning Based on Gimur in Vibration, Waves, and Sound Materials to Improve Student's Learning Outcomes in Junior High School
15.00 – 15.10	Ediyanto	SE-009-099-ISA-AA122	Science Learning for Student with Autism Spectrum Disorder: A Literature Review
15.10 – 15.20	Tri Wahyuni	SE-010-108-DSA-AA42	The Effect of Treffinger Learning Model on The Student's Higher Order Thinking Skills for Science Subject
15.20 – 15.30	Puteri Lailatul Fitriyah	SE-015-155-DGA-AA101	The Improvement of Higher Order Thinking Skills through Learning Cycle 7E on Analyzing Human Excretion System
15.30 – 15.40	Ibrohim	SE-031-232-DGA-AA196	Implementation of Inquiry-Based Learning (IBL) to Improve Students' Understanding of Nature of Science (NOS)
15.40 – 15.50	Finny Tessa Avionita	SE-028-199-DSA-AA263	The Improvement of Scientific Literacy in Pressure Topic Through PBL Model on Junior High School Students
15.50 – 16.00	Erni Yulianti	SE-038-310-DSA-AA267	Evaluating the Effectiveness of Problem-Based Learning in Enhancing Students's Higher Order Thingking Skills
16.00 – 16.10	Alvita Kartika Pryadiani	SE-039-312-DSA-AA270	Enhancing Scientific Literacy in Analyzing Pressure Topic through PjBL STEM Model
16.10 – 16.20	Sugiyanto	SE-041-314-DGA-AA276	The Effect of Integrated STEM in POE Learning Model Towards Analyzing Ability on Work and Energy Concept of 10th Grade Students

Keynote Speakers

Current Trends in Culturally Relevant Science Curriculum (CRSC) Research in Asia

Lilia Halim

Abstract. Aiming to meet the United Nation Sustainable Development Goal of quality education for ALL (Goal 4), the Ministry of Education in Malaysia is committed to reduce the students' achievement gaps, particularly between urban-rural, socioeconomic status and gender by 2020 as highlighted in the Malaysia Education Blueprint 2013-2025. A great number of researchers worldwide has suggested that quality education is achievable when the concept of equity in education is practiced by ensuring formal science curriculum is connected to students' cultural background. These global call for quality education encourages academics to conduct more research in the field of culturally relevant science curriculum to help improve the equity by offering culturally responsive curriculum. Current trends in research conducted around the world particularly in the field of culturally relevant science curriculum can be used for strategizing smart partnerships between academics, curriculum developers and policy shapers of science education in Malaysia. This talk will be based on outcome of a quantitative method of meta-analysis to critically analyze and synthesis the current trend in culturally relevant science curriculum research in Asia. Several databases such as EBSCOHOST, ProQuest, Taylor and Francis, Springer Link, Eric and Elsevier were searched for articles on culturally relevant curriculum in Asia within a 2010-2018 time frame. It is hoped that the findings of this study will become a useful resource for educators in designing authentic and meaningful learning experience that is culturally relevant to the students' backgrounds, needs and interests. Furthermore, it is hoped that this study will provide a clear vision and strategy for establishing meaningful learning partnership between stakeholders in meeting the challenges 4IR era.

Keywords: culture, curriculum, Asia, science learning, culturally relevant science curriculum

Web-Based Diagnostic Assessment

Kim Chwee Daniel Tan

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Abstract. The internet is prevalent in society today, and user-friendly web-based tools are readily available for developing diagnostic assessments. Two-tier multiple choice diagnostic instruments are easily developed using tools such as Google Forms which also has the affordances of allowing branching from each first-tier answer to an associated subset of second-tier options, as well as allowing the choice of more than one second-tier reason. The web-based diagnostic instrument on ionisation energy (wIEDI) was developed to explore these affordances. The results from the administration of the wIEDI showed that it better facilitated responses reflecting consistency of the use of specific ideas in student thinking, as well as provided direct evidence of students' possible multiple conceptions within each question and across a range of questions. The study makes a case the use of web-based technology in the diagnostic assessment of students.

Keywords: internet, wIEDI

Mathematics Education: Building Mathematical Identities

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Abstract. For many years and across most of the world, mathematics has been seen as an unpopular and disliked subject, and many students have discontinued with mathematics as soon as they can. Furthermore, mathematics is often seen as difficult and disconnected from the 'real world', and so people perceive it as dull and boring, and irrelevant for them. Despite many years of research and investigation, this untenable situation does not seem to be improving. Therefore, in this paper the argument is that there needs to be new approaches to mathematics education and mathematics education research. Specifically, there is a pressing need to understanding mathematics more broadly than just a cognitive practice, and mathematics education as developing mathematical identities – *head, heart and hand*. This requires a more nuanced and personal understanding and appreciation of mathematics, and a more overt focus on the affect dimension of doing and learning mathematics. Research and development to this end needs to be more creative and flexible – it is already clear what the problem is, and so now proactive ways to ameliorate it in local contexts in necessary. Some ideas for this are discussed to conclude the paper.

Keywords: mathematics, understanding

Supporting Saudi Science Teachers' Implementation of Inquiry-Activities through Assessment conversation strategies

Dr. Saeed Almuntasheri

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Abstract. This study presents the impact of a professional development that embed assessment conversation strategies into the 5Es teaching approach on Saudi science teachers' implementation of science-based inquiry. Twenty-one science teachers attended the workshops that lasted for a semester as part of their diploma in education in Albaha University. Th assessment conversation instrument that developed by Ruiz-Primo & Furtak (2006) was adapted in this study. It is consisted of 18 items with a Likert scale (alpha Cronbach = 0.79) and observe the assessment strategies used to initiate and to develop dialogic inquiry. The overall results indicated that science teachers became more capable to develop inquiry skills with their students. Some strategies were highly developed, at the initiation phase (write down observations (M= 3.67), interprets data (M=3.52), at the recognition phase (provide neutral responses M=3.41), and display diverse explanations (M=3.61). However, teachers at the using phase did not exceed the moderate level (asking how/why questions (M=3), provide extended examples (M= 2.57). The results also showed the difficulties facing teachers to develop some skills such as (evaluate the quality of evidence (M=2.19) and promote consensus (come on an agreement M= 1.95). The study underlines the significance of incorporating assessment conversation strategies into the professional development program to help science teachers to enact scientific inquiry.

Keywords: Assessment conversation, scientific inquiry, Professional development

Challenges of Biological Education: Biological Literation Towards Multidiciplin Biology

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Abstract.Biological literacy in our view is part of scientific literacy. Biological literacy is concerned with the acquisition of attitudes, skills, and biological knowledge that enables people to participate in biological discourse and develop problem solving and decision-making skills in daily life using biological concepts. Biological literacy has long been appointed as one of the goals of biology learning. In Indonesia, where there is still a need for public understanding of biodiversity, malnutrition, major health problems, biological literacy is needed so that people can make decisions about the socio-scientific problems facing them. The new biology plays a role in faster progress in facing complex and interrelated challenges such as in the fields of health, environment, energy and food. In this context, social problems can be regarded as driving integration on a very large scale, encourage technological developments that enable new discoveries. Reorientation of the goals and processes of teaching and learning of biology is based on the importance of educating students to be able to prepare themselves for success in a life that is multitasking, multifaceted, technology driven, diverse, and vibrant. Learning biology should teach students to live in the information age; empower students to be able to use the knowledge and skills they already have by using current technology to discover new things in the future; prepare students to be able to think for themselves, make the right decisions, develop expertise, and continuously learn throughout life. Biology learning strengthens scientific literacy and biological literacy and develops biological expertise with a multidisciplinary approach. Solving socio-scientific problems in daily life as well as in the complex and interdisciplinary work world will require each individual to go far beyond conventional biology understanding. Resolving the problems of this century requires mastery of biology, physics, chemistry, mathematics, engineering, design, computing, information technology, and broader connections between science, engineering and ethics.

Invited Speaker

Metacognitive skills in Physics Problem Solving

Marlina Ali[1, a)] Johari Surif[2, b] and Corrienna Abdul Talib [3, b)]

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Abstract. The purpose of this paper is identify metacognitive skills employed by the students in solving physics problem called "lift question". This study consisted of 21 students. Respondents solved four physics problems while talking aloud. However in this paper only one question will be discussed. Each of the respondents were videotaped. Interviews were conducted right after the test. Written answers from physics task were marked according to the schema. The thinking aloud were transcribed verbatim from the videotapes as well as interviews. Transcripts were coded and examined looking for both similarities and differences. As a conclusion, more successful problem solvers engaged more often in actions that can be labelled as metacognitive that the less successful group.

Keywords: more successful vs less successful, problem solving, force and motion, metacognition, thinking aloud

Students' Reflevtive Thinking Towards E-Service Learning in an Authentic Learning Environment in Learning Science and Computer

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Abstract. A growing body of research proves that Service Learning can bring a lot of benefits to participating students, in terms of academic performance and developments of social and emotional competences. Service Learning has positive effects on the understanding of social issues, personal insights, cognitive developments and skills. However, most of previous researches in this area were carried out using conventional teaching methods, where students are not exposed with the integration of online technology with potentials to provide a more flexible access to content, instruction and learning activities. Many instructors abandon their Service Learning initiatives in their teaching when required to deal with the integration of online technology, viewing it as a barrier, rather than a facilitator. When a Service Learning component is conducted online, in the form of instructions or services, or both, it becomes E-Service Learning. E-Service Learning is essential to equip students with important skills required later in their career, while simultaneously promoting their reflection towards learning activities. It also fosters students' engagement with their learning, which is based on an authentic learning environment, thus encouraging their reflective thinking. Therefore, there is a need for the integration of E-Service Learning in an authentic learning environment, as universities are now moving towards more authentic learning strategies that are student-centred and are able to provide students with the crucial skills they need. Results from the research conducted showed that, the integration of E-Service Learning in an authentic learning environment supported the development of important career skills, enhanced understanding and encouraged students' reflection towards their service learning activities.

Technology Assisted Cognitive Augmentation: an OLE Prototype to Nurture Cognitive Skills in Chemistry

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Abstract. Since a decade ago, there has been an ever-lasting maneuver to nurture cognitive skills among students across the globe using technology. Technology assisted cognitive augmentation had crafted an online learning environment (OLE) as one of interactive learning tool equipped with unlimited learning materials for students to learn, engage and ultimately construct their cognitive skills. The dynamic nature of education from being knowledge-centered to nowadays fluidity of cognitive skills further intensifies the role of OLE in information age education ecosystem, as pedagogy per se is seem inadequate to nurture cognitive skills. The purpose of this paper is to present an OLE prototype, designed and developed to nurture cognitive skills among students in chemistry. The design and development process of the protype using instructional design model approach, integration of learning model, implantation of 21st century learning medias and the predicted data analysis technique (as the OLE is not yet tested) are presented. The proposed OLE is anticipated capable to nurture cognitive skills in chemistry such as HOTS. At the end of the paper, suggestions for future research are proposed.

Keywords: cognitive augmentation, online learning environment prototype.

Curriculum and Policy

CE-008-052-DSA-AA47

The Relevance Of Learning Chemistry In Vocational High School

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Abstract. One of the problems that becomes the background of the study on Chemistry learning in Vocational High School is the low motivation of students to learn. Vocational High School is an educational institution which aims to prepare its graduates to be skillful and ready to work based on their field, so Chemistry learning in Vocational High School is expected to support the vocational learning based on their expertise or profession. Referring to this, there have been literature studies on how to carry out Chemistry learning that has the expertise relevance toward Vocational High School in order to increase the student's learning motivation. The application of Chemistry learning which is oriented in vocational competence as well as in Socio Scientific Issues context and leaning chemistry in context of Occupational Health & Safety and Environment, can increase the motivation in learning Chemistry of Vocational High School students.

Keywords: learning chemistry, motivation, socio scientific issues.

CE-018-115-DGA-AA70

How the Nature of Science (NOS) was introduced by High School Chemistry Textbooks

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Abstract. Science education in the 21st century refers to the scope of scientific literacy, how to understand science more deeply through the understanding of the Nature of Science (NOS). The aspects contained in the NOS can develop science literacy of students for school learning. It is important to know how the NOS is taught to students, especially in textbooks that are major teaching source in learning process. The purpose of this study was to analyze aspects of the NOS contained in three high school chemistry textbooks used in Tanjungpinang. The analysis was focused on the first and second chapters as representatives of high school chemistry textbooks in class X, XI and XII. Research used a content analysis technique from textbooks through a conceptual framework consists of four themes of the NOS : (a) science as a body of knowledge, (b) science as a way of thinking, (c) science as a way of investigating, (d) interaction between science, technology and society. For this study, the four themes framework has been modified to include descriptors from national level documents, such as Science for All Americans (AAAS, 1990) Benchmarks for Science Literacy (AAAS, 1993) and the National Science Education Standards (NRC, 1996). The results of the study were measured used Cohen kappa (κ) analysis to show the level of agreement of two raters of high school chemical textbooks on the content of the NOS. The Cohen kappa (κ) value generated from 0.305 to 0.675 shows that the agreement has a correlation to the concept of the NOS which is divided into 3 types of data : text, figural and assessment of each textbook. Based on the results of this study, it is expected that teachers can understand the concept of the NOS that has been analyzed in high school chemistry textbooks to be applied in school learning so that students better understand the nature of science more deeply and in the future can design textbooks that emphasize the overall of the NOS.

Keywords: chemistry textbooks, nature of sciences (NOS), science literacy.

CE-029-198-DGA-AA134

The Palm Oil Controversy: an Example of a Socio-scientific Issue as a Context in Teaching Science Concepts and Educating Future Citizen in a Global World

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Abstract. This paper discusses the current controversial debate on palm oil production as it is now excluded from the list of sustainable sources for biodiesel feedstock by the European Commission, as stated in the Delegated Act on Renewable Energy Directive II. This policy has raised tension between the European Union and palm oil producers, such as Indonesia. Indonesia is at the first place of producing palm fruits. In this paper, we discuss how the controversy on palm oil use might be operated as a context to teach science. The issue can be utilized to provide students a context to practice skills they need to be actively involved in societal discussions in order to act as scientifically literate and responsible citizens. Firstly, we describe the societal ramification of the issue. The discussion is then followed by how the issue might be incorporated in a science (chemistry) class and the functions of the issue in class.

Keywords: global world, science concepts, socio-scientific issue

CE-034-219-DSA-AA167

Fostering Ill-structured Problem Solving Skill of Chemistry Students using Socioscientific Issues as Learning Contexts

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Abstract. Solving ill-structured problems is a skill needed to maintain the competitiveness of students as future generations in the era of industry 4.0. Such skill combines various high-level thinking skills such as argumentation, creativity, critical thinking into a single unit of action with the aim of getting the best possible solution. Several studies have shown that students have difficulties in applying ill-structured problem in their learning. This is related to the lack of student's connection to the problems, and the complexity and novelty of the problem. Students have been more accustomed to well-structured problems that only involve lower aspect of their thinking skills. Therefore, their interest and involvement are required in facing ill-structured problems. Strengthening students' connection to ill-structured problems can be done by enriching the context of problems which is able to encourage students' involvement to the problem affectively and emotionally, so that students will be interested and challenged to overcome the problem. This paper discusses the possibility of a combination of socioscientific issues (SSI) as an ill-structured context of problem solving, considering that SSI contextual learning uses controversial problems which is directly related to daily life of students. Through SSI, it is expected that students' motivation and attitude towards science content that underlie these issues will increase, encouraging them to improve metacognition and self-regulation during the problem solving process, thereby facilitating their connection to problems. The combination of SSI as a context and ill-structured problem solving holds a high potential to be able to increase problem solving skills of students, especially for ill-structured problems.

Keywords: ill-structured, problem solving skill, socioscientific issues, learning context

CE-048-346-DGA-AA343

Flipped Classroom : New Way for Increase Critical Thinking Skill in Chemistry Courses

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Abstract. Flipped classroom is a learning approach that flip the classroom around and home assignments. Out-side class (at home) students recieve lecture and in side class (class face-to-face) they discuss what they encounter in the out-site class. The perpose of this study was find out the effectiveness of instructional media flipped classroom towards critical thinking skills. Sample of this study is first year students in the second semester in basic chemistry courses.The measured was instractional media flipped classroom system compared the traditional class that only uses lectures and power points. In this study we used a post-test design to investigate the impact of the application of flipped classroom on students' critical thinking skills, measured using the critical thinking skills instrument created based on the Ennis indicator. Analysis used the Mann-Withney test, the results showed that the implementation of flipped classroom led to a significant increase in critical thinking with signifikasi score 0,03.

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SE-009-099-ISA-AA114

The Challenges of Indonesian Science Teachers In Teaching Students With Special Educational Needs In Inclusive School

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Abstract. Inclusive school is one kind of equality and form of education without discrimination where children with special needs and children in general can get the same education. Since 2000, the Indonesian government has started to commit itself in providing inclusive education. This commitment is realized by the circular of DIRJEN DIKDASMEN DEPDIKNAS No.380 / C.C6 / MN / 2003 dated January 20, 2003 about the implementation and development of inclusive schools in each district / city consisting of elementary, junior high school and vocational school. In its implementation, inclusive education has some challenges especially for science teachers. These challenges are curriculum changes, heterogeneity of students with special needs, and learning in the classroom. The curriculum changes will have an impact on teacher adjustment to the new curriculum. Heterogeneity of students with special needs will have an impact on the difficulty of teachers to adjust to the character of students with special needs. So, of course, also have an impact on the learning method in accordance with students with special needs. But this challenge will not be a problem if all interested parties with inclusive education are committed to implementing inclusive education seriously. Teacher as the spearhead also must be a figure who always learns to be able to adjust to all forms of change in the education system.

Key Words: Science Teacher, Students Wuth Special Educational Needs, Inclusive Education

SE-030-225-DGA-AA170

The Work of Informal Environment in Language Learning

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Abstract. This study is to examine the work of informal environment in language learning at English Department of Madura University. The students at English Department of Madura University are as parts of population in this research. This study is an ex post facto research, using quantitative approach. A sample is decided using proportional stratified random sampling technique. The data are analyzed by simple regression technique. The result of the study shows that the work of informal environment in language learning at English Department of Madura University is not particularly high, 0.43 (43%). The informal environment of English Department of Madura University operates on students' proficiency level in English. It enriches the students' input to communicate in English as well as makes the input of students becoming intake. It implies that the teachers and members of academic society at Madura University in particular Teacher Training and Education Faculty should assist students with the appropiate language environment in order to put up the right conditions of classroom to help students with meaningful input. It is recommended that the members of academic society of English Department at Madura University are being responsive to proper speech style in English teaching learning process.

Keyword: Environment, English Learning, Informal, Input, Intake

BE-001-012-ISA-AA137

Analysis of Government Funded Research in Indonesia from 2014-2018: Implications for Research Trends in Science Education

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Abstract. In this study, we analysed all projects awarded to the top-five public Teacher Education Institutions (TEIs) in Indonesia from 2014-2018 to report on recent trends in science education research. The analysis revealed four important findings in terms of research topic, subject or context, product and outcome, and content target. Scientific literacy, character, and cognitive are the top three research topic over the last five years. Interestingly, more than half of the studies (61%) targeted students in real school settings. In addition, the research projects produced varied product and outcomes such as teaching and learning material and pedagogical model/ strategy. For the content target, the project was dominated by school science subjects. Building from these findings, we offer some educational context for why scientific literacy and character has emerged as such a prominent topic in Indonesia. We also highlight the importance to more involve teachers in the research project, significance of the research product and outcome in improving science teaching and learning practice in schools, and the need to promote research on pedagogical coursework of TEIs curriculum. This study has implications for the future direction of science education research in the country, particularly for government funded research.

Keywords: Indonesian science education, governmental research funding, teacher education institutions.

BE-017-104-DSA-AA78

Is it Important to Develop Critical Thinking and Collaboration Skills for Prospective Teacher-Students?: Students' Perspective

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Abstract. Critical thinking and collaboration skills are very important skills that must be owned by teachers in the 21st-century. Critical thinking skills make teachers more sensitive and critical of the teaching and learning did so that teachers can continue to improve their learning. Improving learning will be maximized if a teacher collaborates with other teachers to design improvements in the teaching and learning process. The development of critical thinking and collaboration skills will be maximized if they realize the importance of having these skills. The purpose of this paper is to outline the opinions of prospective teacher-students about how important the development of critical thinking and collaboration skills for prospective teacher-students. The method of this research is descriptive and literature study. Data retrieval was carried out through questionnaires that are given to 224 prospective teacher students at Universitas Negeri Malang. The questionnaire was filled out by 63 postgraduate and 161 undergraduate students. The purpose of the questionnaire is to find out the opinions of prospective teacher-students about how important the development of critical thinking and collaboration skills was. Analysis of the data carried out using quantitative and qualitative analysis techniques. The results of the questionnaire given show that all prospective teacher-students agree that the development of critical thinking and collaboration skills is important, especially for prospective teacher-students. These results indicate the need for developing critical thinking and collaboration skills for prospective teacher-students through various models/methods/strategies in learning.

Keywords: Collaborative Skills, Critical Thinking Skills, Prospective Teacher-students

BE-025-129-DGA-AA73

Development of 21st Century Skills at the Senior High School: Teachers' Perspective

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Abstract. Twenty-first-century skills development is a basic requirement in the 21st century. The development of 21st-century skills for students is determined by the learning process in the classroom. The learning process in the classroom involves teachers as learners. It needs to be studied further, what are the difficulties and needs of teachers in developing 21st-century skills for students. The purpose of this paper is to describe the difficulties and needs of high school teachers to implement 21st-century teaching and learning. The method of this research is descriptive and literature studies. Data retrieval is done through questionnaires given to high school teachers in Malang City. The questionnaire was filled by 49 biology teachers in Malang city who taught class 10-12. The questionnaire tried to find out the difficulties and needs of teachers in teaching 21st-century life skills. The results of the questionnaires given showed that the difficulties experienced by teachers in teaching 21st-century skills related to the condition of students, teachers, facilities, and existing policies. Whereas what the teacher needs in teaching 4Cs (creativity, critical thinking skills, collaboration skills, and communication skills) are innovative teaching and learning models/methods and IT Mastery for teaching and learning.

Keywords: teaching and learning, teachers' perspective, twenty-first century skills

BE-056-262-DSA-AA252

Study of Learning Problems in Waste Management Topic (Case Study in Biology Study Program, State University of Malang)

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Abstract. With regard to education in 21st century, Ministry of National Education set Strategic Plan for 2010-2014, that was about four universal education paradigms in Indonesia. One of them was education for sustainable development. This paradigm requires that education can foster awareness about the importance of environmental sustainability, especially for Biology students. To achieve it, it must be supported by the learning process. However, the learning in waste management topic still have several problems, so it has not been able to foster student environmental awareness. Based on the case study in biology students, it can be concluded that the method of explanation of lecturers is still monotonous, the material is incomplete, and there are no standard teaching materials. So far, waste management learning has mostly only used scientific articles. This is of course still limited, because scientific articles tend to discuss the results of research. Thus, learning materials need to be developed that can accommodate students, so that it is expected to foster environmental awareness and education for sustainable development.

Keywords: learning problem, waste management, biology.

BE-041-185-DGA-AA322

Spaces to Spur Renewable Energy-Literate Students in the Indonesian Junior and Senior Secondary Schools' Science Curriculum: A Meta-Analysis

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Abstract. Globally education is expected offering solutions for any global challenges included exploring alternative renewable source energy. In fact, there is not fully enactment about this discourse especially in the Indonesian Education system. With this mind, we tried to explore the chances to implement the renewable energy teaching and learning in both junior and senior secondary schools in fostering students' literation on the alternative renewable source energy. To enable profoundly investigating the topic, we employed a meta-analysis study. Two main ideas that have been risen in probing Indonesian students' literacy on renewable energy, namely the curriculum analysis and the previous learning practices from Indonesia or overseas countries. Previous studies revealed that the fully enactment on the renewable energy curriculum has a high positive correlation with the innovation that has been spurred in some countries. This study also found that Indonesian curriculum offers the opportunities to engage student with the renewable energy in any grade from junior to senior secondary school. However, there are only a few studies which rose the topic and reveal the impact of the learning and teaching practices. By the end of the study, we offered the learning strategies to rise the students' literacy on renewable energy massively.

Keywords: meta-analysis study, renewable energy, science curriculum.

BE-076-363-IGA-AA333

The Role of Extensive Biology in Nigerian Colleges of Education Curriculum Among Undergraduates; A Case Study of F.C.E (T) Potiskum, Yobe State

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Abstract. Biology is the study of living things and a subject that provides part of the literacy needed for national growth and development. Despite the quest by all nations to grow scientifically and technologically, Biology status as contained in the National Policy on Education (FRN, 2013) is now elective for science students only in Nigerian colleges of education. The latest development that may constitute negative influence on the national growth and development led to this paper that addressed reconsidering the status of Biology in Nigerian senior secondary schools and colleges of education curriculum: implications for scientifically literate society. It also buttressed the importance of Biology to humanity and also averred the significance of Biological Science curriculum study as applied to current NCE Biology minimum standard programmed in Nigeria. The study concluded that the knowledge of Biology is needed by all students. Also, it was recommended that government and relevant stakeholders should promote teaching and learning of Biology by all students in Nigerian senior secondary schools, colleges of education and universities among others.

Key words: BSCS, Literacy Society, Biology, Curriculum, Scientific, Status.

Assessment

ME-003-008-DGA-AA21

Mathematical Writing Communication Skills with OpQ en-Ended Approach through Interaction Design on the Peer Assessment Learning Model

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Abstract. This study aims to describe mathematical writing communication skills of the student in solving calculus problems with an open-ended approach through peer assessment learning models in low (MR), moderate (MS), and high (MT) capable students. The test subjects were 50 mathematics students who took calculus courses. The research data were obtained from the analysis of the answer sheets of students who took the pretest and posttest and were analyzed based on indicators of mathematics writing ability. The aspects that are measured are (1) the ability to use mathematical language (notation, terms, and symbols) to express mathematical information, (2) express mathematical ideas logically and be afraid to solve problems, and (3) analyze and evaluate mathematical ideas. The results of the analysis show that: (1) MR is able to use mathematical notations, terms, and symbols but the information is written is incomplete; able to express mathematical ideas logically, not coherently and wrong answers; and unable to express the relationship between mathematical ideas and available information, (2) MS is able to use mathematical notations, terms and symbols inaccurate but the information is written is quite complete; able to express mathematical ideas logically, coherently but wrong answers; and able to express the relationship between mathematical ideas, and (3) MT is able to use the notation, terms and symbols accurately and completely; able to express mathematical ideas logically and coherently and correct answers; able to express the relationship between mathematical ideas precisely from all available information.

Keywords: assessment learning model, calculus problems, interaction design.

ME-017-060-DGA-AA87

Exploring the Types of Problems Task by Mathematics Teacher to Develop Students HOTS

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Abstract. Higher-order thinking is an important skill developed in middle school students. One way that mathematics teachers do in developing students' higher-order thinking skills (HOTS) is by giving them tasks in the form of mathematical problems. The purpose of this study was to reveal the type of assignment of mathematical problems to develop HOTS students by teachers in junior high school. This research is a case study carried out on two mathematics teacher, novice and experienced in SMPN 3 Malang. Data collection is done through observation and interviews. The results showed that (1) the novice teacher chooses the task in the form of mathematics problems taken from the book without regard to the proximity of the problem context with students, selected mathematics problems were closed problems both in ways and solutions, problems were presented in core activities and students were asked to do individuals, (2) the experienced teacher chooses the tasks in the form of mathematics problems that are designed by the teacher itself and pay attention to the proximity of the problem context with students, selected mathematics problems are open problems in ways and closed in solutions, problems are presented in core activities and students are asked to do in groups.

Keywords: higher-order thinking skills (HOTS), mathematical problems.

ME-067-230-DSA-AA183

Analysis of Mathematical Literacy Test as a Problem-Solving Ability Assessment of Junior High School Students

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Abstract. This research is aimed at analyzing mathematical literacy test as a problem solving ability assessment of junior high school students. In addition, it also aims to evaluate students' mathematical literacy skills. This is a qualitative descriptive research. The method of collecting data used were questionnaire and question items testing students' problem-solving and mathematical literacy. The results discussed on this research are assessments of validity, reliability, level of difficulty, and discrimination power of test items. Aspects measured about mathematical literacy was students' ability of creative thinking, critical thinking, reasoning, determining solving strategies, communication, giving reasons, using mathematical tools and evaluating the results.

Keywords: mathematical literacy, questionnaire.

ME-076-269-DGA-AA216

Building Student Critical Thinking Ability Through the Peer Assesment Learning Model on Calculus with the Open Ended Approach

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Abstract. Critical thinking is an ability that must be possessed by students, it because that is a skill that has been recognized as an important skill in the 21st century. Thinking critically also makes someone to reason effectively. In addition, having critical thinking skills will improve student competitiveness in the work environment. This research was conducted to find out the results of the development of peer assessment based cooperative learning models which developed by Permadi (2017) with the aim of fostering critical thinking skills. The research method used was descriptive qualitative by looking at the work results of student worksheets, analysis of video transcripts from the discussion and supplemented with interview transcripts. The research subjects were 16 students, consisting of 8 students from 34 offering A students and 8 students from 27 B offering students, who took short semester Calculus courses for the 2019/2020 academic year. Each offering in the learning group is formed consisting of 3 students. Offering A formed 12 groups and offering B formed 10 groups. The formation of this group is based on the results of the t-test of two samples on the value of the pretest, the results show there are differences in the average value of the pretest of the two offerings (t-count = 2.94 with a value of p = 0.005). Based on interval values (31,68-42,60) in offering A and offering B interval (42,73-56,38) a group of students with high, medium and low ability categories is formed. From the groups in each offering four groups of students were taken including those recorded and fully video during the learning process. The results of the analysis of critical thinking indicators based on Angelo's theory show that: (1) 81% of mahasisma are able to analyze problems. (2) There are 58% synthesis skills (making new ideas) that are owned by students. Only 30% of students master the skills of recognizing and solving problems, concluding and evaluating. Based on the response questionnaire of 85% of students who felt the difference in learning activities with what they used to do, 85% of respondents stated that they found it easier to understand learning material through peer assessment learning, 46%, respondents stated difficulties in giving assessment scores towards the variable accuracy in problem solving.

Keywords: cooperative learning model, peer assessment, critical thingking.

ME-076-269-DGA-AA217

Application of Peer Assessments Learning Model to Build Student's Creative Thinking Skills in Calculus Materials with the Open Ended Approach

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Abstract. Learning plays a role in building the ability to think creatively which is one of the important abilities in the 21st century. This research is conducted with the aim of describing the application of peer assessment learning models (Permadi, 2017; Permadi, 2018) with an open-ended approach in building students' creative thinking skills. The research's method used was a mix method of quantitative (two sample t-test) and descriptive qualitative by analyzing student's worksheets , interview's transcript and video during learning proccess. The research subjects were 16 students, consisting of 8 students from 34 offering A students and 8 students from 27 B offering students, who took Calculus courses in the short semester of 2019/2020 academic year. Each offering was formed into groups , which consisted of 3 students in every group. Offering A formed into 12 groups and offering B formed into 10 groups. The formation of this group is based on the results of the t-test of two samples on the value of the pretest, the results show there are differences in the average pretest value of the two offerings (t-count = 2.94 with a value of p = 0.005). Based on the value of the interval on offering A (31,68-42,60) and offering B (42,73-56,38)a group of students with high, medium and low ability categories is formed. From the groups in each offering, four groups of students were taken to recorded using voice recorder and camera video wholly during the learning process. Based on the results of the discussion in the learning model, peer assessment of students' creative thinking skills is done by analyzing analyzing sheets , interview's transcript and video. The results of students discussions are: a) a having curiosity, b) likely asking meaningful question based on the topic, c) expressing their ideas as a response to the problem, d) giving opinions spontaneously and confidently, e) could work independent, and f) happy to try new things (students tried to solve the problems in another way they never used). Sumarmo (2013) stated that creative thinking is an ability which involves: (a) the fluency in making various idea; (b) the flexibility in giving opinion; (c) be able to produce something new; and making the detail of an idea. Based on the response questionnaire students 85% of respondents felt the difference in learning activities with what they used to do, 98% respondents stated meaningfulness in learning, 85% of respondents had the opportunity to share information in group, and it was easier to obtain learning experience.

Keywords: learning model, peer assessment, creative thinking.

ME-076-269-DGA-AA218

Oral Mathematic's Communication Skill in The Aplication of Peer Assessment Learning Model

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Abstract. Student communication ability is one of the fundamental abilities that must be have by students in doing mathematic's activities. One of the way to construct knowledge is through communication. It's through awareness during the process of expressing ideas verbally. This research was conducted with the aim of describing mathematical communication skills of Mathematics college students in a peer assessment cooperative learning models developed by Permadi (2017). The research method was descriptive qualitative by analyzing video and unstructured interview transcripts during the application of the model. The Participant was 61 students consisting of 2 classes, which 34 students from class A and 27 students from class B who took calculus courses in the short semester of the 2018/2019 academic year. Class A is divided into 13 groups of students and class B into 9 groups of students randomly, which each group consists of three students. Four groups were taken randomly as samples, which recorded wholly using a video camera during the application of the model. The research showed that in applying peer assessment cooperative learning models, observed the advantages and disadvantages in students' oral communication skills. The advantages are 1) getting a new mathematic's vocabulary, 2) feeling free in expressing mathematical ideas logically and systematically. On the other hand, lack of student oral communication is constrained due to differences in terms of, 1) experience about content, 2) selection of mathematical vocabulary. Based on the questionnaire responses , 100% of students felt the meaning of the model in construct knowledge about calculus, 88% of respondents said they had the opportunity to share the idea, 88% of respondents said that it was easier to obtain learning experiences.

Keywords: cooperative learning model, peer assessment, mathematical communication.

MA-016-299-DGA-AA258

Negative Scoring of Multiple Choice Tests

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Abstract. Multiple choice tests are widely used to examine student knowledge, especially when we have so many students as examinees and we need a fast scoring. Conventional, there are two scoring methods, number right scoring and negative marking. By the number right scoring, examinees get positive values for a correct answer, and get zero value for incorrect answers and absent or omitted answers. Examiners can gain score by guessing the answers. If the test score is to extract student's level knowledge, the test score due to guessing must be reduced. We know that, to do it, a negative marking is designed. In this paper, mathematically, we discuss a formula for negative marking.

CE-021-146-DGA-AA95

Development And Implementation Of Multiple-Choice Chemical Literacy Survey In Acid-Base Chemistry

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Abstract. The consequences of placing chemical literacy as learning outcomes are the availability of appropriate instructional approaches, teaching materials and assessment instruments. The aims of this research are to develop valid and reliable multiple-choice chemical literacy test in acid-base chemistry and its implementation. The test development was carried out through five stages, i.e., (1) literature study, (2) development of items, (3) expert judgment, (4) pilot study, and (5) finalization of the test. The trial involved 138 students who had learned knowledge of acid-base chemistry. The final instrument of multiple-choice chemical literacy test in acid-base chemistry consisted of 26 items with Cronbach's Alpha reliability coefficient of 0.804. Survey to 64 respondents shows that their average score is 57.75% (moderate category). At the level of domains, the average score of respondents' chemical literacy in acid-base chemistry from the lowest to the highest are (a) epistemic knowledge (41.93%); (b) competency to explain phenomena scientifically (57.59%); (c) competency to interprete data and evidence scientifically (58.01%); (d) procedural knowledge (59.16%); (e) competency to evaluate and design scientific inquiry (63.28%); and (f) content knowledge of acid-base chemistry (66.54%). These results suggested that theoretical epistemic knowledge and its use in explaining phenomena need more attention in instruction.

Keywords: acid-base chemistry, chemical literacy, multiple-choice.

CE-026-193-DSA-AA131

Implementation Questions of Learning Outcome Assessment Based on Curriculum 2013 in Chemistry Twelve Classes for Senior High School in Malang

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Abstract. 2013 curriculum comes with improvements to content standards and assessment standards. The assessment standards in the 2013 curriculum require students to be able to think critically and innovatively based on international standards of education that refer to the PISA assessment standards. The assessment standards used by PISA refer to assessment instruments that measure the high-level abilities of students (Higher Order Thinking Skills) or HOTs. This study aims to determine the implementation of the 2013 Curriculum assessment standard on the XII grade high school chemistry test questions in Malang. The study used descriptive qualitative approaches and content analysis methods with data collection methods, namely documentation. Validity statistics in the study used interpreter reliability and Cohen-Kappa. The results of the study showed that the assessment of learning outcomes of students had fulfilled the standard assessment based on the 2013 curriculum with the percentage of HOTs questions on class XII questions amounting to 12.50%. The validity test of the findings shows a perfect interpretation with the value of the agreement coefficient 0.61-0.87.

Keywords: Learning Outcomes Assessment, HOTs, Chemistry, 2013 curriculum

CE-032-209-DSA-AA146

The Development of Higher Order Thinking Skills Oriented Test on Acid-base Chemistry for 11th Grade Students

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Abstract. The implementation of the scientific inquiry approachment in Indonesian curriculum needs appropriate assessments, one of them is a higher order thinking skills (HOTS) test. Acid-base chemistry, one of chemistry topics in senior high school curriculum, has concepts that are interrelated with each other that suitable to improve students' higher order thinking skills. The purpose of this study was to develop a valid and reliable higher order thinking skills-oriented test on acid-base chemistry. The study applied research and development design. The development of instrument was carried out in five stages, namely (1) literature review, (2) development of items, (3) expert judgment, (4) pilot study, and (5) finalization of instrument. The pilot study involved 205 students of public and private senior high school in Malang Raya. The final product of instrument consisted of 32 valid items of HOTS test on Acid-Base Chemistry with Cronbach's Alpha reliability coefficient of 0.787. This indicate that the instrument produced by this research and development can be used to assess students' higher order thinking skills on Acid-Base Chemistry.

Keywords: test instrument, higher order thinking skills, acid-base chemistry, senior high school students.

CE-040-259-DGA-AA230

Development of Four-Tier Diagnostic Test for Identifying Misconceptions in Chemical Equilibrium

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Abstract. The aims of this study was the development and validation of a four-tier diagnostic test to identify students' misconceptions in chemical equilibrium (FTDTCE). Diagnostic tes four-tire for chemical equilibrium have never been developed. This study consisted of five stages adopted the procedure used for the four-tire instrument developed by Habiddin & Page and involves: (1) testing and interviewing, (2) defining the conceptions of students who were wrong (not scientific), (3) developing prototype of FTDTCE, (4) validating prototype FTDTCE, (5) developing the final FTDTCE. The diagnostic test instrument developed consisted of 25 questions with the level of confidence to the questions and reasons. The results of content and construct validation by experts obtained of 96% and 97% respectively with very valid/feasible criteria. The results of the validity of the items showed 25 valid items in the first and second combined tier, 1 item that has been revised in the first tier, and 4 items that have been revised in the second tier. The discrimination index of the items showed 11 items were fair and 14 items were good. The results of the difficulty level showed 9 items were difficult, 15 items were moderate, and 1 item was easy question. The reliability of the tes was very high at 0.848 and the reliability of the confidence level is very high at 0.834. The product of a four-tier diagnostic test that was valid, reliable, and feasible to identify students' misconceptions in chemical equilibrium.

Keywords: diagnostic test, four-tier, misconceptions, chemical equilibrium.

CE-022-167-DGA-AA281

Development of Multiple Choice Tes to Assess Senior High School Students' Chemical Literacy on Topic of Properties of Salts

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Abstract. Each instruction requires appropriate strategies and assessments, including instruction of chemical literacy. Properties of salts which is closely related to daily life is suitable for instruction of chemical literacy. The purpose of this research is to produce a valid and reliable test on the topic of properties of salts to assess senior high school students' chemical literacy. This study applied design of research and development and also survey. The test development was carried out through five stages, namely (1) literature review, (2) items development, (3) expert judgement, (4) pilot study, and (5) finalization. The survey was carried out integrated with pilot study by analyzing the results of pilot study using a valid and reliable test. The research and development produced a chemical literacy test consist of 25 valid items with Cronbach's Alpha reliability coefficient of 0.605. Analysis of student performance using the valid and reliable test shows that the respondents' average chemical literacy score is 36.60 from a maximum score of 100 with a low category.

Keywords: assessment, chemical literacy, properties of salts.

CE-047-343-DGA-AA313

The Quality Analysis of Chemistry Item In Final Semester Examination for Tenth Graded Vocational Student Majoring in Computer and Networking Engineering in Bantul Regency

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Abstract. This research aims to investigate the quality of final examination test items given to Computer and Networking Engineering students. The test items were made by 4 Chemistry teachers in state vocational school and 4 Chemistry teachers in private vocational school in Bantul regency. This research discussed the quality of the test items made by the state vocational school Chemistry teachers, the quality of the test items made by the private vocational school Chemistry teachers, and the quality of the overall test items made by the state vocational school and private vocational school Chemistry teachers. The quality of the test items was measured by using four variables: (1) material, construction, and language aspects, (2) cognitive level comparison, (3) the appropriateness of the materials tested to the materials covered in 2013 Curriculum, and (4) the appropriateness of the number of the test items given to the materials covered and time allocated.This research used ex-post facto research design. The sample of the research was taken from the final examination test items for the tenth-grade vocational school students of Computer and Networking Engineering in Bantul regency in 2017/2018 academic year. There were four state vocational schools and four private vocational schools involved in this research. The quality of the final examination test items was measured by using the instrument which had been validated by three lecturers whose specialty were in Chemistry education. Therefore, the results of the data analysis were in the form of descriptive qualitative data in the four variables used. For the first variable, the aspect of material, construction, and language, it was found that the quality of the final examination test items was good. For the second variable, cognitive level comparison, it was found that the quality of the final examination test items in the four state vocational schools was good meanwhile the quality of the final examination test items in the four private vocational schools was fair. For the third variable, the appropriateness of the materials tested to the materials covered in 2013 Curriculum, it was found that the mean percentage in the four state vocational schools was good while the mean percentage in the four private vocational school was excellent. Lastly, for the fourth variable, the appropriateness of the number of test items given to the materials covered and time allocated, it was found that the mean percentage in four state vocational school was fair meanwhile the mean percentage in four private vocational school was poor. Talking about the quality of the overall test items made by the state vocational school and private vocational school Chemistry teachers measured by using the four variables of concern, it was found that (1) the aspect of material, construction, and language was in excellent category, (2) cognitive level comparison was in fair category, (3) the appropriateness of the materials tested to the materials covered in 2013 Curriculum was in excellent category, and (4) the appropriateness of the number of test items given to the materials covered and time allocated was in fair category. Regarding to the result of this research, it is highly suggested for the vocational school Chemistry teachers to be able to construct good and appropriate test items.

Keywords: chemistry item, networking engineering.

PE-041-245-DGA-AA203

Development of Diagnostic Concept Maps for Identification of Students' Misconceptions

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Abstract. Concept maps are usually used as learning media and are rarely used as evaluation tools. Through this study concept maps will be used as a substitute for diagnostic tests that are often used to detect misconceptions in students. The research approach used is quantitative, research & development methods and collection techniques through surveys. Development of the Diagnostic Concept Map Instrument (IPKD) using the ADDIE model. The IPKD validation used two-tier diagnostic tests as a standard form of testing that is often used to identify misconceptions. The IPKD implementation used the target population of all class XII high school students in Banda Aceh City, but because of the limited time and cost randomly taken as many as 20 students of class XII of the State Senior High School 6 of Banda Aceh City. Based on the results of data analysis, it was found that students who experienced misconceptions were relatively low, knew the concepts in the medium category, lacked knowledge in the medium category and relatively low students who answered by guessing. These results did not differ significantly from the results of the two-tier diagnostic test. The findings through this study prove that the use of diagnostic concept maps to identify misconceptions is more effective in knowing the level of understanding and revealing student misconceptions.

Key Words: Misconception, diagnostic tests, concept maps, conceptual, understanding

PE-056-329-ISA-AA300

Investigating of the Factors Affecting Physics Performance Indonesian Students Based on TIMSS 2011 Dataset

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Abstract. The aim of this study is to examine the effects of the factors on Physic achievement of 8-grade Indonesian students in the Trends in International Mathematics and Science Study (TIMSS) 2011. Around 9,074 eight-grade students from 153 schools within 31 provinces in Indonesia participated in TIMSS 2011 assessment. A Path Analysis using the AMOS program was employed to examine the effect of the factors on Physics achievement using five plausible values as outcomes variables. This study highlighted various important findings on student predictors. The findings indicated the statistically significant influence of student's attitudes (Like Physics and Confidence Physics) toward Physics, Gender differences, and Homework on 8-grade Physics Achievement of Indonesian students.

Keywords: Physic achievement, TIMSS 2011

SE-009-099-ISA-AA115

Post-Learning Cycle A Web-Based Formative Assessment Model on Physics Learning Temperature And Heat Matter for Vocational School Students

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Abstract. Web-based formative assessment model divided into three cycles of pre-learning cycle, learning cycle and post-learning cycle. The present study develop post-learning cycle a web-based formative assessment model in physics specifically for heat and temperature materials in vocational school students class X. This research uses research and development method. Post-learning cycle a web-based formative assessment model developed with 6 stages: 1) the collection of information and drafting, 2) planning, 3) develop initial product form, 4) to test the starters, 5) revisions, and 6) trial. Based on trial results, it was found that post-learning cycle a web-based formative assessment model can help teachers and students to get quick feedback. Rapid feedback can help students to gain understanding of the concept quickly and can help teachers to find students so that problems can be solved quickly. This formative assessment model can be used as a tool of assessment and evaluation of achievement of student learning outcomes.

Keywords: formative assessment, feedback, physics learning, web-based.

SE-025-186-DSA-AA124

Analysis and Profile of Students' Creative Thinking Skills Using Open-Ended Multiple-Choice Test

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Abstract. This study aimed to determine students' creative thinking skills in grade VII of SMP Negeri 1 Jaten during the process of science learning. This study was carried out using quantitative-descriptive method. Data collection were done by using open-ended multiple-choice tests based on students' creative thinking skills indicators. Tests were previously validated by experts in learning evaluation. Validity of test items were detemined using Karl-Pearson formula related to product moment correlation coefficient. Reliability of tests were determined using Alpha-Cronbach formula. Difficulty level and discriminating power were also used as item parameters in this study. The results of this study showed that students' creative thinking skills on each indicator were 49% of fluency which was in the low category, 72% of flexibility which was in the medium category, 34% of originality which is in the low category, and 35% of elaboration which is in the low category.

Keywords: quantitative-descriptive method, open-ended multiple-choice test, science learning.

SE-037-303-DSA-AA262

Web Based Formative Assessment Integrated in Science Learning to Improve Students' Concept Understanding

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Abstract. Assessment in learning based on the 2013 curriculum is not only by assessment of learning approach, but also assessment as learning and assessment for learning. This assessment can be done by integrating formative assessment. Integration of web based formative assessment can solve the time constraints and large number of students. This study aims to know the increase of junior high school students' concept understanding of vibration, wave, and sound in science learning integrated by web-based formative assessment. This research was conducted at Malang 1 Junior High School class VIII-C academic year of 2018/2019. This research was mixed method with embedded experimental type. Quantitative data were score of pretest and posttest values. Qualitative data was obtained from observation and interviews. Quantitative data analysis consisted of the Kolmogorov Smirnov test, paired t-test, N-Gain, and size d-effect. Qualitative data analysis was carried out by data reduction, plot spread, and cross tabulation. Paired t-test results showed a significant difference between the pretest and posttest scores (9.895> 2.03693). The d-effect result shown value of 2.25 with a high category and N-gain value of 0.63 with the upper medium category. Based on analysis, it can be concluded that the students' concept understanding showed an increase by integrated web based formative assessment in science learning.

Keywords: assessment, science learning, web-based.

BE-014-088-DSA-AA165

Developing of Cognitive Test Instruments Based on Scientific Literacy on 'Coordination System' Learning Material in SMAN 1 Kepanjen

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Abstract. Scientific literacy is one of the 21st century life skills that is important to be developed so that students can use science knowledge to solve problems and make decisions in their lives. The purpose of this research was to develop cognitive test instruments based on scientific literacy on 'coordination system' learning material whose validity, practicality and effectiveness have been proven and tested. This study is a research and development study which was adapted from the ADDIE development model, consisting of five stages, namely analysis, design, development, implementation, and evaluation. The aspects to be measured in this research were the level of validity consists of logical validity and empirical validity, practicality of instrument user and effectiveness of the value of student's cognitive learning outcomes. The product is tested to 214 students of MIPA 11th class in SMAN 1 Kepanjen who received 'coordination system' learning material. The results show that the cognitive test instrument was revealed feasible based on logical validity by assessment expert and material expert. Based on empirical validity analysis of the item was revealed feasible with level of reliability was 0.81 for multiple choice questions and 0.86 for essay questions, level of difficulty of the item with the easy categories about 35% and medium categories about 65%. Level of different abilities are in good criteria about 60% and very good good criteria about 40%. Practicality level of the cognitive test instrument was revealed very practical and level of effectiveness was revealed very good.

Keywords: coordination system, develop cognitive test instruments, scientific literacy.

BE-028-133-DSA-AA156

The Development of Performance Assessment to Measure Science Literacy Skills on Circulatory System's Lesson in XI Grade of Senior High School 5 Malang

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Abstract. The aim of the study was to develop a performance assessment instrument that was valid, practical, and effective for measuring students' literacy skills in XI grade on circulatory system's lesson at Senior High School Malang. This study uses the ADDIE development model which consists of 5 stages, namely Analysis, Design, Development, Implementation and Evaluate. Analysis of the results of the construct validation test showed the average percentage of 96% assessment expert validation (very valid), the average percentage of material expert validation was 99.6% (very valid), and the percentage of field practitioner validation was 98% (very valid). The practicality level of performance assessment based on the results of analysis of student and field practitioner response questionnaires was found to be 96.4% (very practical). Classical learning completeness criteria are said to be effective with percentage percentages of presentation performance 91%, assessment of discussion performance 86%, assessment of practicum performance 100%, and competency test questions on cognitive aspects of science literacy skills 89%. The results of the empirical validation test through the analysis of the difficulty level calculation, show questions with difficult criteria as many as 2 items, the questions with moderate criteria are 7 items, and the questions with easy criteria are 14 items. The analysis of the differentiation of questions was compared with the criteria for distinguishing items, showing questions with sufficient criteria as many as 15 items, questions with good criteria as many as 2 items, and questions with excellent criteria as many as 6 items. Analysis of the calculation of the answer pattern shows that of the 23 questions it has a functioning distractor. The analysis of reliability calculation was then compared with the criteria for item reliability, showing the number 0.77. The limitations of this study are still carried out in one class, amounting to 35 students. Based on the results obtained, the performance assessment developed has been feasible to be used as a learning assessment and can measure science literacy skills in XI grade on circulatory system's lesson at Senior High School 5 Malang.

Keywords: performance assessment, circulatory system, science literacy skills.

BE-013-079-DGA-AA222

Explaining the Application of Illinois Critical Thinking Essay Test in Inquiry-Based Learning to Measure Student's Critical Thinking Skills: A Classroom Action Research

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Abstract. Various ways could be used to measure student's critical thinking skills. One method that can be used was integrating the Illinois Critical Thinking Essay Test on inquiry-based learning. This study aimed to describe the process of using Illinois Critical Thinking Essay Test on inquiry-based learning to measure student's critical thinking skills. This research was a class action research which used Kemmis and Mc Taggart (2007) model. Data of student's critical thinking skills were collected from the results of the pretest and posttest which were then analyzed using the rubric developed by Zubaidah (2015). The results of the study showed that the use of Illinois Critical Thinking Essay Test in inquiry-based learning had a positive impact in facilitating to assess the progress of students' critical thinking skill.

Keywords: critical thinking skills, inquiry-based learning.

BE-013-079-DGA-AA224

Developing Of Assessment Instruments Based On Science Literacy In Guided Inquiry Learning On Plant Diversity Materials To Measure Student Learning Outcomes At Senior High School 1 Srengat

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Abstract. 2013 curriculum provides opportunities for students to have thinking skills, psychomotor skills, as well as the ability to use knowledge and skills. The aim of the study was to produce valid scientific literacy assessments on Plants Diversity material. The research and development model used ADDIE which consists of five stages, namely analysis, design, development, implementation, and evaluation. Assessment instruments developed in the form of tests, non-tests, and learning devices. The trial subjects in the study were 69 students of class X MIPA 2 and X MIPA 3 at SMAN 1 Srengat. Aspects measured in research and development are validity of validators, practicality of instrument users, and effectiveness of improving scientific literacy skills. The validation results from assessment and learning experts were 95.63% and 75.00% for construct validity. The validation results from material experts were 88.58% and the validation results from field practitioners were 95.80% and were declared valid, the practicality level was 92.14% with very practical criteria and could be used, as well as an effectiveness level of 85.72 with a very effective. Based on these results show that the learning device developed has been valid, practical, and effectively used in learning activities. Assessment based scientific literacy developed can measure student learning outcomes.

Keywords: assessment instruments, guided inquiry, plant diversity, scientific literacy.

Media, ICT and Teaching Material

ME-013-036-DGA-AA24

The Development of a Braille Geometry Module Based on Visual Impairment Students Synthetic Touch Skill with RMT Approach

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Abstract. The aim of this research is to develop a Braille Geometry module based on visual impairment students synthetic touch skill with Rigorous Mathematical Thinking (RMT) approach that was valid dan practical using ADDIE development design. This module designed to optimize students synthetic touching skills and develop RMTs three cognitive functions i.e the cognitive function of qualitative thinking, quantitative thinking with precision, and abstract relational logic thinking. A module was validated by media experts and material experts. The practicality of the module is measured by the student's response questionnaire. Data were analyzed using descriptive quantitative. The results showed the validity of geometry Braille module from experts showed valid in 86, 2%. Some revisions are needed especially on the representation of quadrilateral model which need appropriating to students physiological structural abnormalities. Based on data collected from seven students who have completely filled 10 statements in the questionnaire, about 87, 5% of students stated they could understand the questions very well and they agreed that module enhanced their understanding of the quadrilateral concept. Thus those result indicated a high level of practicality. This research concludes this module has good validity and practicality, especially for visual impairment student geometries object understanding that has limited visualization.

Keywords: Braille, Geometry, Module, visual impairment, RMT.

ME-014-039-DGA-AA26

Teaching Materials Based Development of Statistics RME

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Abstract. This research aims to develop teaching materials based on realistic mathematics education (RME) are valid, practical, and effective responses to the topic of Statistics in the fourth grade of elementary school. The resulting product is LIT, Master Books, and books students. The method used is the type of research design Gravemeijer & Cobb (2013). The research was conducted in three phases, namely preparing for the experiment, experimenting in the classroom, and conducting retrospective analyzes. This data was collected using a curriculum analysis, observation, interviews, field notes, tests, and questionnaires. Data were analyzed qualitatively and quantitatively. Based on research that has been conducted, resulting LIT valid, practical, and effective investigation of mathematical problem solving ability of students. With an average gain of LIT 83.09%, for the acquisition of 82.5% of teachers book, and for 85.4% of the student book. This is evidenced by the test results praktikaliitas using a questionnaire with the acquisition of 87.5% of questionnaires for teachers and 83.8% of questionnaires to students.

Keywords: LIT, HLT, RME, Statistics.

ME-018-066-DSA-AA17

Developing Interactive Multimedia on Polyhedron Material for Class 8 Junior High School Students

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Abstract. This study aimed to produce interactive multimedia that was valid, practical, and effective. The procedure of this research was carried out by referring to ADDIE model which consisted of five phases, namely Analyze, Design, Development, Implementation, and Evaluation. Based on the data analysis, the results obtained were (1) the validity test of the media got score of 3.75, the validity of the material got score 3.63, and the validity of the students' questionnaire responses got score 3.7, so the developed instructional media met the valid criteria, (2) the practicality test of instructional media got score of 3.5 that was obtained from student response questionnaire, so that the developed instructional media met the practical criteria, (3) the effectiveness test was that 83% of students obtained 80 and above which showed that developed instructional media met the effective criteria. Based on these results, the developed instructional media were declared to be valid, practical, and effective.

Keywords: ADDIE, Polyhedron, Instructional Media, Interactive Multimedia, Swish Max 4.

ME-019-067-DSA-AA29

Developing Ethnomathematics-Based Mathematics Learning Module on Quadrilateral Material for Class VII Junior High School Students

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Abstract. This study aimed to develop and determine the advisability of modules based on ethnomathematics on Quadrilateral material for class VII junior high school students. The development model referred to the Plomp development model (2013) which consisted of 3 phases: preliminary research, prototyping phase, and assessment phase. The research results showed that the module was declared valid with a module validity score of 3.86, a validity score of RPP (lesson plan) of 3.87, a validity score of the student response questionnaire of 3.57, and a validity score of the test questions of 3.74. The module also met practical criteria based on the results of student questionnaire response resulting in an overall percentage score of 89.8%. The developed module also met the effective criteria namely 87.5% of students got scores above minimum studying mastery (KKM). Thus, the developed module is feasible because it meets valid, practical, and effective criteria.

Keywords: developing, module, ethnomathematics, quadrilateral.

ME-029-093-DGA-AA66

Developing Mathematics Module Based on Literacy and Higher Order Thinking Skills (HOTS) Questions to Train Critical Thinking Ability of High School Students in Mojokerto

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Abstract. This research aims to describe the process and results of the developing mathematical module based on literacy and higher order thinking skills (HOTS) to train the critical thinking ability of high school students in Mojokerto that are valid, practical and effective. This research is development research that uses an adopted Tessmer development model. The subject of this research were 11th grade students at SMAN 1 Puri Mojokerto. Three students with high, medium and low mathematical ability for the One to One stage. In the Small Group stage, nine students, with the provisions of three students with high mathematical ability, three students with middle mathematical ability, and three students with low mathematical ability. While the field test stage, the research subjects were 30 students with heterogeneous mathematical ability. The students' mathematical abilities were seen from the first semester of academic year report scores and in each stage. The development process starts from the preliminary stage, which is conducting literature studies about mathematics module based on literacy and HOTS questions, this process then followed by contacting the headmaster and teachers regarding the research schedule. The next stage is the self-evaluation, this stage consists of the analysis and design stages that analyze the students as the subject of this research and material used in the research. The materials used are Mathematical Induction, Linear Program, Matrix and Geometry Transformation, and designing a prototype. The third stage is prototyping, this stage consists of experts review, one to one, small group and field test. In the expert review, a prototype II was produced which were said to be valid. Whereas in the one to one, three students were tested and III prototypes were produced. The small group, a trial was conducted and a prototype IV was produced. Then the field test, testing and produced mathematical modules that met the valid, practical and effective. The results of this study are mathematics module based literacy and HOTS questions to train critical thinking ability that meet the validity criteria with valid categories, fulfill practical criteria with a very practical level. As well as meeting the module's effectiveness criteria by having students' critical thinking ability either high or high.

Keywords: higher order thinking skills (HOTS), literacy.

ME-049-171-DGA-AA135

Development of Non-Routine Mathematical Problems in Equation and Equation Materials of Absolute Value

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Abstract. In the initial research on students' mathematics books, it was found that the availability of non-routine questions was still very limited. To achieve the goal of learning mathematics, students need to be given a problem-solving experience. Therefore, in learning materials need to be inserted into non-routine questions and learning activities must involve problem solving. Based on that reason, in this study non-routine mathematical questions will be developed. This development research rests on the development model of Plomp which includes three phases, namely: (1) Prelimiary Research; (2) Prototyping Phase; and (3) Assessment Phase. Based on data analysis, obtained non-routine mathematical questions that are valid, reliable, and have a fairly good level of difficulty and power difference.

Keywords: non-routine mathematical questions, problem solving, absolute values.

ME-060-207-DGA-AA188

Developing Math Learning Kits Using RME Approach Oriented to Mathematical Connections Ability and Self-Confidence

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Abstract. The purpose of this research is to develop the product of mathematics learning device with RME approach that is oriented to mathematical connection skills and student confidence with valid, practical, and effective qualities. The materials developed consists of lesson plan, student's works sheet, and tes learning outcomes. This research is a research development with the reference ADDIE. The results of the study show that the learning devices developed valid are indicated by the results of the assessment of each learning device having an average score with the criteria of "very good". Practical assessment is indicated by the results of the teacher's assessment of the learning device with the criteria of "very good", while the assessment by students is 87.10% with the criteria of "good", and the average learning implementation is 83.88%. Effective assessment is indicated by the results of the student's of the mathematical connection ability test of 83.33% and the student confidence questionnaire has a presentation of 86.67% with high minimum category.

Keywords: ADDIE, learning kits, RME.

ME-066-229-DSA-AA184

Practicality and Effectiveness of Realistic Mathematical Learning Materials to Support Mathematical Literacy Skill of Junior High School Students

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Abstract. Mathematical literacy is ability to apply mathematics concepts in daily life. In previous studies, teaching materials have been developed into students' books form characterized by realistic mathematics that are able to support the mathematical literacy abilities of junior high school Student. This article will discuss about the implementation of mathematics learning using student book that had been developed. The characteristics of realistic mathematics learning are: (1) the use of context; (2) the use of model; (3) utilization of student contributions; (4) interactivity; (5) relation with other concepts. The analysis result showed that the mean of practicality of teaching materials is 91,3% in very practical criteria. The learning effectiveness which is obtained from class observation during learning process is in effective criteria. While student-book's effectiveness obtained from the result of quiz scoring, assignment and daily test showed that 84% students got scores above the minimum passing score. This showed that the student books are practice and effective.

Keywords: mathematical literacy, realistic mathematics, student book.

ME-068-235-DGA-AA91

Infusing *E-Book* to Solve Plane Problem in Geometry with TPACK Framework for Upgrading Mathematical Communication Ability for Junior High School Student

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Abstact.The e-book is designed to solve plane geometry problems using the TPACK framework to improve mathematical communication ability. This development study was conducted with 34 participants from junior high schools using a 4-D design with instruments consisting of student response questionnaires and student worksheets in the form of flip page e-books, mathematical communication skills questionnaires and TPACK integration questionnaires for teachers. The results of the implementation of the learning devices with seven meetings showed a positive response from participants with an average value of 82.35% of students' mathematical communication ability which were a good category. The analysis of the relationship between the components of TPACK framework shows that PK has a significant relationship with CK, PCK and TPK; TK with TPACK; CK with PK, PCK, and TPK; TCK with TPACK; PCK with PK, CK and TPK, and TPK with PK, TK, CK, PCK, and TPACK. The TPACK components have significant p-value <0.05.

Keyword: mathematical communication skill, TPACK framework, e-book, plane problem.

ME-073-260-DGA-AA269

Development of Rokumatika Educational Game (Sugoroku Mathematics) to Improve the Skills of Grade 8th Middle School Students in Solving Mathematical Problems on Circle.

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Abstract. Sugoroku is one of the board games from Japan, where players throw dice, then move their pieces according to the numbers on the dice. Based on the results of an interview with one of the eighth grade mathematics teachers at Tumpang High School 1, it is known that the material that is difficult for students to learn is circle material, students can memorize concepts in a circle, but students still experience difficulties if they are packaged in the form of more problems complex. This causes the student's skill on the circle material to be reduced. The purpose of this study is to develop an educational media game Sugoroku Mathematics game that can help students improve students' skills in solving on math problems in circle material.

Keywords: circle material, educational game, sugoroku.

ME-078-288-DGA-AA246

DiAh Formula as an Alternative for Solving the Measures of Dispersion Problem in Basic Statistical Subject in High School and University Level

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Abstract. Measures of dispersion is one of the material section of the basic statistics subject given in high school and college which includes the Average Deviation, Standard Deviation and Variance / Variety especially in group data. This study aims to describe the application of the diAh formula through the discovery learning approach to solve the measures of dispersion problem. All data were obtained from observations on research subjects who applied the diAh formula. The research subjects were mathematics teachers who had experience in applying the diAh formula. The results of the study indicating that the diAh formula is an alternative for solving the measures of dispersion problem easily.

Keywords: DiAh formula, discovery learning, measures of dispersion

ME-003-008-DGA-AA329

Development of Game "*Alop's Adventure*" on Algebraic Expression

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Abstract. This development research aims to produce the learning media on algebraic expression that are valid, practical, and effective to improve modeling algebraic skills. The media developed are named "Alop's Adventure" and developed using software RPG Maker VX Ace. Development model refers to development of Alessi-Trollip with three stage that are planning, design, and development. The prototype that was developed tested limited on 10 junior high school students who had not yet received algebraic expression. Based on development analysis was obtained that media has been developed get a category very valid, practical, and effective to improve modeling algebraic skills.

Keywords: algebraic expression, learning media, RPG Maker VX Ace.

CE-013-081-DGA-AA79

The Use of Augmented Reality Based Learning Media to Develop the Technology Literacy of Chemistry Teachers in the 21st Century

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Abstract. 21st century chemistry learning process requires teachers to implement creative learning methods that are supported by technology. However, the teacher's ability to use technology in chemistry learning is still low. The purpose of this study is to develop the teacher technology literacy using augmented reality based learning media. This research used mix-method with sequential strategies mixed methods. The first stage of this research was conducted by surveying the use of technology in chemistry learning. The instrument used was closed and open questionnaire. The second stage was done by collecting qualitative data through interview techniques. The data taken from this stage were to obtain the data of teachers' technology literacy after they received a training treatment using Augmented Reality based learning media. The research subjects consisted of 25 Chemistry teachers spread in Central Java. The results of the study show that teacher literacy in chemistry learning is still low. The training of augmented reality based learning increases the teachers' technology literacy. In addition, augmented reality based learning media also helps teachers to introduce abstract concepts to students. In addition, this learning media also helps teachers who have limited tools and materials in the laboratory to introduce the laboratory work virtually to the students.

Keywords: augmented reality, learning media.

CE-039-254-DGA-AA207

The Effect of Quality of Chemical Multimedia Reviewed from the Ability of Students in Chemistry

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Abstract. This research was conducted to determine the effect of students' ability in the field of chemistry on the quality of multimedia they developed. The sample consisted of 20 students who were taking multimedia development thesis in 2016 to 2017. The measurement of chemical knowledge was carried out by giving a chemical understanding test in accordance with their respective multimedia topics. The quality of the media produced uses expert validation data, which consists of material validation and media validation. The results showed that the ability of students in the field of chemistry consisted of 42.5% of students with quite high ability, 35.3% of students with moderate ability, and 19% entering in low-ability students. Students who are highly skilled in chemistry tend to be good at mastering chemical concepts, but are weak in designing media. Low-ability students tend to be weak in mastering chemical concepts but good at designing media. Whereas students with ordinary abilities are seen to be sufficient in mastering chemical concepts and designing media.

Keywords: ability of students, chemical multimedia.

CE-037-246-DGA-AA294

Song Innovation in Multimedia on Stoikiometry Chemical Learning

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Abstract. This research aims to produce song innovations in multimedia that are feasible and effective in stoichiometric learning. This research is a development research through ADDIE (*Analysis, Design, Development, Implementation,* and *Evaluation*) approach. The samples of this study were students of class X MIPA 1 SMAN 6 Samarinda and X MIPA 5 SMAN 1 Samarinda. The research data analysis technique uses a combination method (*Mixed Methods*). This innovation product has been tested for quality, with a very good level of feasibility in material aspects, language/communication, presentation, technical quality, effects on learning strategies and approaches. The effectiveness in learning are measured based on the comments and positive responses of students with the achievement of students' learning outcomes completely reaching a standard value of more than 75%. The response of class X MIPA 1 of SMAN 6 and X MIPA 5 of SMAN 1 Samarinda were 88.59% and 89.73%, respectively and both its response included in very good categories. The number of students has reached a standard value of class X MIPA 1 of SMAN 6 and X MIPA 5 of SMAN 1 Samarinda were 83% and 86%, respectively. The song innovation in multimedia was concluded very feasible and effective when applied in stoichiometric learning.

Keywords : innovation, multimedia, song, stoichiometry.

CE-046-328-DSA-AA297

The Development of Learning Media KONELA (Configuration Electron Aufbau) in learning chemistry

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Abstract. The development of learning media KONELA (Aufbau electron configuration) as a learning media has been carried out. This study aims to develop electron configuration learning media, measure their quality and effectiveness. The development process uses Research and Development (R & D) methods from Borg and Gall. Learning media Electron configurations are made with indicators of the sequence of charging electron configurations with lights. The quality is in a very good range and is applied positively in learning. The effectiveness of KONELA media compared with two-dimensional aufbau bridge media in measuring mastery of concepts with KONELA media results is better than two-dimensional aufbau bridge media in improving mastery of concepts.

Keywords: konela, learning media.

PE-009-070-DGA-AA19

Development of Android-based Assessment to Improve Understanding of Student Concepts on Vector Topics

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Abstract. Efforts to achieve learning goals are often constrained by understanding the students' initial concepts that are wrong. Understanding this wrong concept will influence other concepts. Moreover, the understanding of vector concepts is a basic concept in physics. This study aims to develop an android-based assessment to improve the understanding of student concepts on vector topics. The Android-based assessment contains conceptual questions with three levels of problem-correct questions accompanied by vector material in the form of videos. The difficulty level of the questions increases from level 1 to level 3. Each level consists of three questions with the same subtopic and packaged in .apk format. Research and development is carried out using the ADDIE model which consists of: Analysis, Design, Development, Implementation, Evaluation. Android-based assessments developed on vector topics are classified as valid with a score of 3.72 on a scale of 4 and the readability test is classified as read which is worth 81.6% so that this development is suitable to be used to improve understanding of student concepts on vector topics.

Keywords: understanding, android-based

PE-012-082-DSA-AA32

Development of KOKAKELO (Local Wisdom Physics Comics) as an Android-Based Media of Physics Learning

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Abstract. This study aims to develop local wisdom physics comics as an Android-based learning media. The development model used is 4D (Define, Design, Develop and Disseminate). This learning media was developed using *FireAlpaca64 software, Power Point 2013*, and *adobe flash*. The media is tested through four steps: Test experts, colleagues, initial trials and field trials. The results of this study are KOKAKELO-based Android learning physics media. KOKAKELO contains local wisdom physics comics with the topic of Archimedes' Law and questions. The results of the study indicate that the local wisdom physics comics get a good category and can be used by students.

Keywords: android-based media, kokakelo.

PE-014-089-DSA-AA34

Development of Interactive Multimedia Based on Resource Theory in Heat Concept

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Abstract. Giving feedback to students is an important component in the learning process, and plays a key role in realizing effective learning. However, with a large number of students in each class relatively, individual feedback is a challenge for teachers in Indonesia. Interactive multimedia is an alternative solution that can substitute the role of a teacher in giving feedback. This article reports the development of interactive multimedia based on resource theory. This interactive multimedia identify the students' cognitive resources then provides feedback to students based on students' cognitive resources. The interactive multimedia has been declared valid and appropriate to use by two experts. The test had been done with 31 senior high school students. The test result showed a positive response and indicated that this interactive multimedia was feasible to use.

Keywords: Feedback, heat, interactive multimedia, resource theory

PE-016-092-DSA-AA67

Creating Physics Comic Media a Local Wisdom Dol Musical Instrumen in Chapter of Sound Wave

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Abstract. This research aims to develop comics physics learning media based dol musical instruments. Dol musical instruments are local wisdom from Bengkulu, the local wisdom raised sound wave physics material. The researcher used R & D development with the development model of Borg & Gall. Research began with preliminary research, research design, developing initial products, limited trials, limited revised trials, initial field trials, revisions to the initial field trials. The comic physics media contains sound wave lesson, learning videos, exsamples and practice exercises and can be operated using a smartphone. Products are categorized as suitable for use in the process of learning physics based on assessment in good categories.

Keywords: comics, musical instrument.

PE-005-055-DSA-AA112

The Effectiveness of Computer-Assisted Recitation Programs to Enhance Student's Understanding of Newton's Laws

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Abstract. This paper presents the effectiveness of computer-assisted recitation programs to enhance student's understanding of Newton's Laws. Recitation program in the form of exercise conceptual questions accompanied by feedback directly given outside the class. The subjects of the study consisted of 102 X's grade of public high school in Malang. The research instrument used consisted of 11 reasoned multiple-choice questions concept mastery tests. The results showed that the program effectiveness improve the students understanding with N-gain 0.53 (medium category) and an effect size 4.3 (strong category).

Keywords: computer-assisted recitation, Newton's law.

PE-032-212-DGA-AA152

Developing Interactive Tutorial Method Animation using Adobe Flash Professional CS6 on Electrical Subject for Senior High School

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Abstract. Currently, digital technology is being much interest in every sector for instance educational sector. It is due to easily understanding on learning process for student. In order to enhance student interest on electrical subject, an interactive tutorial method animation (ITMA) has been developed by using Adobe Flash Professional CS6. This research was conducted in Lab UIN Islamic Senior High School of Yogyakarta. The student responses toward ITMA was investigated by using procedural model. It refers to elaboration research procedure by Borg and Gall. According to procedural model, the research was divided into 7 stages where literature study, planning, preliminary product development, preliminary field testing, main product revision, main field testing, and final product. In addition, the data were collected by using questionnaire instruments which are contains: validation sheets, response sheet, and assessment sheet. The qualitative expert assessment data of ITMA was used to reference preliminary product revision which is taken from 7 experts. Then, the qualitative student response data was determined by using Guttman statement scale. The result of assessment by experts showed a very good result which are 92.8%, 91.6%, and 95.2% of ideal percentage assessed by subject, media, and learning experts, respectively. Furthermore, the final product of ITMA showed well response from students of 96% approval percentage. Therefore, the developing ITMA was suggested to increase student interest on electrical subject.

Keywords: adobe flash, electrical subject.

PE-042-250-DSA-AA206

Faraday Flashlight Project Based Science Technology Engineering and Mathematic to Enhance Students' Problem Solving Skill

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Abstract. Students need some skills to prepare themselves to compete in twenty first century. One of the skill is problem solving which can be trained in learning. Project based learning (PjBL) based science, technology, engineering and mathematic (STEM) can support students' problem solving skill. Faraday flashlight project as representative of basic development of electromagnetic in modern technology. Students learn how the engineers and scientists develop technology by problem solving process in PjBL based STEM. The aim of this study to show the effect of PjBL based STEM to students' problem solving skill.This study used mix method, data collected by pretest, posttest, interview and observation. The object of this study were senior high school students were consist of fourty students. Data analyzed by paired t-test, N-gain, effect size and data reduction. The result of this study showed that PjBL based STEM has enough role to take effect to students' problem solving skill. This condition was caused by steps of PjBL based STEM could help student reach problem solving skill. Students' skill to decribe usefully, used physics approach, spesific application of physics, and logical progression had medium category. However, mathematical procedures had high category of N-gain. Based on effect size criteria, PjBl based STEM had hight effect to all problem solving skill indicators. This caused by students still used physics equation memorization to solve their problem. Furthermore, this study can help teacher to apply learning which consist of project and help students to face up as twenty first century generation by STEM.

Keywords: PjBL, STEM.

PE-044-271-DGA-AA226

Development of Integrated Kit of Hookes Law As Learning Media For Students's Conceptual Mastery and Problem Solving Skill

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Abstract: The students often deal with difficulties in learning elasticity concept, particularly in measuring length increments appropriately. To overcome the problem, an integrated kit of Hooke's law was developed. The best performance indicators of the integrated kit are valid, practical, and effective. The results of the research shows that the development the learning media are 3.8 valid, 100% practical, N-gain of 0.79 for problem solving effectiveness, N-gain of 0.77 for conceptual mastery, and 89.7% learning completion. It was concluded that the integrated kit of Hooke's law is valid as learning media, students do not experience difficulties in using the kit, and the kit is effective to increase students' conceptual mastery and problem solving skills.

Keywords: Hooks Law, learning media.

PE-044-271-DGA-AA228

Innovation of Integrated Ticker Timer Learning Media to Support Inquiry-Based Physical Learning In Kinematics

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Abstract. Physics learning in sub-kinematics competencies in high school is expected to use a scientific approach with inquiry learning models. In order for learning to develop kinematics competencies properly, Ticher Timer is needed which has a good performance, namely using an integrated Ticher Timer. A good integrated Ticher Timer performance indicator is valid, efficient, easy, safe and durable when used and looks beautiful. The results of the integrated Ticher Timer show that the integrated Ticher Timer performance shows that 98% is in line with expectations. It was concluded that the integrated Ticher Timer innovation developed can improve good performance in physics learning where: (1) Data obtained is accurate, fast and adequate; (2) Operation is easy, safe, durable and pleasant; (3) Helping and motivating teachers and students to use it.

Keywords: kinematics, ticker timer.

PE-045-274-DGA-AA231

The Role of Phet-Based Learning Material In Scientific Approach

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Abstract. The use of technology in learning process is very important, for instance, media simulation. In line with that, our present study focuses on the development of learning material that is integrated with a well-known media simulation, i.e. PhET. This online learning platform enables students to experience simple experiments just like in the real world. Hence, the scientific approach can be done even by means of virtual observations. The purpose of this study was to explore the feasibility of the PhET-integrated learning material for Grade XI senior high school students on the topic of Wave Characteristics using scientific approach. Based on the results of the analysis, it is known that the average value of product validation of teaching materials and lesson plans by each expert have average values of 3.55 and 3.56, respectively. Meanwhile, the results of limited trials indicate that the readability of teaching materials have attained good criteria. It implies that the developed product in this study are feasible and ready to be implemented in teaching learning process, particularly on the topic of Wave Characteristics.

Keywords: PhET-integrated learning material, scientific approach, wave characteristics

PE-047-279-DGA-AA238

Development Physics Learning Regarding Temperature with Designing Web-based Sensor Delivery System in Real Time using Python and Raspberry Pi

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Abstract – To date, wireless data transmission including sensor data reading is crucial in many fields. In this study, we aim to design a Web-based physics learning media. The Raspberry Pi is claimed as a microprocessor to send data with these characteristics. The Raspberry Pi is programmed to read temperature sensors from DHT11 that are connected to the web program. This research uses Python as its programming language. The results of this study are serial delivery systems temperature sensor data that can be read by web programs and are expected to help physics learning regarding temperature changes in real time.

Keywords: Raspberry Pi, Python, DHT11

PE-043-256-DGA-AA275

Investigation of Mathematical Method For Physics Lecture And Opportunities to Implement Computer Aided Design

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Abstract: The purpose of this study is to describe the lecture process of Mathematical Physics and the potential for the implementation of Computer Aided Design. The model is to develop the concept and ability of mathematical logical thinking of students of Physics Education Study Program. Mathematical physics is used to study physics related to how to systematically find out about nature. The research subjects consisted of 2 lecturers of Mathematics Physics lecturers, and students who had taken Mathematics Physics Courses, namely levels 3 and 4. The number of students filling out questionnaires was 97 students from 126. Observations were conducted in class. Observations are focused on the learning process of Mathematical Physics in the class. Data was collected using questionnaires to get student responses to the implementation of lectures in Mathematical Physics. The results of the study were as many as 85.92% of students gave positive statements about the implementation of lectures, while the rest gave negative statements. This shows that studying physics is not only mastery of a collection of knowledge in the form of facts, concepts, or principles, but also an inquiry process. Therefore, the effort taken is to improve the quality of tertiary education. Learning innovation is adjusted to the demands of educational change in the era of industrial revolution 4.0 (millennial). Entering the 21st century, competency support for the utilization of information, media and ICT is needed, while innovation competencies require the support of a learning process that can strengthen creativity through critical thinking skills.

Keywords: millennial, fisika matematika, computer aided design, teacher candidate

PE-046-275-DGA-AA284

Games-Edu Space on Development of Flipbook Teaching Materials Based Inquiry Lesson

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Abstract: Physics learning needs to be developed into learning activities that trigger students to be active, independent, and fun. This can be supported by the presence of physics teaching materials accompanied by educational games and appropriate learning models. Inquiry model lesson in accordance with the principles of physics learning "students find out". Games-edu space has many advantages in learning activities by combining play and learn activities to give an exciting impression of learning for students.This research focuses on developing and knowing the feasibility of inquiry lesson based flipbook teaching materials with games-edu space in Hooke's law and elasticity material. This type of research is a 4-D models in which the results of the data obtained from the questionnaire sheet validator and student response. The results of the study indicate that the product is categorized as very valid and suitable for use in physics learning. This research and development proves that the flipbook teaching material can vary the activities of students in learning physics.

Keywords: edu-space games, flipbook teaching materials, hooke's law and elasticity material, inquiry lesson models

PE-054-298-DSA-AA256

Development of Macromedia Flash Technology-Assisted Indonesian Traditional Game "*GATA-Fisika*" as Physics Learning Innovation

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Abstract. Until recently, physics has been considered as one of the most challenging subjects for students due to the various calculation and formula memorization. Plenty of studies stated that students' learning difficulties are driven by inappropriate methods used by the teachers in which many still use conventional approaches, implying low students' learning motivation. Many studies revealed that student's motivation could be overcome by using interactive media. But then again, other reports claimed that they were not well accommodated due to the poor of students' kinesthetic involvement. Therefore, we developed the media technology combined with a traditional Indonesian game as a solution to increase the students' physics understanding particularly on the topic of simple harmonic motion (SHM). We adapted a modified-ADDIE model to develop the physics learning media. In this present study, the report focuses on the development of the media. The traditional game chosen was *engklek* which was well designed and combined with several puzzles and quizzes utilizing a Macromedia Flash player. The appropriateness of the developed product "*GATA-Fisika*" was obtained from the product validation and the readability test. The product validation was done by experts, and the readability test was tested to 28 students in a senior high school in Malang, Indonesia. This present study revelaed that "*GATA-Fisika*" is feasible to use as effective learning model for physics teachers, particularly in the topic of simple harmonic motion.

Keywords: *indonesian traditional game, learning inovation, physics.*

PE-058-335-DSA-AA309

Application of Light Reflection Concept in Math-Hoodie Learning Media

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Abstract. Dimension 3 material in mathematics is one of the material that requires skills in describing 3-dimensional shapes and analyzing its parts, but based on research that has been conducted by the PKM-PSH Math-Hoodie Team Universitas Negeri Malang at Cendika Bangsa Vocational High School, Kepanjen, most students have difficulty in describing the building space to be analyzed. Therefore, Math-Hoodie is used to help students visualize the building of space to be studied and analyzed in the form of a simple hologram. Math-Hoodie (Mathematic Hologram Three Dimension) is a set of learning media that consists of a hardware to display holographic images and learning videos and is equipped with a manual book as a guide for implementing learning. Focusing on Math-Hoodie Hardware, this hardware is made of acrylic material that is assembled in such a way that it can display the shape of the space to be studied in the form of video into a simple hologram. Research on the working principle of Hardware Math-Hoodie is done by directly observing holographic images formed on 4 sides and variations in the angle from the Math-Hoodie layer to the gadget screen. Based on these observations, it was found that this simple hologram was formed as a result of the reflection of light on the Math-Hoodie Hardware. The reflection of light occurs in acrylic which has a refractive index greater than air which is 1.49 while the air refractive index is 1 so that the light coming from the gadget's screen through the air and reflected by acrylic and seen by observers as a hologram. The Math-Hoodie Hardware assembly pays attention to the ratio of the side lengths and heights of each layer in the form of a trapezoidal shape to obtain the optimal angle to show the desired holographic image that is right in the middle of the layer. Based on experiments that have been carried out, the optimal angle to the four layers that are assembled into a rectangular pyramid form is hooked up with a gadget screen to create a holographic image through this device is a 45 ° angle.

Keywords: learning media, light reflection.

PE-060-354-DSA-AA334

The Effectiveness of Multi Modal Representation Textbooks to Improve Students' Scientific Literacy of Senior High School on the Topic Sound and Light

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Abstract. The scientific literacy is one of important ability to be provided to students as a form of preparing citizens who are able to compete in the 21st century. The results of field studies showed of the problem lies in the textbooks used in learning is not oriented toward science literacy component. Therefore, this study aimed to know the effectiveness of the use textbook-oriented provisioning capability science literacy by using multi modal representation. The method used quasi-experimental research design. Effectiveness is determined by the normalized percentage gain value, stastistical tests and effect size. The results showed that the textbooks developed with multi modal representation is effective to improve students' scientific literacy. The hypothesis testing showed that there was a significant difference on the ability of science literacy between class that uses textbooks with multi modal representation and the class that uses the regular textbook used in schools.

Keywords: Textbook, Multi Modal Representation, Scientific Literacy

PE-061-355-DSA-AA338

The Effectiveness of Multiple Representation Electronic Books Based Android to Improve Critical Thinking Skills of Senior High School Students on the Topic of Optical Instruments

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Abstrack. Critical thinking skills is the one of skills required by students in facing the real word problems in 21st century era. The purpose of the research is analyzing the effectiveness of the use e-books-oriented critical thinking skills by using multiple representation. The research design was used pre-test/post-test control group design. Effectiveness is determined by the hypothesis test and effect size. The statistical testing showed that there was a significant difference on the aspects of critical thinking skills between class that uses Android-based e-books using multiple representation and the class that uses the standard e-books. Where as based on the size of the impact it has the value of the very large categorical effect size. The result showed that Android-based e-books developed with multiple representation is effective to improve students' critical thinking skills.

Keywords: Electronic book; Multiple Representation; Critical Thinking Skills

SE-007-048-DGA-AA20

The Development of Power Point Optimization Training Module as Learning Media: a Validation Study

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Abstract. Module is a complex teaching materials that allow students to learn independently. Qualified module is produced through the validation stages. Validation is a very important process in teaching material development in order that it can be used practically and effectively. This study aims to determine the validity of the training module of PowerPoint optimization as a learning media. The type of this research is Research and Development with 4D model (Define, Design, Develop, and Disseminate). Research data is the result of expert evaluations regarding product validation both in construction and content. Validation is a sequence of activities at the development stage. in conducting validation, it must also be ensured that the instrument used to assess the product is also valid to avoid bias when evaluating the product. Validation data were analyzed using Aiken's V. The results of the study showed that the module developed was included in the valid category therefore it could be used at the trial stage.

Keyword: PowerPoint optimization, validation study.

SE-012-137-DGA-AA93

Developing Android Based Mobile Learning Media to Facilitating ICT Literacy of Junior High School Student

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Abstract. This study is type of research and development study (R&D) which aim to determine the level of feasibility of android-based mobile learning media products and identifying students' equipness of ICT literacy in science learning. This study uses quantitative methods to study the level of product feasibility and descriptive methods to describe transparency of ICT literacy knowledge of junior high school student. The media is android web application with LMS moodle platform was used online operation in the class. The sampling use simple random sampling technique which one class from several classes with the highest level of android smartpone ownership in class VII SMPN 1 Banjarmasin. Data was collected through questionnaires and observation sheets. Based on the analysis, the level of feasibility from media and material experts obtained values of 4.73 and 4.48 with very good criteria and the students' equipness in ICT literacy is fulfilled for all ICT literacy aspects. There is access, manage, integrate, evaluate , create, and communicate aspect with the dominant equipness in the aspect of access.

Keywords: android, ict literacy, mobile learning.

SE-013-138-DSA-AA96

Analysis of Science Teaching Materials Based on Critical Thinking Skill Indicators on the Topic Classification of Materials and Its Properties

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Abstract. Critical thinking skills are one of the important skills in the 21st century. These types of skills are important aspects of learning and needs in the future. Critical thinking skills are needed in the learning process to improve students in higher order thinking skills. The use of teaching materials can be a way to improve students to think critically. This study aimed to determine the analysis of science teaching materials for junior high school students with indicators of critical thinking skills on the topic classification of materials and its properties. The results of the analysis showed that teaching materials that contain indicators of critical thinking were interpretation which was 77.08%, analysis which was 42.65%, inference which was 56.25%, evaluation which was 32.14%, explanations which was 64.47%, and self regulation which was 28.57%.

Keywords: Critical thinking skills, science teaching material

SE-034-276-DGA-AA233

Developing Science Teaching Book with a Scientific Approach to Analyze The Concept of Energy in The 7th Grade Junior High School

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Abstract. The observation's result in the Junior High School (SMP/MTs) in Malang City is known that students have difficulty in understanding energy in the life system's material. This happened because learning is still centered on the teacher, and the students only accept concepts explained by the teacher. Therefore, a science teaching book is needed to support student understanding of the energy in the life system's material and the student-centered learning achieved. This study aims to produce a science teaching book with a scientific approach to analyze the concept of energy for seventh- grade junior high school that is valid and suitable for use in learning. The feasibility test is done through media validation, material validation, and limited readability tests. Media and material validation were carried out by one science education lecturer, limited readability testing was carried out by three junior high school teachers and 10 seventh grade junior high school students who had taken energy material in the life system. The results of the study showed that the science teaching book with a scientific approach was developed are valid and appropriate to use in the future.

Keywords: concept of energy, developing science.

SE-035-281-DGA-AA305

Development of Digital Learning Media Based on Android Games with Joyful Inquiry Model to Increase Science Literacy Skills for Second Year Students of Junior High School in Subject Matter of Vibration

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Abstract. The aim of this research was to develop digital learning media in the form of android games to improve students' scientific literacy skills. Digital learning media are developed based on the joyful inquiry learning model for the subject matter of vibration. The validation of digital learning media was carried out by media experts, subject matter experts, science teachers, and second year students of Junior High School 1 Duduksampeyan in Gresik Regency, Indonesia. The results of expert validation showed that digital learning media is very valid with a validity rate of 84% and readability rate of 87%. The effectiveness of digital learning media in increasing students' scientific literacy was measured by quasi experiments using two classes of second year students of Junior High School 1 Duduksampeyan in Gresik Regency, Indonesia. The experimental class used digital learning media with the joyful inquiry learning model and the control class used the inquiry learning model. The results of the independent sample t-test showed a significance value of 0.0012 (greater than $\alpha = 0.05$) which meant that there were significant differences between the scientific literacy abilities of the experimental class and the control class. The N-gain value of the experimental class is 0.72 and this value is greater than the N-gain value of the control class that is 0.47. These results indicate an increase in the scientific literacy ability of students in the experimental class is higher than that of the control class students so that the digital learning media developed are effective in increasing students' literacy abilities.

Keywords: Android Games, Joyful Inquiry, Learning Media, Science Literacy, Vibration

SE-049-360-DSA-AA344

Development of Entrepreneurship E-Module for Elementary School Students Based on Local Wisdom in Madura Island

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Abstract. The aim of this research is to develop a valid, practical and effective entrepreneurship e-module for Elementary School students in Madura. The validity level of the entrepreneurship e-module is known through the results of validation analysis by the validator. The level of practicality is known through observations of the use of entrepreneurship e-module, and the level of effectiveness known from two aspects, namely (1) the average score of students' learning outcomes and (2) positive responses of the students. The development research model used to modify the 4D model by Thiagarajan and Sammel that consists of four stages, namely the stages of defining, designing, developing, and disseminating.

Keywords: entrepreneurship e-module, Elementary School, Madura

BE-003-023-DSA-AA59

Developement of *Problem-based Learning* Module Based on The *Allium sativum's* Potency in Hyperlipidemic Mice Research to Improve Student's Critical Thinking Skills and Cognitive Learning Outcomes

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Abstract. Development of problem-based learning module based on the *Allium sativums's* potency in hyperlipidemic mice research result to improve Biology undergraduate student's critical thinking skills and cognitive learning outcomes is a module that developed using the problem-based learning syntax and phenomena from the *Allium sativums's* potency to decrease lipid level in hyperlipidemic mice research result. The initial skills analysis of Biology undergraduate students in Universitas Negeri Malang that occurred in April 2018 showed that their critical thinking skills and cognitive learning outcome need to be improved, because it is still in a low grade. This study aims to produce a module bases on problem- based learning syntax using phenomenon that happen in the student's life basis so it can contextualize the topic/ course and can train and improve critical thinking skills and cognitive learning outcomes. This study used ADDIE model to developed the module. Validity, practicality dan readability of the module tested by the expert of animal and human physiology, experts of module along with animal and human physiology lecturer that have minimum magister tittle. The undergraduate student's critical thinking skills and cognitive learning outcomes were test through a quasi experiment using two classes in Biology Departement Universitas Negeri Malang that divided into control and experiment class. Student's critical thinking skills tested with problem-based learning worksheet inside the module for experiment class, while control class using ordinary worksheet prepare by lecturer. Cognitive learning outcome tested by student's gain score of the pretest and posttest. Analyze's result showed that the problem-based learning module based on the *Allium sativums's* potency in hyperlipidemic mice research result can improve undergraduate student's critical thinking skills and cognitive learning outcomes. It is proven by analysis data that shows the average value of critical thinking skills in experiment class is higher than control class (16.2 > 13.1), so is the cognitive learning outcomes. The average value of gain score in experiment class is higher than control class (0.75; high-g > 0.57; medium-g). ANACOVA results (P= 0.000) also prove that this difference is really caused by the treatment. This result can conclude that problem-based learning module based on the *Allium sativums's* potency in hyperlipidemic mice research result can use to improve undergraduate student's critical thinking skills and cognitive learning outcomes in Universitas Negeri Malang.

Keywords: *Allium sativum*, cognitive learning, hyperlipidemic mice.

BE-004-033-DGA-AA16

Module Development for High School Remedial Learning In Biology Subject

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Abstract. Permendikbud (2013) in 2013 Curriculum learning, students who have not yet reached KKM must be completed through remedial learning before continuing on the next competency. Based on research conducted by Adawiyah (2017) at SMAN 8 and Brawijaya Smart School in Malang City, Siti Sariyah (2017) at SMAN 1 and SMAN 2 in Batu City, Lailil Hidayah (2017) at MAN 1 AND MAN 3 in Malang City knowed that teachers difficulty in implementing remedial learning because of time constraints so that remedial learning is not preceded by discussion of material but is immediately retested or given assignments. To overcome the limitations of time the development of modules for learning biology remedies is carried out. Module development research was carried out in 2018 by Ihda Wardah Faradina at SMAN 1 Pandaan-Pasuruan in material structure of animal tissue, Anisa Kurniasih at SMAN 2 Malang City in material digestive system and Aulia Ayu Suryanitha at SMAN 2 Lamongan in material structure of plant tissue. Modules are developed using the ADDIE development model which consists of the stages of analysis, design, development, implementation and evaluation. The results of the study in the form of 3 modules for remedial learning in addition to printed forms can also be shared e) in students smartphones.

Keywords: modul, remedial learning.

BE-005-035-DGA-AA104

Validation of Textbooks on Animal Embryology and Reproductions Based on Research on the Development of Mice Embryos by Adding DEET (Diethyltoluamide)

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Abstract. The purpose of this study was to determine the validation of Animal Embryology and Reproduction textbooks based on the results of research on the development of mouse embryos by adding DEET (Diethyltoluamide). This research is a development study of Animal Embryology and Reproduction textbooks based on the research on the development of mouse embryos by adding DEET. The development of this textbook refers to the 4D model developed by Thiagarajan, et al. (1974) which consists of 4 stages, namely Define, Design, Development, and Disseminate, modified to be adapted to this study. This textbook is validated by material, media and language experts. The instrument used is an expert validation instrument. It can be concluded that the Animal Embryology and Reproduction textbook based on the results of research on the development of mouse embryos with the addition of DEET was declared feasible and valid to be used as a textbook for Animal Embryology and Development by material, media and language experts.

Keywords: DEET, reproduction, mice embryos.

BE-009-063-DSA-AA187

Development of Guided Inquiry Module Based on Research Result to Improve Science Process Skills and Cognitive Learning Outcomes

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Abstract. Learning outcomes emphasize the development of science process skills and student cognitive learning outcomes. The learning method that should be applied is small group discussions, class demonstrations, independent assignments, and lab work. But the results of observations through questionnaires analyzing the needs of lecturers and students showed dominant learning were done through presentations and discussions. Learning presentation methods and discussions have not been able to improve science process skills and student cognitive learning outcomes. Development research aims to produce, test the validity, practicality, and effectiveness of guided inquiry-based modules on reproductive system topic based on the results of research to improve science process skills and student cognitive learning outcomes. The study used the ADDIE development model which consisted of analyze, design, develop , implement, and evaluate. The results of the research contained in the module are the potential of single garlic extract (*Allium sativum*) on the quality of male mice sperm model of hyperlipidemia. The effectiveness test design is a pretest- posttest control group design. Modules for increasing science process skills are proven by differences significantly between students using modules and not using modules (p-value 42,509 <α 0.05). Increasing cognitive learning outcomes is proven by there are significant differences between those who still use modules and not using modules (p-value 0.008<α 0.05). The resulting module is effectively used in the learning process.

Keywords: cognitive leaning, science process.

BE-011-065-DGA-AA23

The Development of Interactive Multimedia on Nervous System, Endocrine System, and Sense Organs Materials to Improve Students' Critical Thinking Skills of Class XI SMAN 1 Lawang

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Abstract. Based on previous studies, it was known that interactive multimedia can help the learning process and may affect the critical thinking skills. This research and development aims to develop appropriate, practical and effective interactive multimedia in nervous system, endocrine system, and sense organs materials. The research and development model used is Lee and Owens's Model (2004). Based on the results of the validation from material experts, media experts, and practitioners, the percentages were 100%, 98% and 100% showed that multimedia interactive developed is very valid. Interactive learning multimedia that has been developed cannot stand alone but must be used in synergy with the UKBM which is structured with guided inquiry syntax and contains questions adjusted to the indicators of critical thinking skills. Practicality tests obtained the percentage of 94.5% showed that multimedia interactive developed is very practical to use in the learning process. The improvement in critical thinking skills was measured by using the gain score and obtained a value of 0.812 which showed that interactive multimedia was developed effectively to improve students' critical thinking skills.

Keywords : critical thinking, endocrine system, interactive multimedia learning, nervous system, and sense organs.

BE-012-076-DSA-AA51

Effectiveness Analysis of Development of Genetic Books with Mind Mepping Model Using Argument Map Methods to See Self-Efication and High-Level Students

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Abstract. Textbooks are one of the tools for the teaching and learning process. Therefore, teaching books must be arranged systematically, interestingly, aspects of high readability, easy to digest, and comply with applicable rules of writing. The purpose of the analysis of this article is to look at high-level thinking skills and student self-efficacy using the min mepping model with the argument map method. Based on the results of the literature study the use of the map argument method can improve critical thinking skills of the arguments that have been prepared by students, and also high-level thinking skills can lead to student self-efficacy. Based on the description above, it can be concluded that the development of mind mepping model textbooks using the argument map method is very effective to improve high-level thinking skills and student self-efficacy.

Keyword: argument maps, high level, mind mapping, thinking textbooks.

BE-016-100-DGA-AA105

Needs Analysis of Development Genetics Flash Flip Book Multimedia Based on Improve Learning Models In University

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Abstract. The purpose of this study was to: (1) analyze the availability of learning media used in genetic subjects at the Biology Education Study Program at IKIP Budi Utomo Malang; (2) knowing the needs of lecturers for genetic learning media; and (3) knowing the needs of students for genetic learning media. This type of research is a qualitative descriptive study with the subject of research is the biology education student IKIP Budi Utomo Malang class of 2016 as many as 40 students. The research instrument consisted of a questionnaire for lecturers and students. The results of the study and discussion show that (1) the unavailability of learning media as a reference for students in genetic subjects because the learning process in the class still uses lectures and discussions (2) lecturers need a learning media to improve student understanding (3) students need genetic's flash flipbook learning media based on Improve learning models with the latest findings and in accordance with the character of students, most students support the development of learning media so that students can learn independently with learning media.

Keywords: learning models, multimedia.

BE-030-145-DGA-AA138

The Development of Teaching Materials Oriented Problem-Based Learning Integrating Tifa Local Wisdom to Train Student Critical Thinking Skill

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Abstract. Tifa is a typical musical instrument of Papua. There is no biology teaching material based on Tifa local wisdom. The purpose of this study was to develop teaching materials oriented problem-based learning integrating Tifa local wisdom to train student critical thinking skill. This type of research was development research used the 4-D model (Define, Design, Develop and Disseminate). The subject of this research was 24 students in class X SMA Yapis Manokwari. Data were analyzed descriptively. The results of the study show that (1) The teaching material was valid criteria (X = 4.42), (2) The criteria of practicality was practical (X=3.78), (3) Implementation of teaching material was effective to train students' critical thinking skill (70.83 % of students achieved critical category). The conclusion that can be drawn from this research is the integration of Tifa local wisdom in teaching materials oriented problem-based learning is feasible and effective. Teaching materials that have been developed effectively train critical thinking skills of high school students.

Keywords: teaching materials, thinking skill.

BE-042-213-DSA-AA180

Effectiveness of Research-based Cell Division Control Module on Students' Critical Thinking Skills

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Abstract. The aim of this study is to evaluate the implementation effectiveness of research-based cell division control modules on critical thinking skills. This research method is quasi-experimental with a nonequivalent control group design. The population in this study were biology students of class 2018, Faculty of Science and Technology at UIN Maulana Malik Ibrahim Malang with a sample of 56 students. Class 2018-C used as the experimental class with 28 students using a research-based cell division control modules, while class 2018-B as a control class with 28 students without using research-based cell division control modules. The instruments used are essay questions that have been validated, critical thinking skills rubrics and syntactic implementation sheets. The collected data of both groups were analyzed and interpreted using unpaired t test. The results showed that there were significant differences in critical thinking skills of students in the experimental class and the control class with a significance value of p (= 0,000) <α (0.05). Therefore, it can be concluded that significantly the research-based cell division control module to improve students' critical thinking skills.

Keywords: research-based cell division control module, critical thinking skills.

BE-044-228-DSA-AA186

Development of Problem Solving Module Based on Result of Black Soybean Tempe Extract in Hematology Aspect on Type 2 Diabetes Mellitus Rat to Improve Problem Solving Skills

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Abstract. This study aims to produce a module based on problem solving syntax using common phenomena that happen in student's life to improve their problem solving skills. This study used ADDIE model to developed the module. Validity, practicality and readability of the module were tested by animal and human physiology expert that have minimum magister tittle. The undergraduate student's problem solving skills were tested using a written test through a quasi-experiment model. This model used two classes of Biology undergraduate students in Biology Departement Universitas Negeri Malang that divided into control and experiment group. Student's problem solving skills were tested with problem-solving worksheets that were inside the module for the experiment group, while control group using a worksheet prepare by lecturer. The average results of student problem solving skills before and after giving the module turned out to be increasing in each category and the results of statistical analysis stated that the learning model using the module had an effect on the results of student posttest. It is proven by analysis data that shows the average value of problem solving skills in experiment class is higher than control class (3.2>2.9 in Defining problem, 2.7>2.5 in Developing lan, 3.4>3.3, in analyzing and in interpreting and problem solving 3.5>3.2). As for the statistic results using WILCOXON test, it showed the significance (P= 0.000). So it can be concluded that the module developed by hematological research is valid, practical, and effective to improve undergraduate student's problem solving skills in Universitas Negeri Malang.

Keywords: hematology, diabetes mellitus.

BE-045-231-DSA-AA182

The Development Problem Solving Module Based on Research at the Level of Advanced Glycation End Products (AGEs) of Hyperlipidemic Mice Model to Improve Student Critical Thinking Skills and Cognitive Learning Outcomes

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Abstract. Learning outcomes for the strata 1 program must be adjusted to the level of qualification and are at level 6 which are applied to train critical thinking skills and learning outcomes facilitated by problem solving models. Problem solving modules based on research results is one of the teaching materials that can help students learn more deeply and train and improve higher-order thinking skills and student learning outcomes. Critical thinking skills is high order thinking skills, if you have the ability to think critically, the learning outcomes obtained is also high. The purpose of this study was to produce problem solving based modules based on the results of research on advanced glycation end products (AGE) mice model of hyperlipidemi to improve of critical thinking skills and student learning outcomes. The development model used in the study by adopting the model of ADDIE and tested its validity. The problem solving module based effectiveness test to improve critical thinking skills and student learning outcomes is done through Quasi experiments on 35 students who are taking human physiology anatomy courses at University of Muhammadiyah Malang. Data on implementation results were analyzed using anacova and *Quade's rank analysis of covariance*. Student's critical thinking skills tested with problem solving worksheet inside the module for experiment class, while control class using ordinary worksheet prepare by lecturer. Cognitive learning outcome tested by student's gain score of the pretest and posttest. The results of data analysis showed that the average critical thinking skills in experiment class was higher than control class in each aspect of critical thinking skills. The average value of gain score in experiment class is higher than control class (0.73; high-g > 0.49; medium-g). ANACOVA results (P= 0.000) also prove that this difference is really caused by the treatment. This result can conclude that problem solving module based on research at the level AGEs of hyperlipidemic mice models can use to improve undergraduate student's critical thinking skills and cognitive learning outcomes in University of Muhammadiyah Malang.

Keywords: AGEs, critical thinking skills, hyperlipidemic mice model, problem solving module, student learning outcomes.

BE-047-242-DSA-AA200

Practice Guidelines As An Efforts to Foster Students' Psychomotoric Aspects And Critical Thinking for SMK

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Abstract. The aim of education is held are for improving the quality of human resources through learning activities. The success of learning is reflected when all or most of the material is able to receive to students. Learning in Indonesia is currently carried out according to the 2013 Curriculum which is also guided by improving the skills of the 21st Century. Based on the facts in the field, it shows that there are still schools that have not been maximal in implementing learning that is in accordance with these demands. The results of observations and questionnaires at Maharani Pharmacy Vocational School show that there are still many problems that occur in implementing the 2013 Curriculum so that classroom learning is very weak. The existence of learning like this will produce students who are not qualified in their expertise, especially at the level of vocational school. One way to overcome this is by making relevant teaching materials such as practicum guides that will help students improve their skills. The purpose of this study was to develop and test the validity, effectiveness, and practicality of the dry simplicia material practicum guide developed and measure the improvement of psychomotor aspects and critical thinking skills of students in Vocational High Schools. This research method uses the ADDIE development model and continues with measurements of psychomotor aspects and critical thinking using indicators that have been developed. The results showed that the practicum guide developed had a high validity value of 100% in the material validator, 100% in the media validator and 96.2% of the field practitioners' validaot. On the measurement of psychomotor aspects and critical thinking skills, the results of a moderate increase are n-gain 0.6.

Keywords: critical thinking, practice guidelines, psychomotoric aspect, SMK's student.

BE-049-253-DGA-AA209

Android-based Mobile Learning Media on Material of Plant Cell Structure & Function: Meaningful Learning Strategy

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Abstract. Learning cell generally applied with the teacher centered, students in secondary schools have learning difficulties (Fernandez, et al., 2018). This condition has an impact to the level of students. The results of the observation showed that biology students in the first year tended not to apply meaningful learning, because students had the perspective that learning biology about cells include memorizing materials. Plant cells have abstract material concepts so that it needs to be pursued in a meaningful learning process through media development. This study aims to develop android-based mobile learning media in the structure and function of plant cells and to know the results of validity tests, effectiveness tests, and practical tests of the media developed. Research method development research using the ADDIE development model. The object of this research is 65 prospective students of biology educators. The time of study in February to July 2019. Data analysis from results is quantitative and qualitative. The results show that the percentage of Android-based Mobile Learning media validation scores produces an average of 90%. The average score of the learning material validation score is 100%. The effectiveness of the media includes the medium category with the N-gain score of 0.7. Media practicality test results were 96.5%.

Keywords: android base, mobile learning media, plant cell.

BE-050-255-DSA-AA208

Developing Environmental Change Module Based on *Problem-Based Learning* and Its Effect on Students' Environmental Care in X Grade SMA Brawijaya Smart School

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Abstract. The low quality of the environment is the impact of human ignorance about the surrounding environment. Most people realize the danger posed by various activities carried out, but they do not have the awareness to abandon these bad habits. One effort to increase awareness of the environment is through education. Through education, ethics and values can be instilled to care for the environment. This study aims to produce a valid and practical module on environmental change and to see the differences in the attitude of caring for students who are taught by modules and not taught by modules. The module development design uses the ADDIE development model and the research design used is a quasi-experimental design. Quantitative data were collected through pretest and posttest then analyzed with Anacova. While qualitative data is obtained through interviews, comments, and suggestions by the validator. The results of the study indicate the development of valid and practical environmental change modules. While the influence of modules in learning based on trials with p-value 0.04 is smaller than α (0.05) and the average value of each is 74.12 and 70.42. The conclusion is, there are differences in the environment care attitude of students who are taught with environmental change modules based on Problem-Based Learning

Keywords: development of environmental change modules, environmental care.

BE-051-258-DGA-AA210

The Development of Problem Solving Module According to Results of The Effect of Black Soybean Tempe Extract to Type 2 Diabetes Mellitus Rat Interleukin 6 Level Research to Enhance Student's Critical Thinking Skills

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Abstract. Learning in higher education refers to the Indonesian national qualification framework curriculum (KKNI) at level 6 for undergraduate programs which is able to apply their fields of expertise and utilize science, technology, and / or art in their fields in solving problems and being able to adapt to situations (Dirjendikti , 2014). Achievement of graduation in accordance with KKNI, students are required to adjust the course based on semester credit units (credits) which are determined according to the study program and expertise of interest (Depdikbud, 2012). The purpose of this study was to produce a Problem Solving based module based on the results of research on the effect of black soybean tempe extract on interleukin 6 levels in type 2 diabetes mellitus rats to improve students' critical thinking skills that are valid, practical and efficient. The research procedure uses the ADDIE development model with 5 stages, namely analyze, design, develop, implementation; and evaluate. The trial design used a nonrandomized control group pretest-posttest design. Product validity was measured based on validity tests by media experts, material experts and field practitioners. The practicality of the product is measured based on student responses using the questionnaire response sheet after product use. Product effectiveness is measured based on evaluation tests before and after the application of modules based on Problem Solving. The module developed is said to be valid, practical, and effective. Valid based on media expert review (92.74%) and material experts (91.43%) field practitioners (93.92%.). Practical based on student response (80.90%). Effective in improving critical thinking skills based on the calculated F value Quade's rank analysis of covariance obtained at 209,082 with p-value = 0,000 <α (α = 0,05).

Keywords: critical thinking, modules, problem solving, type 2 diabetes mellitus.

BE-020-112-DSA-AA65

The Development of Problem Solving Module Based on The Research Results of Potential Purple Sweet Potatoes in T2DM Mice Models to Improve Student Cognitive Learning Outcomes

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Abstract. The purpose of this study is to the develop of problem solving module based on the research results of potential purple sweet potatoes in T2DM mice models to improve student cognitive learning outcomes of Budi Utomo S1 IKIP Malang students. The type of research used is research and development. The research model used is the ADDIE research and development model. Cognitive learning results based on the non-parametric analysis test, namely Quade's rank analysis of covariance, showed that there were significant differences in cognitive learning outcomes between experimental class students using the problem solving immune system module with an average corrected 83.30 with control class students who did not use the immune system module. problem-based on a mean of 46.65. The conclusion of this study is that the modules produced have met the validity requirements, practicality and effectiveness to improve students' cognitive learning outcomes.

Keywords: problem solving module, purple sweet potatoes, T2DM mice model.

BE-027-132-DGA-AA81

The Development of Android-Based Interactive Multimedia in Respiratory System Materials to Improve Science Literacy Ability of Class XI Students in SMAN 02 Batu

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Abstract. The aim of research and development is to develop Android-based interactive multimedia in respiratory system material to improve scientific literacy skills of students of XI class in SMAN 02 Batu which have proven their feasibility, practicality, and effectiveness. The development model used is the Lee & Owens model, which consists of five stages, namely needs analysis, design, development, implementation, and evaluation. The feasibility test results by material experts showed a percentage of 100% (very feasible), by media experts showed a percentage of 99.44% (very feasible), by evaluation experts showed a percentage of 92.19% (very feasible), and by field-practitioners showed a percentage of 96.96% (very feasible). The feasibility test results are revised according to comments and suggestions. The small-scale practicality test results conducted on 15 students of class XII showed a percentage of 84.03% (very practical), but still be revised according to comments and suggestions. The results of the effectiveness test on the class taught using multimedia (32 students) viewed from the gain score of 0.73 were greater and significantly different compared to the class without multimedia (33 students) who obtained a gain score of 0.47. Practical test results by students (large scale, 32 students) showed a score of 86.67% (very practical). Therefore, multimedia developed is feasible, practical, and effective, so it can be used in learning to improve students' scientific literacy skills.

Keywords: android-based interactive multimedia, respiratory system, scientific literacy skills.

BE-013-079-DGA-AA220

Development of Learning Devices Based on Guided Inquiry of Plant Diversity Material to Improve Science Process Skills and Learning Outcomes in Grade X Students at SMAN 1 Gondanglegi

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Abstract. The 2013 curriculum emphasizes inquiry-based learning can strengthen the scientific approach. The scientific approach can also be realized through improving students' science process skills. The aim of the study was to produce a valid, practical, and effective guided inquiry-based learning device on the material of Plant Diversity to improve science process skills and student learning outcomes. Research and development uses a 4D model consisting of 4 stages, namely define, design, develope, and disseminate. Learning tools developed in the form of syllabus, lesson plans, student worksheets, and assessment instruments. The trial subjects in this study were 28 students of class X MIA 1 and 24 students of class X MIA 2 of SMAN 1 Gondanglegi. Aspects measured in research and development are validity of validators, practicality of instrument users, and effectiveness of student learning outcomes. The average validity of the learning device experts, material experts, and field practitioners is 94% with very valid criteria, the practicality of 93% with criteria is very practical and usable, and the effectiveness is 89.2 with very effective criteria. Based on these results show that learning devices has been valid, practical, and effectively used in learning activities. This study has produced a product of guided inquiry-based plant diversity material learning that can be used to improve science process skills and student learning outcomes

Keywords: guided inquiry, learning outcomes, plant diversity, scientific process skills

BE-013-079-DGA-AA221

Development of Biology Learning Devices with Guided Inquiry Model on Plant Diversity Material to Measure Science Process Skills and Critical Thinking in Grade X Students at SMAN 9 Malang

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Abstract. Learning activities in the 2013 Curriculum are expected to use a scientific approach that is contextually based in daily activities. The aim of this research to overcomes problem by developing learning devices with guided inquiry models on plant diversity material to measure science process skills and students' critical thinkingThis research and development using the ADDIE model according to Branch (2009). The research data consist of quantitative and qualitative data. the results of the validation of the learning device shows that the criteria are very valid, with details of the percentage value of yhe syllabus validity of 94.7%, lesson plan 93.2%, assessment instrumen 93.3%, handouts 95.4%, and UKBM 95.1%. The practicality test result show that the learning device is very practical, with details of the percentage value of 92,8%. The effectiveness of learning can ce seen from the learning outcomes of attitude and psychomotor aspects showing that it is very effective with a percentage value of 91.1%, 87.3%, and aspects of knowledge show quite effective with a percentage value of 80.9%. Based on these results show that the learning device developed has been valid, practical, and effectively used in learning activities. Learning devices developed were able to measure science process skills and critical thinking skills for students.

Keywords. critical thinking skills, guided inquiry, learning devices, plant diversity, science process skills

BE-055-270-DSA-AA223

Developing Biology Learning Devices On "Fungi" Material Using Discovery Learning Model To Promote Students' Critical Thinking Skills And Cognitive Learning Outcomes Of Grade X SMAN 6 Malang

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Abstract. 2013 curriculum uses a scientific approach in the learning process. Learning devices used in the learning process affect student learning outcomes, so it is necessary to develop learning devices that support the learning process in accordance with the demands of the 2013 curriculum. Discovery learning is learning models using scientific approaches are in the learning process. This study aims to produce discovery learning based learning on mushroom material to improve critical thinking skills and cognitive learning outcomes of grade X SMAN 6 Malang. Data collection is carried out in the even semester of academic year 2019. The method used in the development of learning devices uses a 4D development model developed by Thiagarajan. The results of the development are indicated by the results of validity tests by learning validator experts, material validator experts and field practitioners of 99.07%. The practicality test results of learning devices obtained a percentage of 88.07%. The results of the effectiveness test were calculated using the Hake formula to determine the g value of the average value of the pretest and posttest. The g value obtained is 0.72. Based on these results, it can be concluded that the learning device based on discovery learning in mushroom material can improve critical thinking skills and cognitive learning outcomes of class X of SMAN 6 Malang.

Keywords*:* cognitive learning outcomes, crithical thinking skills, discovery learning, learning device

BE-057-284-DSA-AA244

Developing Webtoon Based on Reciprocal Teaching on the Immune System and Its Effect of Scientific Literacy Students

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Abstract. Scientific literacy skills needed for students as a step thinking in order to solve increasingly complex problems. Empowerment scientific literacy skills can be done by applying the appropriate learning media in the classroom. One of them is to apply Webtoon based on Reciprocal Teaching. This research aims to develop Webtoon based on Reciprocal Teaching on the immune system and its effect on students' scientific literacy. The research model used in this research and development by Lee and Owens. The quantitative data in the form of pretest and posttest results then were analyzed by multivariate analysis of covariates (mankova) and based on the level of scientific literacy of students. The qualitative data obtained through interviews, observations and results to the media developed validator. The results showed Webtoon immune system has been qualified validity and practicality based on the assessment by the validator subject experts by 96.19%, the validator media expert at 98.97%, 97.78% by field practitioners and students' questionnaire responses amounted to 94.67%. Research Webtoon based on Reciprocal Teaching results scientific literacy was higher in the experimental class compared with the control class. In a class that used Webtoon based on Reciprocal Teaching indicates the level of scientific literacy of students reached 100% at the level of multidimensional, whereas in Webtoon class with the level of scientific literacy inquiry model multidimensional level of 69.44%. Based on the test results of scientific literacy mankova obtain the value of $p < 0.05$ so that the alternative hypothesis (H_1) is accepted, which means that Webtoon based on Reciprocal Teaching effect on students' scientific literacy. Suggestions are expected Webtoon based on Reciprocal Teaching can be applied in other schools in order to improve the scientific literacy of students in other schools.

Keywords: immune system, inquiry, reciprocal teaching, scientific literacy, Webtoon.

BE-063-302-DSA-AA279

Developing of Problem-Based Learning Ecology Teaching Materials on Flora Community in Savana Bekol Baluran National Park to Improve Students' Critical Thinking Skill

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Abstract. Based on the 21st Century Partnership Learning Framework, some of the competencies or skills students must possess in the 21st century, one of which is the ability to think critically. Means in training critical thinking can be done in various ways, one of which is teaching materials. During this time the learning carried out in the Ecology Course still has not utilized a variety of teaching materials sourced from the surrounding environment optimally, even though the phenomena that occur in the environment help students learn contextually. The purpose of this research and development is to develop teaching materials on Ecology Courses by applying problem-based learning (PBL) in it, so that it is expected to accommodate students to understand the phenomena that occur in the flora of Savana Bekol community in Baluran East Java National Park to improve skills think critically at students. The development of problem based learning based material refers to the ADDIE development model, which starts from analyze, design, develope, implement, and evaluate. The effectiveness of teaching materials to improve the results of critical thinking in students is done through pre-experimentation with 25 students who are taking ecology courses in the Department of Biology, Surabaya State University. The results of the validation of the three experts showed very positive results, from the material experts obtained a score of 98.33 (very valid); acquisition of validation scores from field practitioners by 100 (very valid); and from the media expert validator at 98.75 (very valid). Practical test to 20 correspondents, obtained a mean value of 89.2 belonging to the very practical category. Effectiveness test results show an increase in critical thinking in all aspects, namely: 1) applying, 2) evaluating, 3) analyzing information, 4) using data to develop thinking skills, 5) synthesizing. Suggestion: the use of teaching materials requires broad lecturers' insight so that the lecturers also participate in facilitating students to develop critical thinking and really need to pay attention for the time allocation provided so that the utilization goes well and according to the learning plan.

Keywords: critical thinking, flora community, problem base learning,

BE-071-324-DGA-AA298

Exploration of Invertebrate and Vertebrate Animals in Malang Regency as an Animal Diversity Learning Resource for Biology Student at the Universitas Negeri Malang

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Abstract. Malang Regency has a high potential for diversity of invertebrates and vertebrates, so it needs to be optimized as a learning resource. The purpose of this study was to explore invertebrate and vertebrate animals based on the local potential of Malang Regency as a learning resource for animal diversity subjects in biology students at the Universitas Negeri Malang. Animal diversity subjects require learning resources as a reference that is used to teach the diversity of invertebrate and vertebrate animals based on their characteristics. This research was conducted in the southern Malang Regency in May-August 2019. The research design used the exploration method. The results of this exploration activity obtained diversity of invertebrate species as many as 5 phyla, namely porifera, coelenterate, mollusca, arthropod, echinodermata, 17 classes, namely calcarea, hexactinellid, demosponges, scypozoa, anthozoa, bivalvia, gastropods, cephalopods, monoplacopora, arachnida, crustacea, diplopoda, insecta, crinoidea, ophiuridea, asteroidea, and echinodea. Vertebrates are divided into 1 phylum, chordates, 5 classes, namely pisces, amphibians, reptiles, aves, and mammals.

Keywords: animal diversity, invertebrates, Malang regency, vertebrates.

BE-072-326-DGA-AA296

Developing Digestive System Guided Inquiry Research-Based Module on the Effect of Purple Sweet Potato's Extract towards DMT2 Rat's MDA Levels.

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Abstract. This study aims to produce a teaching material that is the form of an inquiry-based digestive system module based on the results of the study of the influence of purple sweet potato extract against the MDA levels of type 2 diabetic rat which is valid and Practical. This study adapted the ADDIE model to develop the module that consist of Analyze, Design, Develop, Implement, and Evaluate, but this research and development did not reach the Implement stage. Data types in research include quantitative data (score validation by validators, and practicality test scores, and qualitative data (comments and suggestions from validators and students). The validation score data and the practicality test of the teaching materials are analyzed by a percentage analysis technique. The results of module validation by media experts, material experts, and field practitioners acquired a score of 98% by media experts with very valid criteria, 96% by material experts with very valid criteria, and 97% by field practitioners with very valid criteria. The results of module practicality by students of 94% with very valid criteria. The conclusion in this research is digestive system-based inquiry module on the research effect of purple sweet potato extract towards DMT2 Rat's MDA Levels valid, and practical for students in Learning Animal and human physiology courses of undergraduate biology education program at State University of Malang. The advice that can be proposed is that the research should be applied to the implement test stage to test the effectiveness of the developed product, and also can be added with the results of other research related to the digestive system.

Keywords: digestive system, guided inquiry, purple sweet potato.

BE-071-324-DGA-AA298

Exploration of Invertebrate and Vertebrate Animals in Malang Regency as an Animal Diversity Learning Resource for Biology Student at the Universitas Negeri Malang

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Abstract. Malang Regency has a high potential for diversity of invertebrates and vertebrates, so it needs to be optimized as a learning resource. The purpose of this study was to explore invertebrate and vertebrate animals based on the local potential of Malang Regency as a learning resource for animal diversity subjects in biology students at the Universitas Negeri Malang. Animal diversity subjects require learning resources as a reference that is used to teach the diversity of invertebrate and vertebrate animals based on their characteristics. This research was conducted in the southern Malang Regency in May-August 2019. The research design used the exploration method. The results of this exploration activity obtained diversity of invertebrate species as many as 5 phyla, namely porifera, coelenterate, mollusca, arthropod, echinodermata, 17 classes, namely calcarea, hexactinellid, demosponges, scypozoa, anthozoa, bivalvia, gastropods, cephalopods, monoplacopora, arachnida, crustacea, diplopoda, insecta, crinoidea, ophiuridea, asteroidea, and echinodea. Vertebrates are divided into 1 phylum, chordates, 5 classes, namely pisces, amphibians, reptiles, aves, and mammals.

Keywords: animal diversity, invertebrates, Malang regency, vertebrates.

BE-073-336-DSA-AA315

Need Analysis of Biology Teaching Material using Macrozoobenthic Diversity as Bioindicator Water Quality of Metro River Module for Junior High School

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Abstract. The purpose of this study determined the needs of Biology Teaching Material using Macrozoobenthic Diversity as Bioindicator Water Quality of Metro River Module for Junior High School. The type of research was a descriptive quantitative of survey method used questionnaires and interview. This research was conducted at SMPN 15 Malang, which is located around the Metro River. The subject of the research were 58 students of grade VIII and class VII Science Biology teacher. The sample was taken by purposive sampling. The result of this study showed that teachers and students (81,03%) have agreed with teaching material that already exists, but they still needed to apply it by doing the practicum beside learning through notes given by the teacher (50% strongly agreed; 46,6% agreed). From the results of needs analysis showed that students needed the biology teaching material using Macrozoobenthic Diversity as Bioindicator Water Quality of Metro River Module (20,7% strongly agreed; 53,4% agreed).

Keywords: biology teaching material, need analysis

SE-044-325-DSA-AA293

Three-Tier Web Applications Modeling on Cloud for Budgeting Efficiency

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Abstract. When escalating a web application server to a multi-tier architecture, web developers and system administrators should be able to determine which server models are the best in order to achieve efficiency in new servers procurement budgeting. In this work, we used a simulation application called Simpy to compare the performance of several multi-tier server models to determine what kind of server model is most efficient to use. We then use Simpy output to plot some graphics in order to analyze which model has the best performance. Simpy has shown that model (1,1,1) with high hardware specification is better to be used because it only occupied less server so that developers can save much on budgeting.

Keywords: budgeting, cloud VM, multi-tier server, web application, queuing simulation.

Learning Strategy and Model

ME-037-120-DGA-AA129

The Effectiveness Of Cooperative Learning Model Type STAD And Jigsaw Based HOTS On Mathematical Problem Solving Abilities

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Abstract. This research was aimed to describe: (1) the effectiveness of cooperative learning model type STAD and Jigsaw based HOTS on mathematical problem solving abilities, (2) comparing the effectiveness of cooperative learning model type STAD and Jigsaw cooperative based HOTS on mathematical problem solving abilities. The research design used was quasi-experimental research with a pretest posttest non-equivalent group design. This study uses two experimental classes. The research instrument used was a test of mathematical problem solving abilities. The results showed that: (1) Cooperative learning model type STAD and jigsaw was effective on mathematical problem solving abilities, (2) there was a difference in effectiveness between ccooperative learning model type STAD and Jigsaw based on HOTS on mathematical problem solving abilities. and 3) ccooperative learning model type Jigsaw is more effective than the STAD type for mathematical problem solving abilities.

Keywords: Cooperative learning type STAD, Jigsaw, High Order Thinking Skill (HOTS), mathematical problem solving ability.

ME-042-140-DSA-AA185

Increased Motivation to Learn by Using Learning Model Learning Community Students Mathematics Education

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Abstract. Learning This Research aims to increase the motivation of teaching students in differential calculus learning using the Learning Community model in the class B Mathematics Education University Ahmad Dahlan (UAD) academic year 2018/ 2019, totaling 28 students. This type of research is a class action study consisting of planning, action, observation, and reflection phases. The instrument used in this study is an observation sheet. The results showed that the student's learning motivation increased as demonstrated by the increased motivation of learning students from Cycle 1 which was 76.5% in the high category, while in Cycle 2 increased to 81.5% in the class very High. Based on the results of this study, it can be concluded that using learning Model Learning Community can improve the cultivation of teaching differential calculus of class B students UAD mathematics education.

Keywords: learning community, learning model, motivation.

ME-044-143-DGA-AA84

The Readiness of Mathematics Teachers in Utilizing Technology in the 21st Century Learning Process

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Abstract. This study aims to determine the readiness of mathematics teachers in utilizing technology in the 21st century learning process. The readiness means the ability of teachers to design, use and create technologies such as: learning videos, internet, android applications, software, etc. that are used in learning process. Meanwhile, the 21st century learning referred to in this study is learning process that reflects 4C's skills, namely: critical thinking and problem solving, creativity and innovation, communication, collaboration. The study was conducted by observing and interviewing teachers and students about how technology is used in the classroom in the learning process so that the technology can bring out the 4C's students ability. The findings indicate that the readiness of teachers to use technology in the mathematics learning process is in the moderate value. This is indicated by the teacher's ability to use technology in learning. In addition, the technology used is only to motivate students in learning.

Keywords: the readiness, the 21st century learning.

ME-045-144-DSA-AA89

The Influence of PAIKEM Based Learning with *Educational Songs* on Student Learning Motivation

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Abstract. One of the low learning motivation of students in Senior High School (SMA) is due to conventional learning motivation which tends to make students passive. Learning with a pleasant learning atmosphere and students playing an active role in constructing their knowledge can spur student motivation. One of the lessons that can be a solution is the PAIKEM based learning. The purpose of this study was to determine the effect of the PAIKEM based learning with educational songs on student learning motivation. This type of research was pre – experimental with one – group pretest – posttest design. The instrument used in data collection is a motivation questionnaire. The subject of this study was the XI grade private high school students in surabaya as an experimental class. The results of the study showed a significant differrence in the learning motivation of students who followed the PAIKEM based learning with educational songs. It is known from the results of pretest and posttest data analysis using the *t* test, obtained the value of $t_{hitung} = 4{,}89$ then campared to the price of t_{tabel} with a significant level $\alpha = 5\%$ and $df = 30 - 1 = 29$ obtained $t_{tabel} = 2{,}05$. It turns out $t_{hitung} \geq t_{tabel}$. Based on this, it can be concluded that the PAIKEM based learning with educational songs has a positive influence on student learning motivation.

Keywords : Educational Songs, Learning Motivation, PAIKEM Based Learning.

ME-054-179-DGA-AA123

The Implementation of Constructivistic Strategy for Delivering High School Mathematics: a Study to Know the Misused of Mathematics Education Students in Peer Teaching Practice

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Abstract. It is predicted that mathematics education students still need knowledge to strengthen their capability in utilizing constructivism strategy as the ultimate trends for delivering school mmathematics. The purpose of this study is observing, analyzing, and describing their misinterpretation in applying construvistic strategies such as inquiry strategy, guided discovery strategy, problem solving strategy, RME strategy, meaningful instruction strategy, and open-ended strategy. The type of the study is explorative qualitative study. The subject of the study is twenty mathematics education students, they are grouped into six groups, each group consists of 3-4 students. Each group is asked to deliver special topic of high school mathematics. The way to deliver is one of the construvistic strategies. The lacks of each group are taken to be the focuses of the class discussion. The main activity is revising the mistaken and the misconception of the used strategy. The result of the study shows that each group (1) does not have good understanding about the strategy, (2) tries to do the same way as what they usually do of their high school teachers, and (3) realizes their mistakes, tries to get the right concepts of the strtategy, and has deep understanding about the strategy.

Keywords: constructive strategy, high school, mathematics, peer teaching practice.

ME-062-220-DGA-AA163

Exploring of TPACK Framework For Optimizing Critical Thinking In Learning Social Arithmatic Material For Yunior High School Student

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Abstract. Critical thinking ability is needed for student to solve the problems in the material of social arithmetic such as a trading, a manufacture, an agriculture, etc. in mathematics learning process. The purpose of this study is to explore and design TPACK framework and analysed the intersectional relationships between TPACK components for performing teacher integration model of learning with infusing flipbook as technology tool. The model are applied to the students and the participants were 31 students of class VII.5 SMP 3 Batanghari. The instruments consist of student test and portfolio and teacher response questionnaires, learning activity observation sheets, daily assessment instruments as well as a TPACK measurement questionnaires for teachers. The results show that the flipbook technology influenced student critical thinking, learning environment, and student achievement which are 80.64% of students responded optimal categories and 70.7 % of teacher responded in the good categories. The observation results of learning activities and daily assessments show that PK has a significant relationship to CK, TCK, and TPK; TK was significant to TPACK; CK was significant to PK, PCK and TPK; TCK was significant to TPACK; PCK was significant to PK, CK, and TPK; and TPK was significant to PK, TK, CK, PCK, and TPACK. The TPACK components have significant p-value <0.05.

Keywords: critical thinking, social arithmetic, TPACK framework.

ME-063-224-DGA-AA169

Islamic Values in Mathematics Learning through the Realistic Mathematics Education (RME) Model in Arithmetic Sequence and Series Subject Class XI MA Matsaratul Huda

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Abstract. Mathematics is one of the lessons that is less desirable for students, especially students in boarding schools, such as MA Matsaratul Huda. They assume that mathematics has nothing to do with Islamic values. Therefore, Islamic values are very important to be applied in mathematics learning that are abstract for the students. It is essential for the teachers to apply mathematics to real life. Realistic Mathematics Education (RME) is one of the mathematical learning models that can link the objects of mathematical studies with real-life so that students easily understand mathematics, especially in arithmetic sequence and sequence material. Therefore, this study is to internalize Islamic values in mathematics learning through the Realistic Mathematics Education (RME) model in arithmetic sequence and series subject carried out during two meetings. This research is a descriptive qualitative study with the research subject being students of class XI IPA MA Matsaratul Huda. Data is obtained in the form of observations of teacher and student activities, student response questionnaires, documentation, and tests. The results of the analysis of the observation data of the teacher's activities obtained the final value and the results of the analysis of the observation data of the students' activities got the final score. In addition, students also respond "positively" to learning by percentage. Classically the results of student learning tests get results so that students' mastery learning can be said to be "completed". Based on the results of these studies it can be said that the internalization of Islamic values in mathematics learning through Realistic Mathematics Education (RME) to help students understand the material and can provide new knowledge about the relationship of mathematics and Islamic values. This research can be used as an alternative in providing better learning

Keywords: Arithmetic Sequences and Series**,** Islamic Values, Mathematical Learning, Realistic Mathematics Education,

ME-077-273-DGA-AA229

Application of Open Ended Approach with TPS (*Think Pair Share*) to Improve Creative Thinking Skills for Student of Class VII-B of SMP Negeri 9 Malang

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Abstract. One of the special skills needed in the 21st century is creative thinking skills. Creative thinking skills is a thinking process that leads to new ways of understanding. One of the approach that can improve creative thinking skills is open ended approach. Another factor that influence the improvement of creative thinking skills is conduct a learning activity using one of the learning models, namely TPS (Think Pair Share). In this research, we use open ended approach with TPS to improve students' creative thinking skills. The subjects of this research are students of class VII-B of SMP Negeri 9 Malang consisting of 33 students.This research uses classroom action research which consists of 2 cycles based on Kemmis and Mc Taggart models. The teacher's actions that can improve students' creative thinking skills are asking students to work on open ended problems individually (Think), asking students to discuss in pairs (Pair), and appointing group representatives to present the results of the discussion in front of the class (Share). The result shows that the learning process by applying open ended approach with TPS can improve students' creative thinking skills with evidence in the first cycle there are 33.3% of students in good category and in the second cycle there are 84.5% of students in good category.

Keywords*:* creative thinking skills, open ended approach, TPS (Think Pair Share).

ME-079-304-DSA-AA266

Application of Cooperative Learning Type Teams Games Tournament (TGT) to Increase the Student's Activity

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Abstract. This research is motivated by the experience of the author during the field study and practice activities at a senior high school at Malang. At the school, the author taught mathematics for 10th-grade students. The author used cooperative learning strategies to teach. But, many students were not excited and they were not active in class. From the literature, we can see that the Teams Games Tournament (TGT) cooperative learning can be conducted to increase student's activity. The purpose of this research is to describe the application of this kind of cooperative learning to the activities of the students when they study mathematics. implementation, The steps of TGT cooperative learning that can increase student activity are 1) class presentation, the teacher explains a mathematics concept to the students by class discussion. The teacher, as a facilitator, helps our students to find the concept by asking some question; 2) group discussion, students were divided into several groups, and each group is given some problems that have to be solved by discussion. 3) games and tournaments, some questions are shown on the LCD screen, then one of the students choose one question. The other students scramble to answer questions. The teacher gives a score to the student's answer. The scores from games and tournaments were accumulated to determine the best team; 4) group awards, the teacher gives awards to the group that gets the highest score.

Keywords: cooperative learning, student's activity, TGT.

CE-007-049-DSA-AA14

Mind Mapping in Argument Driven Inquiry (ADI) Model to Improve Students' Critical Thinking Skills with A Different Prior Knowledge in The Topic of Reaction Rate

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Abstract. Students often encounter many issues in understanding rate of reaction concepts including a low conceptual understanding as well as students' critical thinking skills. The issues can be overcame by using Argument Driven Inquiry (ADI) model. However, when implementing this mdel, many students got into difficulty in expressing their argument orally or evn in wiritng. Therefore, another stragtegy such as mind mapping should be inserted in the learning. This study aimed to investigate the effect of Mind Mapping in Model Argument Driven Inquiry (ADI-mind map) towards students' critical thinking skills with a different prior knowledege in the topic of reaction rate. A *factorialized (2 x 2) version of non-equivalent control group design* with two way ANOVA was implemented in this study. The results show that : 1) there is a significant different of students' critical thinking between students taught using ADI-mind map and those using ADI only ; (2) there is a significant different of students critical thinking skill between higher achievement students and lower achivement students in both ADI-mind map and ADI model only; 3) there is no interaction between learning model and students' prior knowledge towards students' critical thinking skills.

Keywords: mind mapping, ADI Model, critical thinking, reaction rate.

CE-010-061-DGA-AA15

The Effects Of Instructionals Models And Logic Mathematical Intelligence Toward The Chemistry Learning Outcome By Controlling Students' Initial Competence.

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Abstract. The objectives of this research were to determine the effects of instructional models and logic mathematical intelligence on chemistry learning outcomes with initial competence as covariate variable. This research conducted at Chemical education departement of FKIP UHO Kendari during Maret to Juny 2018, and used a quasi-experimental method with a 2x2 by level design. A sample of 58 students was randomly chosen. ANCOVA and t-test ANCOVA applied to analyzed the data obtained at the significant level of 0,05. The results indicate that: (1) the chemistry learning outcomes of students who were taught to use concept attainment model were better than direct instruction model by controlling the initial competence; (2) there was an interaction between instructional models and logic mathematical intelligence on chemistry learning outcomes by controlling the initial competence; (3) the chemistry learning outcomes of students with higher logic mathematical intelligence who were taught to use concept attainment model were higher than direct instruction model by controlling the initial competence; (4) there was no significant differences between the chemistry learning outcomes of students with low logic mathematical intelligence who were taught to use concept attainment models by being taught direct instruction model by controlling initial competence.

Keywords: chemistry learning outcomes, concept attainment, direct instruction, logic mathematical intelligence,initial competence.

CE-012-072-DSA-AA21

The Effect of Lerning Cycle 4ERE on the Vocational High Students' Learning Motivation in Adaptive Chemistry

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Abstract . This study is conducted to investigate the effect of *Learning Cycle* 4ERE (LC-4ERE) on Vocational High School (SMK) students' learning motivation in Chemistry. The problems investigated in this study were 1) is there any effect of the use of LC-4ERE learning model to the Vocational High Students' learning motivation in Adaptive Chemistry?; and 2) How can LC-4ERE foster the students' learning motivation in Chemistry? The researcher used one group *pretest-posttest only* model consisting of three classes from SMK PGRI 3 Kota Malang and two classes from SMKN Singosari Kabupaten Malang. The sample used were students from grade ten whose majors were Engineering Technology or Automotive who have not done yet an internship (*Industrial Working Practice*). From the investigation of pretest and posttest on the students' learning motivation, it was concluded that 1) there is a significant effect of LC-4ERE learning model on the students' leaning motivation in Adaptive Chemistry, and 2) students make improvement on the learning motivation in each phase of LC-4ERE learning model. From this result, it is suggested that the learning of Chemistry in SMK supports productive subjects continuously to foster the SMK students' learning motivation. It is better for the adaptive and productive Chemistry teachers to work side by side and collaborate on designing an appropriate learning model based on the students' character so that the SMK students are motivated to learn Adaptive Chemistry.

Keywords: adaptive chemistry, LC-4ERE, learning motivation.

CE-014-095-DSA-AA35

The Different of Scientific Argumentation Skills in the Reaction Rate Topic as a Result of ADI-S and ADI Learning Models with a Different Scientific Reasoning Ability

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Abstract. The insufficient development of students' scientific reasoning rises a difficulty in understanding rate of raction concepts. Reaction rate teaching that commonly carried out in a verification approach contributes to the insuficient scientific reasoning. *Argument-Driven Inquiry* (ADI) model implementing argument based learning is expected to support students' Scientifi Reasoning (SR) in order to improve students' understanding on reaction rate. However, due to their lack of confidence, students generally got into difficulty in producing an argument. Therefore, scaffolding should be inserted in ADI model. This study used a *quasi experiment* design and the *posttest* results were analysed by two way ANCOVA (2 x 2 factorial). The results show that: (1) ADI model + scaffolding (ADI-S) contributes to a better SR than ADI model only, (2) the higher the SR the better students' scientific argument skill both in ADI-S and ADI models, (3) the interaction between learning models and SR towards students' scietific argument skill was unfound.

Keywords: ADI learning, ADI-S, scientific argumentation.

CE-015-103-DSA-AA39

The Effectivity of *Guided Discovery* with Contextual Approach in Reaction Rate Learning Towards Scientific Literacy Skill

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Abstract. Scientific litearcy is an improtant skill for 21 century students. The skill will drive students to be more responsive to the global competitiveness. Using an active learning approach is one of strategies to improve this skill. This study aimed to investigate the effectivity of guided discovery model with contextual approach in reaction rate learning towards students' scientific literacy. This study is a quasi experiment with pretest-posttest control grup design and involved students at a public high school in Malang. The sampel was determined by the cluster random sampling and divided into two groups (control and experiment). The experiment group was taught using guided discovery model with contextual approach while the control one using direct instruction with contextual approach. The independent sample t-test was implemented in this study. The results show that there is a significant different of the scientific literacy between students taught using guided discovery model with contextual approach and those using direct instruction with contextual approach (sig<0,05). Guided discovery model with contextual approach is effective in improving students' scientific literacy with the average gain of 0,6 that fall in the high category. The average gain score of students who was taught using direct instruction with contextual approach was 0,4 and fall in the medium category.

Keywords: contextual approach, guided discovery, scientific literacy.

CE-009-059-DGA-AA98

The Effect of the Explanation Driven Inquiry (EDI) Learning Model and Initial Ability on the Scientific Explanation Skills of Senior High School students in the Chemistry Class

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Abstract. The purpose of this study were to determine the effect of learning model, initial ability, and the interaction between two variables on the scientific explanation skills on 11th grade student's in the acid-base subject. These research was used experimental research method with 2 x 2 factorial design. The scientific explanation skills (SES) test was applied to the 60 students as sample. The sample was divided into four groups, and each group consists of 15 people. Data analysis technique was used two ways MANOVA at significance level $\alpha = 0.05$. The results show that: First, overall, the result of the SES of student with explanation driven inquiry (EDI) learning model gives a better effect than the guided inquiry learning model. Second, for students who have high initial ability, the result of the SES of student with guided inquiry model gives better influence compared to the EDI model. Third, for students who have low initial ability, the result of the SES of student with EDI model gives better influence compared to the guided inquiry model. Fourthly, there is an interaction between the learning model and the initial ability to the SES of student.

Keywords: EDI learning, scientific explanation.

CE-025-188-DSA-AA127

The Effectiveness of Inquiry with Multipel representation to Improve Critical Thinking Skill in Learning Electrochemistry

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Abstract. This study aims to determine the improvement of students' critical thinking skills, effectiveness of electrochemical learning based on open inquiry with the multiple representation approaches. The research adopted a quasi-experimental method with the control group pretest-posttest design. The implementation was conducted at a SMK Negeri in Bontang majoring. The subjects consisted of 30 students as the experimental group and 29 students as the control group. The instrument consisted of 8 essay questions for conceptual mastery of electrochesmistry that were integrated with critical thinking skills, and questionnaires on students' responses to the implementation of learning. The results show that the learning was effective in improving students' critical thinking skills. This is indicated by the mean N-Gain score of critical thinking skill of the experimental group students is 0.59 and the control group is 0.37 and effect size 1,19 (high category). The highest N-Gain was for the indicator of elementary clarification (N-gain = 0.81) and the lowest for strategy and tactics (N-Gain = 0.35). Students responded positively to the learning..

Keywords: critical thinking skills, inquiry.

CE-027-194-DSA-AA153

Effects of the Metacognitive Learning Strategy on Students' Metacognitive Knowledge and Achievements in Electrolyte and Non-electrolyte Solution Materials

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Abstract. This study aims to investigate the effects of metacognitive strategy on students' metacognitive knowledge and achievements. The design of this study was a quasi-experimental with nonequivalent control group design. The research subjects were two classes of 11th grade public high school students in Malang Regency, Indonesia. One class was taught with a metacognitive strategy (MS) and another class was taught with expository learning (EL). The instrument used is an objective achievements test (reliability, r= 0.614) which is equipped with three questions to measure students' metacognitive knowledge. Scoring of the quality of students' metacognitive knowledge was carried out by two raters. Data on students' metacognitive knowledge and achievements were analyzed descriptively and inferential statistics. The results of this study were: (1) metacognitive strategy influence the students' metacognitive knowledge and learning achievements. The mean of scores of students' metacognitive knowledge and achievements learned by MS respectively $\bar{x}$ = 47 and $\bar{x}$= 58 were higher than students who were taught by EL respectively $\bar{x}$= 36 and $\bar{x}$= 49; (2) metacognitive strategy was more effective at increasing students' achievement than expository with Chohen d-effect sizes and N-Gain respectively 3.45 and 0.47 in MS class and 1.91 and 0.32 in the EL class. Metacognitive learning strategy facilitates the development and using of students' metacognitive knowledge which has an impact on increasing understanding of the material being studied.

Keywords: achievements, electrolyte and non-electrolytes solutions, metacognitive learning strategy, metacognitive knowledge.

CE-031-206-DSA-AA159

What are The Patterns of Discussion to Teach Argumentation Skills in Chemistry Learning?

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Abstract. Argumentation is one of the important scientific activities in contemporary chemistry learning. Argumentation is part of making decisions, maintaining them, and influencing others according to data accompanied by rational explanations. Through argumentation activities, students will interact more deeply with the material being studied. Argumentation is one of the skills that can be trained in students through the provision of surrounding phenomena that are in context of SSI (Sosioscientif issue). As a form of communication, argumentation requires the importance of interaction in the form of patterns of discussion between students. Students are directed to engage in collaborative argumentation activities, because through collaboration students can adapt their personal arguments to arguments that arise from other individuals in the group, allowing students to make improvements or justifications for the argumentation and understanding the concept. By collaborating, students are able to produce better arguments than the arguments produced by students who work individually. However, collaborative patterns also have weaknesses including, not all students in the group are able to master the content of the material being studied, the absence of motivation that encourages students to improve their group performance, and the predominance of tendencies in the group. These things indicate that collaborative activities in arguments have not guaranteed a process of constructing the best arguments. Therefore, the teacher needs to pay attention to the pattern of argumentation activities that can overcome the weaknesses of the collaborative pattern but still fulfill the rules of social constructivist learning. One of the learning activities that can be used for this purpose is to apply cooperative learning patterns to the argumentation process.

Keywords: argumentation skills, chemistry learning, patterns of discussion.

CE-035-221-DGA-AA166

Responding the Integrated Model of Entrepreneur Characteristic with Stem to Enhance Students Creativity

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Abstract. Applying the integrated of the entrepreneur characteristic (EC) combined with science, technology, engineering and mathematics (STEM) for postgraduate chemistry education students are carried out via project-based learning. The creativity as EC attribute and STEM attributes such as an analytical, science, math, technical and communication skills are introduced to deliberate student achievement that norms creative problem solving and creativity to up grate entrepreneur behavior to make a difference throughout their lives are introduced. Four steps for implementing projects are given to students based on local resources as a project where the students in groups chose the own topic and follow by carried out the experiments, presenting the results and it's analyzed individually to perform creativity. The reasons for the characteristic materials and the potential chemical compounds availability, the processing, variant product and labelling are as the basic considerations for exploring individual performance to meet CE and STEM attributes. The response showed that, if students have enough background in natural product chemistry and industrial processing as well as technology for labelling products are valued as STEM and EC sub creativity. The implementation of various initiatives such as the introduction of entrepreneurship into course and the creation of partnership will increase the student achievements.

Keywords: integrated model, STEM.

CE-036-234-DSA-AA190

Difference Student's Cognitive Skills (HOTS and LOTS) through Inquiry Based Learning with OE_3R Strategy in Concept of Molecular Shape

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Abstract. Chemistry learning at education many levels should be in accordance with the characteristics of chemistry, namely as a science based on investigation or inquiry (*Chemistry as Inquiry Science*). Therefore, chemistry learning should be done by inquiry. Many chemistry learning has been developed by inquiry, especially guided inquiry. One of the guided inquiry-based chemistry learning strategy innovations is the OE_3R (Orientation - Exploration - Explanation - Elaboration - Reflection) Strategy, for learning Molecular Shape in High School. The objectives of implementation the OE_3R Strategy on learning Molecular Shape are to determine the effectiveness of students' cognitive understanding achievements. The measured level of cognitive understanding is divided into two categories, i.e HOTS (*Higher Order Thinking Skills*) and LOTS (*Lower Order Thinking Skills*). The study was conducted in High School at Malang with Quasi-Experimental Design of two treatment groups. The two treatment groups were the Experimental Group (36 students) studied with the OE_3R Strategy and the Control Group (35 students) studying with the Non-OE_3R Strategy (*Conventional Strategy*). There is or not difference in cognitive learning outcomes in the two groups obtained the post-test (by Set of Problem Items in the form of *Selected Respond Items*) and analyzed statistically with *Mann-Whitney*. The cognitive learning achievements of students who study with the OE_3R Strategy are higher than those who study with the Non-OE_3R Strategy, both at HOTS and LOTS levels, respectively 88.57% and 83.93% (for Experimental Groups, by OE_3R) and 66.12% and 76.43% (for Control Groups, by Non-OE_3R). These results indicate that the OE_3R Strategy is effective for Chemistry Learning in High School, for the Concept of Molecular Shape.

Keywords: HOTS, , inquiry based, LOTS, OE_3R Strategy.

CE-041-262-DGA-AA236

The Effect of Guided Inquiry Learning that is Enriched with Problem Solving in Buffer Solution Materials on Cognitive Learning Outcomes of SMAN 1 Lawang Students

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Abstract. Chemistry as a scientific discipline ideally is taught by a scientific based approach to give better students' learning outcome. However, in Indonesia, many schools have not applied scientific-based learning which might lead to low student's learning outcomes. However, although many schools have applied guided inquiry model, often many students has difficulty in elaborating their knowledge to solve a problem. This study was aimed to study the effect of the application of guided inquiry learning model that enriched with problem solving in improving students cognitive learning outcomes. This study used a descriptive experiment design and quasy experimental post-test only design. A guided inquiry-based student worksheet of which enriched with problem solving was created to provide student activity in learning buffer solution. Two sample classes of this study wer selected by using cluster random sampling technique from available science classes. One class was taught with guided inquiry-based student worksheet of which enriched with problem solving and another class was taught with guided inquiry-based only. Learning outcome was measured using 22 of multiple choice test and the results were analyzed descriptively and statistically. The result showed that the average score of experimental class was 73.67 which higher compare it of control class (57.39). Furthermore, about 50% of student in the experimental class has passed the school passing grade while only 16.67% student has passed in control class. The students' perceptions on the worksheet were very good based with an average percentage of 80.93% in which categorized as very well.

Keywords: buffer solution, cognitive learning outcomes, guided inquiry, problem solving, student worksheet.

CE-045-321-DGA-AA291

The Influence Of Problem Solving on The Effectiveness Of Guided-Inquiry in Learning Buffer Solutions Based On The Students' Scientific Argumentation Ability

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Abstract. Inquiry learning model is one of important models in chemistry education which promote the development of the ability to think systematically, logically, and critically. Guided inquiry commonly has been applied in teaching chemistry at the high school. However, a phenomenon is often founds that students are not able to use their new concepts to solve problems in different situations which lead to low learning outcome. This paper reports our study on an integration of problem solving in guided inquiry model to help students to apply their new concepts through cycles of problem solving. Buffer solution material was chosen as studied focus due to its character which requires good conceptual and algorithmic understanding. Learning outcome was identified by exploring student's scientific arguments in buffer solution problems. The context of argumentation is relevant for science classes because it acts as a knowledge justification. A quasi-experimental research design with post test only was applied to achieve the research goal and a descriptive design was applied to analyse the learning outcome. The sample was 2 classes of science students at level XI, one class was treated as an experimental class and another class was treated as a control. The data of the students' scientific argumentation skills was obtained from the ability of students to give argument in problems related to buffer. The research instruments include learning instruments and measurement instruments. Descriptive analysis and a one-part t-test with the help of SPSS 25 for Windows were used to analyze the data. The results showed that the guided inquiry learning model enriched by problem solving provided a better learning model compare to guided inquiry models towards students' scientific argumentation skills in buffer solution material. However argumentation skill of both experimental and control classes.

Keywords: buffer solution, guided inquiry, problem solving, scientific argument.

CE-049-350-DGA-AA328

The Influence of Hypothetical-Deductive Learning Cycle on Students' Learning Achievement and Higher Order Thingking Skill

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Abstract. Improving the quality of learning that emphasizes the learning process can be done by providing scientific experience to students. The scientific experience implemented in the Hypothetical-Deductive Learning Cycle (HDLC) is expected to improve student achievement and higher-order thinking skills. This study aimed to determine the increase in students' learning achievements and high order thinking skills on the topic of carboxylic acid. This research used quasi-experimental design. The study was conducted at PIM Pharmacy Academy. The sample was selected by using a cluster random sampling technique, consisting of 2 classes, namely class 3A (30 students) using HDLC and 3C (30 students) using Direct Instruction (DI). The instrument validity and reliability test showed that 20 questions were valid with 96.8% content validity and 0.81 reliability. Data were analyzed using SPSS version 16.0 for windows at a significance level (alpha) = 0.05 with the ANOVA test. Research showed that there were differences in learning achievement and higher order thinking skills of the students of PIM Academy Pharmacy using HDLC and DI on Carboxylic Acid topic.

Keywords : Hypothetical-Deductive Learning, Higher Order Thingking Skill

PE-010-074-DGA-AA30

Pedagogical Content Knowledge Ability in Reflecting Project Based Learning on Physics Concepts

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Abstract. Pedagogical Content Knowledge (PCK) is the ability to teach a content on a particular concept so students can master the concept correctly. One characteristic of qualified teacher is having excellent PCK ability. The purpose of this study is to obtain an PCK ability profile of prospective physics teachers in reflecting project-based learning (PjBL) that had been carried out. This research is a qualitative research with narrative research design. The data collection instrument in this study is Pedagogical and Professional-experience Repertoires (PaP-eRs). The subjects in this study are eight physics students (prospective teachers) in one of State University of East Kalimantan. The results shows that the average value of PCK ability of prospective physics teachers in reflecting PjBL is 1.36 (from interval zero until three) in sufficient category. Based on the results of study, academics or stakeholders need to add adequate facilities as a means for students to practice teaching, develop teaching materials, and master the concept of physics better.

Keywords: pedagogical content knowledge, physics concepts, project-based learning.

PE-018-121-DSA-AA62

Problem Solving skills of Student's on Work and Energy Material Within Inquiry Based Authentic Learning for STEM Education

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Abstract. The research results to explore problem skills within using inquiry based authentic learning for STEM education in work and energy materials. This study was do on 32 students' in Catholics Senior High School of St. Familia Wae Nakeng with mixed method research design, namely embeded experimental model. Data collection was done by using test questions and interviews. Quantitative data analysis is done by using t-test, N-gain, and efect size while qualitative data analysis is done by data reduction, coding data, data presentation and conclusion drawing. Indicators of problem-solving skills in this study are understanding, planning, solving, checking and evaluating. The result showed that student's problem-solving skills in work and energy material experienced significant changes. To see whether there is a change in the problem-solving ability before and after being treated by using the t-test that is 0.000, this value is lower than the specified significance level of 0.05 so, it can be concluded that there are significant differences in problem solving skills before and after learning is done with inquiry based authentic learning for STEM education. To see the improvement of problem-solving skills before and after being treated can be seen of the results on N-gain test of 0.746, the results of this test are classified as high, while to see how much influence inquiry based authentic learning for STEM education has on problem solving abilities of participant students can be seen in the effect size test results of 1.712, these results are categorized as strong. The result showed that inquiry based authentic learning for STEM education can affect student's problem-solving abilities in work and energy materials.

Keyword: STEM, N-gain

PE-021-130-DGA-AA63

Problem Based Learning Model Accompanied by Eksperimen and Project Method In Term Of Creativity on Physics Learning

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Abstract. Creativity is one aspect that encourages students to obtain optimal learning outcomes. Student creativity can be obtained through a learning process with various interactions, learning experiences and environmental influences. The purpose of this research were to determine the creativity of students, especially in physics learning. Technique to collection data were by questionnaire method in one of the Senior High Schools in Ponorogo Regency. Qualitative descriptive analysis data on students' creativity obtained a percentage of each indicator ; fluency 81%, flexibility 87%, elaboration 82% and orisinality 81%. Based on the percentage obtained creativity students included in the high category. The use of models and appropriate learning methods can be used to optimize the creativity of students in the teaching and learning process.

Keywords: Creativity, Physic Learning, Learning Models And methods

PE-022-156-DSA-AA102

The Profile of Teachers' Problem Related to Inquiry Learning Set Based on Level of Inquiry In Physics Learning in Madrasah Aliyah (MAN)

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Abstract. This research aimed to find out the representation of Madrasah Aliyah (MAN) teachers' understanding on inquiry learning set based on level of inquiry. The research method employed was descriptive one with the subject of research consisting of 5 physics teachers in three MANs in Sragen City, taken using random sampling technique. The instrument of research used was learning questionnaire to see the learning set based on level of inquiry developed by teacher and document study of learning set. Data analysis was conducted by categorizing and presenting the result of teachers' questionnaire. The result of research showed that teachers' understanding related to the development of inquiring learning set is varying in each level of inquiry. From the percentage of each level, it can be found out that 100% of teachers have understood and used *discovery learning*, *interactive demonstration*, *inquiry lesson* learning models, 80% have understood and used *guided inquiry lab*, 30% *bounded inquiry lab*, 20% *free inquiry lab*, 40% *Pure hypothetical inquiry*, and 30% *applied hypothetical inquiry*. It indicated that some teachers have not understood the level of inquiry and find some constraints with the development of inquiry-based set. Teachers needed reference and facilitation activity in developing learning set based on level of inquiry, so that in the future inquiry activity can run chronologically corresponding to the level of inquiry.

Keywords: Learning set, Madrasah Aliyah Teachers, Level of Inquiry

PE-023-164-DSA-AA103

Using Argument-Driven Inquiry Learning to Improve Students' Mental Models

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Abstract. Many efforts on the improvement of students' mental models have been reported. It is found that many of mental models researches were conducted incomprehensively. In this work, we report the enhancing of students' mental models on heat and temperature. We used an experimental class who studied under argument-driven inquiry learning and accompanied by a control class who studied under conventional learning. The data were obtained through pre- and post-tests using mental models instrument. The resulted data were grouped into three categories, i.e. scientific, synthetic and initial, and followed by using Mann-Whitney U test and cross tabulation to evaluate the enhancement of students' mental models. We found a significant increase in post-test scores of students' mental models in the experimental class. Furthermore, it was found that a total of students in the experimental class increased more significant than the control class. The difference in enhancement shows that argument-driven inquiry learning gives an impact better than conventional one. It is expected that the teachers may provide more time for students to explore their mental models find through investigation and discussion by implementing an appropriate learning model.

Keywords: students' mental models, cognitive modeling, knowledge representation, argument-driven inquiry

PE-004-054-DSA-AA139

Enhancement of Student's Problem Solving Skill of Heat And Temperature Topic Through Modeling Instruction

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Abstract. This research aims to determine the magnitude of enhancement in student's problem solving skill of heat and temperature topic through modeling instruction. Modeling instruction is one of the constructivist learning model that helps students to be active in finding a model that can be used to solve physics problems. The assessment of problem solving skill in this research refers to research conducted by the Docktor. This research was conducted on 55 eleventh grade students from public high school in Batu. The results showed a significant enhancement which can be seen from the N-gain value of 0.80 with a high category.

Keyword: heat, temperature, modeling

PE-015-090-DSA-AA181

The Increase of Student's Conceptual Understanding in the Topic of Heat and Temperature through Blended Learning

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Abstract. One of the objectives in physics education is the students can understand the concepts given by the teacher. One technique that can be used in the learning process to achieve this goal is Blended learning techniques. The aim of this research is to determine the increase of students' conceptual understanding after being taught using blended learning techniques in the topic of heat and temperature. The research design was one group pretest posttest control group design. The research subjects were students of SMA Negeri 5 Malang consisting of 34 students. The result of this research indicate that there is an increase in conceptual understanding as showed by the pretest and posttest scores. This result also supported by the analysis of the n gain value of 0.72.

Keywords: conceptual understanding, blended learning

PE-026-173-DGA-AA110

The Use of Blended Learning as An Attempt to Improve Students' Higher Order Thinking Skills

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Abstract: Higher Order Thinking Skills (HOTS) of students in Indonesia still low with score 361.4 placed Indonesia at the 40th rank of 41 countries. This research aims to find out the effectiveness of the implementation of a blended learning model for teacher candidates in terms of their HOTS compared to those who learned via conventional instruction. This study applied mixed method research with explanatory design. The subject of research was the first year students of the State University of Malang, 33 students as an experimental class and 31 students as a control class. The research showed that it was a significant difference in HOTS between teacher candidates that learned by blended learning model and teacher candidates that learned by conventional learning model. The HOTS of teacher candidates that learned by blended learning model was higher than that of teacher candidates that learned by conventional learning model. Blended learning on SIPEJAR is beneficial to teacher candidates to analysis, synthesis, and evaluation of electricity problems. According to the interview result, the first teacher candidates feel strange with blended learning, but the candidate can solve the analysis, synthesis, and evaluation problems using SIPEJAR.

Keywords: blended learning, Fundamental Physics, HOTS.

PE-027-191-DSA-AA128

Improvement of Force Diagram Ability with Free Body Diagram Based Learning

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Abstract. This study aims to see an increase in the ability of drawing force diagrams using free body diagram-based learning. The research design was quasi-experimental, with the one group pretest - posttest method. The research subjects were students of class X MIPA 1 and X MIPA 4 in one of the Public High Schools in Malang city, the total subject was 48 students. The research instrument in the form of multiple choice originated from 5 questions related to the use of force diagrams. The alpha crobach instrument is at 0.68. Data analysis using cohen d-effect size to see the effect and N-gain to see an increase of influence in learning. In addition, the Wilcoxon test was used to see the effect of learning on the value of the initial test and the final test. The results of data analysis obtained a cohen d-effect size value of 1.2, N-gain at 0.39, and Wilcoxon significance of 0.00. Declaring the existence of significant learning influences is indicated by differences in the average value of the initial test and final test.

Keywords: Force Diagram, Free Body Diagram Based Learning

PE-029-200-DSA-AA174

Exploration of Problem Solving Ability With Inquiry-Based Authentic Learning for The STEM Program

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Abstract – This study aims to determine students' problem-solving ability through Inquiry-based Authentic Learning for the STEM program. Problem-solving ability is one of the important components in developing the student's ability. This study has been carried out using embedded experimental in grade X MIPA 7of SMA DU-2 Jombang which amount 32 students. Data are obtained by tests, observations, and interviews. Furthermore, the data are analyzed by paired t-test, normalized gain, and d effect size. The results showed that students' problem-solving ability are in the moderate category, which is 0.498 and the d-effect size value is strong, which is 3.293. Overall, 46% of students are still in the novice category and 54% of students have shifted to approaching expert methods to solve problems. Most students have been able to identify the physical quantities of the problem, interpret problems in motion diagrams, use appropriate mathematical procedures, and express the conclusion.

Keywords: Inquiry-based Authectic Learning; STEM; Problem Solving Ability

PE-030-203-DSA-AA142

Exploration of Students' Problem Solving Ability in Learning Cycle 5E with Formative e-Assessment

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Abstract. This study aims to explore students' problem solving abilities in heat and temperature through learning cycle 5E with formative e-assessment. The study involved students of XI MIPA 1 class, at one of the private high schools in Malang. The research used mixed-method method with embedded experimental design. The data was obtained through pretest and posttest problem solving abilities with essay test. The results showed that students' problem solving abilities had increased with an average value N-Gain of 0.40 (lower medium category) and d-effect size of 4.55 (strong category). The student's problem solving process on useful description indicators, physics approach, specific application of physics, mathematical procedures, and logical progression undergo positive changes even though the increase is still in the low category. Indicators that have the highest increase in a row are specific application of physics, useful description, and physics approach. It is expected that the next researcher can improve student's problem-solving abilities on all indicators.

Keywords: learning cycle 5E, formative e-assessment, problem solving ability, heat and temperature

PE-033-215-DGA-AA194

Effect of STEM-based 7E Cycle learning on Concepts acquisition and Creative Thinking on Temperature and Heat

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Abstract. Temperature and heat are learning materials that are considered difficult by students. Students' difficulties in temperature and heat material are caused by a lack of concepts acquisition and creative thinking. So there needs to be a solution to overcome student difficulties by designing the right learning. Suitable learning for developing concepts acquisition and students' creative thinking is a STEM-based 7E cycle learning. Combination of 7E cycle learning and STEM is thought to improve students' concepts acquisition and creative thinking. This research aims to determine the effect of STEM-based 7E cycle learning on concepts acquisition and creative thinking of temperature and heat. This study uses mixed method with an embedded experimental model design. The research subjects consisted of 31 students of XI MIPA 2 MAN Batu. The research instrument in the form of concepts acquisition test consisting of 10 reasoned multiple choice questions and creative thinking tests 5 description questions. Quantitative data concepts acquisition and creative thinking are analyzed using paired sample t-test, n-gain, and d-effect size tests. Qualitative data is analyzed by data reduction, coding, data presentation, and conclusion drawing. The results showed that (1) the level of students' concepts acquisition achieved in the temperature and heat material with the highest category in the "incorrect understanding" category of 43.87% (2) the level of students' creative thinking achieved with the highest category in the "creative" and "very creative" categories at 33.55%. Concepts acquisition and creative thinking has increased after being given STEM-based 7E cycle learning. The suggestions for further research, researchers need to pay attention to factors that influence acquisition of student concepts, namely the characteristics of the questions in the form of content and phenomena that are revealed also the competencies to be achieved, and for creative thinking to further develop students' creative thinking, especially indicators of originality and elaboration.

Keyword: temperature, heat 7E cycle learning

PE-038-237-DSA-AA195

Implementation of Conceptual Problem Solving (CPS) in 5E Learning Cycle to Improve XIth Students Understanding of Archimedes Principle

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Abstract. The focus of the study is to test the effectiveness of learning on improving the mastery of student concepts. The method used in this study is mixed method with embedded experimental design. The data consist of quantitative and qualitative data. The quantitative data were obtained from the pretest and posttest results, while the qualitative data were obtained through observation from all activities during the learning process. This study involved 35 XIth students from Science Program at MA Al-Ma'arif Singosari. The study was conducted during 3 meetings (3 x 45 minutes). The results showed that the average score of students on pretest is 2,66 (SD = 0,97) and on posttest is 5,54 (SD = 1,33). The increase of pretest score to posttest *is* calculated by using *d-effect size* value to know how big the influence of learning for students understanding. The result is 2,51 categorized as bigger than standard. To describe how strong the improvement of students' concept understanding based on the pretest and posttest score, the researcher calculated the average gain of normalized (*N-gain*). It obtained 0,39 under the criteria of the lower medium. The conclusion of this research is learning with conceptual problem solving on 5E learning cycle can improve XIth students understanding of Archimedes principle at MA Al-Ma'arif Singosari.

Keyword: student concept, quantitative and qualitive

PE-039-238-DSA-AA198

The Effect of Integrated STEM with Project Based Learning Model on Creative Thinking Skills and Understanding Concept in Static Fluid

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Abstract. The ability to think creatively and understanding concepts is one of the competencies that must be developed by students in facing challenges in the 21st century. This study aims to identify creative thinking skills and understanding students' concepts in static fluid using STEM integrated with project based learning learning models. This research was conducted using a mixed method with explanatory design. This research applied on 62 students of SMAN 1 Kejayan, 31 students as an experimental group and 31 students as comparison group. The results showed that the average score of creative thinking skills in experimental class is 60,35 and 59,29 in conventional class. Beside that, the average score of understanding concept students in experimental class is 69,16 and 65,90 in conventional class. This results showed that creative thinking skills and conceptual understanding of the experimental class were better than students who learned by conventional models. This difference in results is due to the integrated STEM Project based learning model has engineering design process that can help students develop creative thinking skills and understand their concepts.

Keywords: STEM, project based learning, integrated STEM with project based learning, creative thinking skills, understanding concept, static fluid

PE-049-283-DSA-AA241

Improving Students's Critical Thinking Skills in Senior High School through STEM-Integrated Modelling Instruction

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Abstract: The main challenge in learning nowdays is ensuring students to have critical thinking skills. Therefore, serious efforts are required to overcome the problem. This study focuses on improving the critical thinking skills of high school students through STEM-integrated Modeling Instruction learning. The advantages of the learning model is to provide experiences for students to directly learn science through observing phenomena related to the discussed topic, asking questions after observation, doing experiment and presentation, creating projects, and doing quizzes. This is a mix method research based on quantitative data from the pretest-posttest results and qualitative data from the interview with students. The eight questions that constructly validated by the lecturer and empirically validated by 71 students are stated valid and reliable to measure students critical thinking skills. One group pretest-posttest design is used to measure the influence of learning on critical thinking skills, through pretest and posttest data are analyzed using the t test. The results of the analysis show that there are significant differences with alpha 0.05 and medium improves with N-Gain of 0.32. As a final point, STEM-integrated Modelling Instruction can be considered for learning Physics in schools to improve students critical thinking skills in Work and Energy.

Keywords: STEM-integrated modelling instruction, critical thinking skills, work and energy

PE-008-058-DSA-AA283

Modeling Instruction on Kinetic Theory of Gasses to Enhance Conceptual Understanding

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Abstract. This study to determine the increase in conceptual understanding through modeling instruction when compared to conventional learning. Modeling Instruction focuses on the model to explain the relationship between the magnitude of the ideal gas state (pressure, volume and temperature), kinetic energy, internal energy, and the average speed of the ideal gas. The research method used mixed method type of embedded design. The study was conducted in class XI MIPA in one of the high schools in Batu City. The number of research subjects was 121 students. Data retrieval is done by tests, observations, interviews and photo and video documentation. The analysis was carried out quantitatively and qualitatively to determine the increase in mastery of students' concepts and the difficulties that students still experience after learning. The results showed an increase in conceptual understanding after following modeling instruction when compared to conventional learning. Increased mastery of student concepts can be seen from the value of d-effect size of 0.72 which includes greater than average and N-gain value of 0.43 which is greater than 0.29 and classified as the lower medium. Students have understanding of the relationship between the magnitude of the state, kinetic energy, and average speed. However, students still have difficulty in determining internal energy with the number of gas particles that change.

Keywords: modeling, kinetic theory of gases.

PE-048-280-DGA-AA286

The Effect of TAPPS Method on The Guided Inquiry Learning Model Towars The Physics Learning Achivements for 10th Grade Students

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Abstract: Based on several studies that have been conducted that it is known that the results related to the percentage of physics learning achievement are still low. The cause of the low achievement in learning physics is because the strategies or models used by the teacher in learning and learning activities experienced by students, where the learning done is only teacher-centered. Therefore, efforts need to be made to improve strategies and learning models that can make students act actively in finding their own concepts. This study aims to determine the effect of the TAPPS method on the guided inquiry learning model on physics learning achievement for 10th grade students. This study uses a type of quasi-experimental research with pretest-posttest control group design. The population in this study were all students of 10th IPA SMAN 8 Malang in the academic year 2018/2019 with a sampling technique using cluster random sampling. From the results of data analysis, it was shown that physics learning achievement of students who learned using the guided inquiry learning model with the TAPPS method was higher than the students who learned using the guided inquiry learning model. This means that the guided inquiry learning model with the TAPPS method has an effect on physics learning achievement for 10th grade students.

Key Words: Guided Inquiry Learning, TAPPS, Learning Achievements

PE-049-283-DSA-AA241

Improving Students's Critical Thinking Skills in Senior High School through STEM-Integrated Modelling Instruction

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Abstract: The main challenge in learning nowdays is ensuring students to have critical thinking skills. Therefore, serious efforts are required to overcome the problem. This study focuses on improving the critical thinking skills of high school students through STEM-integrated Modeling Instruction learning. The advantages of the learning model is to provide experiences for students to directly learn science through observing phenomena related to the discussed topic, asking questions after observation, doing experiment and presentation, creating projects, and doing quizzes. This is a mix method research based on quantitative data from the pretest-posttest results and qualitative data from the interview with students. The eight questions that constructly validated by the lecturer and empirically validated by 71 students are stated valid and reliable to measure students critical thinking skills. One group pretest-posttest design is used to measure the influence of learning on critical thinking skills, through pretest and posttest data are analyzed using the t test. The results of the analysis show that there are significant differences with alpha 0.05 and medium improves with N-Gain of 0.32. As a final point, STEM-integrated Modelling Instruction can be considered for learning Physics in schools to improve students critical thinking skills in Work and Energy.

Keywords: STEM-integrated modelling instruction, critical thinking skills, work and energy

PE-050-285-DGA-AA242

Designing and Implementing - STEM based Teaching Materials of Static Fluid to Increase Scientific Literacy Skills

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Abstract. An understanding of a scientific concept and process is needed in everyday life. This ability can be achieved by enter components of scientific literacy indicators in learning. Unfortunately, teaching tools that can be used to improve scientific literacy skills are still uncommon. This research focuses on developing and implementing STEM based teaching materials to improve students' scientific literacy skills in static fluid material. The development design uses a 4D model (define, design, develop, and disseminate) that is modified. After the product is validated by experts using a questionnaire, the effectiveness is tested with Pre-Post design. This research subjects were 35 eleventh grade high school students in Malang City. Data analysis with Wilcoxon signed rank test and N-gain. The result shows the teaching material is valid with the score of 89.5% and the difference in pre-posttest scores with high improvement category indicated by the percentage of n-gain of 87%. In other words, it can be said that STEM -based teaching materials of static fluid are very good to use and improve student literacy skills.

Keywords: STEM, 4D model

PE-051-286-DSA-AA243

Application of Teaching Materials Based on 7E-STEM Learning Cycle to Improve Student's Problem Solving Skills

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Abstract. The problem solving skills is needed to encounter challenge of globalization era. The purpose of this research is to know the improvement score of problem solving skills after the learning used materials based on 7E-STEM learning cycle. The method is the quasi-experimental research with one-group pretest-posttest design and the samples are 29 student in the eleventh grade of high school. The data collected by using pretest and post-test. Data analysis used descriptive statistics, N-Gain, normality test, and Wilcoxon test. The results showed that the improvement of problem solving skill classified to the medium category. It cause some students incomplete write problem description and unable to finish mathematical operations. On the other hand, after students finished learning, they can choose and apply the appropriate physics concepts.

Keywords: problem solving, 7E-STEM

PE-053-291-DGA-AA288

The Effect of Argument Driven Inquiry Towards Physics Problem Solving Skill In Momentum and Impulse Topic

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Abstract: One of the main goals in educational programs is to improve problem solving skills. Increasing the ability of problem solving is the basis for future learning. However, in most countries, students cannot solve basic problems. The Argument-driven inquiry model is effective for scientific inquiry as an effort to develop student arguments and high-level thinking that can be implemented in improving problem-solving abilities. The research design used was a quasi experimental design with pretest posttest control group design. Item description of problem solving ability in momentum and impulse material is used as a test to find out the results of students' problem solving abilities after being treated. Hypothesis test results show that problem solving abilities of students who learn to use Argument driven inquiry learning are higher than students who learn to use Guided inquiry learning

Kerwords : problem solving skill, momentum and impulse, argument driven inquiry

PE-055-318-DSA-AA289

The Influence of Flipped Classroom in Inquiry Learning to Student's Critical Thinking Skills in Impulse and Momentum

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Abstract. Critical thinking skills are one of the main competencies of educational goals. However, the critical thinking skills of Indonesian students are low. Some studies indicate that inquiry learning can train students independently to solve problems by using critical thinking. However, in implementation of this learning model still requires improvements in time management. Therefore, an innovative learning model of a flipped classroom can be applied to optimize the learning process. Flipped classroom utilize technology to make students start learning at home first through online assignments. This study was a quasi-experimental research with pretest-posttest control group design. The research sample was composed of 50 students, 26 students learning through the flipped classroom, and 24 students are learning with the inquiry learning. The instrument of critical thinking skills consists of 9 items with a reliability coefficient of 0.659. Results of the study showed that the critical thinking skills of students learning with the flipped classroom are higher than that of students learn through inquiry learning. The aspect of self-regulation of students who learn through flipped classroom is developing very well, while the evaluation aspects have not developed optimally.

Keywords: flipped classroom, inquiry learning model, critical thinking.

PE-062-356-DSA-AA337

The Effectiveness of STEM-Based Workbooks by using Multi Modal Representations to Provision Vocational High School Students Technology Engineering Literacy on the Topic of Direct Current Electricity

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Abstract. Vocational students as prospective professional workers should be equipped with technology engineering literacy abilities. The purpose of this study is analyzing the effectiveness of STEM-based workbooks provisioning capability technology engineering literacy by using multi modal representation. The research design used a pretestposttest control group design. The results showed that the STEM-based workbooks by using multi modal representations can improve the technology engineering literacy of students. The hypothesis testing showed that there was a significant difference on the ability of technology engineering literacy between class that used STEM-based workbooks by using multi modal representations and the class that used the regular workbook in schools. Where as based on the size of the impact it has the value of the large categorical effect size. The use STEM-based workbooks which were developed by using multi modal representations type is effective to enhance students technology engineering literacy abilities.

Keywords: vocational, STEM-based

SE-005-022-IGA-AA5

A Study of Exemplary Teaching Practices in Chemistry Classroom in Lagos State, Nigeria

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Abstract. The study investigated into exemplary teaching practices in chemistry classroom in Education District 1, Alimosho, Lagos State, Nigeria. Data for the study were gathered from fifty five experienced chemistry teachers drawn from senior secondary schools in the Education District. A teacher survey instrument "Exemplary teaching Practice Questionnaire" (ETPQ) was used to gather information from the selected chemistry teachers. The research was guided by three research questions while data collected were collated and analyzed using frequency counts, percentages and standard deviation. Findings from this study revealed that exemplary chemistry teachers are focused on teaching and display characteristics which are associated with better understanding of subject content knowledge, teaching pedagogy involving asking and responding to students' questions, perfect classroom organization and control, and show of enthusiasm in the use of cognitive monitoring strategies in chemistry classroom among other attributes. Based on these findings, appropriate recommendations for improving the teaching practice of novice chemistry teachers were proffered.

Keywords*:* Exemplary teaching; content knowledge; teaching strategies; pedagogical content knowledge; science education.

SE-008-085-DSA-AA56

Application of Learning Based on Gimur in Vibration, Waves, and Sound Materials to Improve Student's Learning Outcomes in Junior High School

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Abstract. This research aims to determine student's learning outcomes through Guided Inquiry-based learning by Multi Representation in second semester students of class VIII at Junior High School. The research used one group pretest-posttest design. Students are given tests before and after the implementation of learning. Based on the results of data analysis, student's learning outcomes increased significantly. Effective learning is learning that can improve student's learning outcomes. Student's learning outcomes increased significantly as stated by the Normalized Gain score (N-Gain). It can be concluded that learning based on GIMuR can improves student's learning outcomes at Junior High School.

Keywords: *Guided Inquiry by Multi Representation, Students's Learning Outcomes*

SE-009-099-ISA-AA122

Science Learning for Student with Autism Spectrum Disorder: A Literature Review

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Abstract. In the realization of science for All, all students must access and study science learning, including for students with special educational needs. In a previous review, it was found that Students with Hard of Hearing and Visually Impaired can understand science when learning with proper support tools and right learning models. In this literature review, we will study science learning for students with autism. This review is important because the number of children with autism spectrum disorder (ASD) has risen to one in 68 children. Based on a study of 20 peer review articles on the ERIC database published in 2009-2018, it was shown that students with autism could learn science well by using interactive books in the form of science textbooks, e-text, or computer programs. In addition, students with autism can also study with inquiry and technology. But it was not found about students with autism practicing in the science laboratory. It should be noted that students with autism from mild to moderate.

Keyword: Science learning, Student with Autism Spectrum Disorder

SE-010-108-DSA-AA42

The Effect of Treffinger Learning Model on The Student's Higher Order Thinking Skills for Science Subject

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Abstract. Higher Order Thinking Skills (HOTS) is ability that needed to face the 21st century challenge. However the Junior High School students show the low level HOTS. Treffinger learning model is one of models that can influence HOTS. The objective of this research was to know the effect of Treffinger learning model on the student's HOTS. The sampling process was carried out by purposive sampling technique.The subject of this research was the Grade 8th students of SMPN 1 Malang. The research was conducted in a quasy experiment design and analyzed by using Tukey test. Based on the result of hypothesis test, it was gained the score $Q_{calculate} = 7.607 > 2.89 = Q_{table}$. It could be concluded that the implementation of Treffinger Learning model had positive influence to HOTS than conventional model.

Keyword: Higher Order Thinking Skills, Treffinger Learning Model, Natural Sciences Education

SE-015-155-DGA-AA101

The Improvement of Higher Order Thinking Skills through Learning Cycle 7E on Analizing Human Excretion System

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Abstract. The objective of this study was determine the improvement of HOTS by the implementation of Learning Cycle 7E. This study used mixed methods with embedded experimental type. The quantitative data were collected through pretest and posttest values, while the qualitative data were collected through observations of the learning process, photo documentation, LKPD answers, and the results of interviews. The instrument used in this study were RPP, LKPD, sheet of learning observation, and HOTS test. Quantitative data analysis was carried out by t-test (paired sample t-test) and calculation of impact strength (N-gain and d-effect size). Qualitative data analysis was carried out by scatter plot analysis and students responses to LKPD. The results of the t-test obtained t_{count} 38,118 which is greater than the value of t_{table} 2,042, so that there are differences in the value of the pretest and posttest. The results of the calculation of normalized gain (N-gain) obtained a value of 0.67 which is included in the high category. The results of the calculation of d-effect size obtained the 8.36 value which included in the very high category.

Keyword. *high order thinking skills, learning cycle 7E, human excretion system*

SE-031-232-DGA-AA196

Implementation of Inquiry-Based Learning (IBL) to Improve Students' Understanding of Nature of Science (NOS)

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Abstract. Natural Sciences learning in junior high school is developed as an integrative science subject, which is applicative oriented, developing thinking skills, learning abilities, curiosity, and developing caring and responsible attitudes towards the natural environment. Science consists of three main elements, science as a product (scientific knowledge, facts, concepts, principles, theory, and law), science as a process (scientific method), and science as an attitude (curiosity, thoroughness, honest, do not believe without empirical evidence). In Indonesia, science learning is still widely done with verbal explanations both verbally and in writing (for example by filling out worksheets), or done with experiments or practicums that are still verification and not concept discovery. The purpose of this study was to reveal the effect of inquiry-based science learning on the understanding of the nature of science in grade VII students of UM Laboratory Middle School. The sample of the study were 60 students of VII B and VII E classes, with comparative control of students of VII D and VII F classes. Science learning was carried out for 4 topics in grade VII, namely environmental pollution, global warming, the earth and the solar system. The four themes are taught by the inquiry approach, either through laboratory experiments, field observations, direct observation of phenomena and natural events through video. Students' understanding of NOS was measured by using NOS comprehension tests for junior high school students who developed the research referring to the indicators of NSTA that had been validated by experts and practitioners. The results showed that understanding NOS of students who were taught by IBL was consistently higher (69.71%) than students who were taught using modules accompanied by explanations of teachers and conventional practicum (66.25%). Thus it can be concluded that science learning with the IBL approach can improve understanding of the nature of science in students.

Keywords: *Inquiry, Science Learning, NOS*

SE-028-199-DSA-AA263

The Improvement of Scientific Literacy in Pressure Topic Through PBL Model on Junior High School Students

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Abstract. This research aims to analyze junior high school students' scientific literacy improvement through PBL models. This research used mixed methods with embedded experimental type. Subject in this research were VIII-B students of SMP Negeri 1 Malang in the even semester in 2018/2019 academic year which amounted 30 students. The quantitative data were collected through pretest and posttest, while the qualitative data were collected through observations of learning, LKPD answers, and the results of interviews. The quantitative data analysis of normality test using kolmogorov smirnov-one sample test, different test using paired sample t-test, N-gain test, and d-effect size. The qualitative data analysis includes a scatter plot, cross tabulations, student responses of LKPD, and interviews. The results showed that scientific literacy increased through PBL models. The t-test showed the difference between the pretest and posttest values. The results of the calculation of the average N-gain of 0,467 that the increase in the medium category, and d-effect size of 2,351 whose influence in the high category.

Keywords: Scientific literacy, PBL models

SE-038-310-DSA-AA267

Evaluating the Effectiveness of Problem-Based Learning in Enhancing Students's Higher Order Thingking Skills

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Abstract. In today's twenty-fisrt century classroom, students have to acquire high level of competencies in such a way that they become innovative and creative to solve their problems. Only appropriate learning models can facilitate students achieve their high level of thinking skills. In this present study, we report the high effectivity of problem-based learning to give experience for students to think innovatively and creatively. For a more comprehensive exploration, we also performed a qualitative analysis by means of interviews with the students. The problem-based learning was implemented to 30 students in a junior high school in Malang, Indonesia, when they learned human excretory system. Our interviews reveal that the students feel easier in analysing and solving the related problems. These are in line with our quantitative data that there is significant improvement of students tests with *N*-gain of 0.65. In addition, the *d*-effect size of the problem-based learning to higher order thingking skills is 3.57. This is notable that both *N*-gain and *d*-effect size have the same high criteria, which in turns leads to a conclusion that the problem-based learning is effective to boost students's higher order thinking skills.

Keywords: *Problem-based learning, higher order thinking skills, human excretory system.*

SE-039-312-DSA-AA270

Enhancing Scientific Literacy in Analyzing Pressure Topic through PjBL STEM Model

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Abstract. Science education is aimed at students' scientific literacy which is the ability to apply their scientific knowledge in solving problems in everyday life. PjBL-STEM learning can motivate students in activities that are relevant to problems in everyday life. This study aims to analyze the enhancing scientific literacy of eighth grade students of JHS through PjBL-STEM learning on the pressure topic and its application. This research is a mixed method study with the type of embedded experiment. The subjects in this research were students of class VIII-A SMP Negeri 4 Malang in even semester 2018/2019 academic year consisting of 36 students. The sampling technique in this research was purposive sampling. This research has quantitative data and qualitative data. Quantitative data collection techniques used tests. Qualitative data collection techniques used observation and interview some of students. Quantitative data analysis with statistical description, kolmogorov-smirnov test for one-sample test, t-test, d-effect size and N-Gain test. Qualitative data analysis with observational notes from the observer's learning process, LKPD answers, cross tabulation, and the results of interviews with some of students. The results of the study's d-effect size test were 1.14 which was included in the very high category and the results of the N-Gain study were 0.45 which was included in the medium category. The results is showed that learning with the PjBL-STEM model had a very high impact to enhancing of students' scientific literacy.

Keywords: science, PjBL-STEM learning,

SE-041-314-DGA-AA276

The Effect of Integrated STEM in POE Learning Model Towards Analyzing Ability on Work and Energy Concept of 10th Grade Students

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Abstract. Success in learning can be seen through students' ability to analyze a concept of material being studied. This analyzing ability is in the cognitive domain of bloom level C4. In this curriculum of 2013 the demands of students able to analyze tend to be higher than other cognitive domains, one of which is KD 3.9 about work and energy. The topic of work and energy in physics includes complex material and is widely applied to everyday life related to technology. Therefore, there needs to be a learning model that can make students actively involved in analyzing business and energy concepts, one of which is POE (Predict-Observe-Explain) which is integrated with STEM (Science, Technology, Engineering, and Mathematics). This study aims to determine the effect of integrated STEM in the POE learning model on analyzing ability on work and energy concepts of 10th grade students. This study uses quasi-experimental research with the design used is the pretest-posttest control group design. The sampling technique was done by cluster random sampling. The analyzing ability on work and energy concepts was measured using 12 multiple choice test instruments with a reliability of 0.72 with high criteria. This analyzing ability was measured using N-gain from the value of the students' pretest-posttest. Different test of analyzing ability between experimental and control classes was calculated using the T-Test. The results of the T-Test show that significance value = 0.003 < 0.05 means that the analyzing ability of the experimental class is different from the control class. The difference shows that the average N-gain analyzing ability of the experimental class is significantly higher than the control class. Thus, integrated STEM in POE learning model influences the analyzing ability the work and energy concepts.

Keyword: Integrated STEM, POE Learning Model, Analyzing Ability on Work and Energy Concept.

SE-041-314-DGA-AA277

The Effect of 5E Cycle Learning Model Implementation to Students' Critical Thinking Ability on The Activities Analyzing Environmental Pollution

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Abstract. Critical thinking is the ability to make reasonable judgments. Aspects of critical thinking ability include formulating questions, analyzing arguments, assessing the credibility of sources, making deductions and inductions, deciding an action, and evaluating. In 5E Learning Cycle Model (LC 5E) students are encouraged to actively practice critical thinking. This study aimed to describe the improvement of students' critical thinking ability while studying with the LC 5E model in analyzing environmental pollution. The research was mixed method with the embedded experimental type. At each learning, students used worksheets that suitable with the LC 5E model, which includes critical thinking ability. The results of critical thinking exercises were assessed by the assessment rubric, and monitored their progress during the implementation of the LC 5E model. Besides that, the pretest was done before the lesson and posttest after the lesson. The test results were analyzed using the Komogorov-Smirnov test, paired t-test, d-effect size, and N-gain to know the increase quantitatively. Qualitatively, an increase in students' critical thinking ability was analyzed based on his response to the student worksheet. The results of the analysis showed that students' critical thinking ability increased during learning using LC 5E. The increase was indicated by the d-effect with value 2.17 and the N-gain average with value 0.48.

Keywords: Critical, 5E

SE-045-327-DGA-AA299

The Improvement of Higher Order Thinking Skills through Learning Cycle 7E on Analyzing Human Excretion

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Abstract. The objective of this study is to determine the improvement of HOTS by the implementation of Learning Cycle 7E. This study uses mixed methods with embedded experimental type. The quantitative data were collected through pretest and posttest values, while the qualitative data were collected through observations of the learning process, photo documentation, LKPD answers, and the result of interviews. The instruments used in this study are RPP, LKPD, sheet of learning observation, and HOTS test. Quantitative data analysis was carried out by t-test (paired sample t-test) and calculation of impact strength (N-gain and d-effect size). Qualitative data analysis was carried out by scatter plot analysis and students responses to LKPD. The results of the t-test shows t_{count} 38,118 which is greater than the value of t_{table} 2,042, which proves that there are differences in the value of the pretest and posttest. The calculation results of normalized gain (N-gain) shows a value of 0.67 which can be considered as high. The calculation results of d-effect size shows a value of 8.36 which can be considered as very high.

Keywords: HOTS, Learning Cycle 7E

SE-032-264-DGA-AA301

Improving Science Learning Outcomes of Middle School Students through Learning Joyful-Inquiry Interactive Demonstration Assisted by an Android Game

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Abstract. The inquiry interactive demonstration model learning can improve the mastery of students' concepts of learning material through demonstration activities. Learning that utilizes android-based media can increase learning motivation and cognitive achievement of students. This research aims to analyze the improvement of students' cognitive learning outcomes after learning joyful-inquiry-interactive demonstration (J-IID) assisted by android games. This research is a Mixed Methods study of embedded experimental type. This study use the Pretest-Posttest Control Design. The research was in SMPN 5 Malang with the subjects is class VIII B. The sample selection technique used purposive sampling. The results of hypothesis testing using paired t-test showed that there were differences between the pretest and posttest scores. The results of the N-Gain test showed a score of 4.0, which means an increase in student learning outcomes in the medium category. Improved learning outcomes are shown from the increase in the value of the pretest to posttest, which is from 68.74 to 81.42. The d-effect size test results show the effect of J-IID learning has a high impact on improving learning outcomes with a score of 1.03. Based on the data analysis shows that learning using the joyful-inquiry-interactive demonstration model assisted by Android games can improve students' cognitive learning outcomes in human respiratory system material.

Keywords: android, inquiry interactive demonstration model learning.

SE-046-330-DSA-AA308

Influence of STEM Based Learning Cycle toward Students' Critical Thinking Ability

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Abstract. The ability of critical thinking is one of the 21st-century skills. However, the critical thinking ability of Indonesian students is still low. Various instructional efforts were made to improve these abilities, one of which is the STEM-based Learning cycle. STEM-based Learning Cycle is a student-centered learning model and provides them an opportunity to analyze problems independently. They have various points of view and synthesize information independently so that they can solve problems by using critical thinking ability. This study aims to determine the effect of the STEM-based learning cycle on the critical thinking ability of junior high school students on pollution and global warming. Research is a quasi-experiment with one group pretest-posttest design. The sample in this study were students of grade VII of SMP Negeri 4 Malang in the 2018/2019 academic year consisting of 30 students. The instrument is the critical thinking test composed of 20 multiple choice items with a reliability coefficient of 0.81. The results of this study indicate that the STEM-based learning cycle effects to students' critical thinking ability with a *d-effect size* of 1.123. The ability to set the strategy and techniques improves well, while the inference ability has not developed as expected.

Keywords: learning cycle, STEM, critical thinking ability

BE-007-051-DGA-AA41

The Relevance of the Use Metacognition Strategies Towards the Achievement of Student Biology Learning Outcomes of High School Students

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Abstract. Previous research has suggested that training students' metacognition strategy skills can improve student learning outcomes. However, this research was examined the relevancy between metacognition strategies toward learning outcomes achievement of high school student in learning human reproductive system, with descriptive method. Population was 11th grade students subdistrict North Tambun, Bekasi. The sample consisted of 100 students of 11th grade high school who had been studying human reproductive system in biology major, with two stage random sampling that combined between cluster random sampling and individual random sampling . The data were collected by test method for student learning outcome with cognitive processes of Bloom's Taxonomy (C1 until C4) and Metacognition Strategy Questionnaire, it used to classify student into same group (students with Self-awareness Strategies (A), Modifying Strategies (B), Imitation Strategies (C), or other strategies finding (D, E, etc)). Data were analysed using software SPSS 20. The analysis found that: 1) Students use 3 types of metacognition strategies during learning of human reproductive system 2) Students who use the tendency of type A metacognition strategies (self-awareness) obtain higher score compared to Modifying (B) metacognition and Imitation (C) 3) Metacognition strategies was relevant with score of taxonomy of cognitive C1, C2, C3, and C4.

Keywords. *Metacognition Strategies, Biology Learning Outcomes*

BE-010-064-DGA-AA151

A Brief Explaination of Problem-Based Learning by Its Advantage, Disadvantage and Effect Upon Student's Scientific Literacy : An Experimental Research

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Abstract. Various researches revealed that the scientific literacy skill of Indonesian student's is low. Based on previous research it was known that Problem-Based Learning (PBL) could enhance student's scientific literacy skill, however PBL could give heavy cognitive load during investigation process. This research aimed to understand the effect of process diagram in PBL on student's scientific skill in XI grade biology learning as an alternative in optimizing PBL. This research was a quasy-experiment research which used pretest posttest simple randomized control group design. The data of scientific literacy was collected from pretest and posttest and will be analyzed using ANACOVA. The result showed that there was no difference in student's scientific literacy skill taught by PBL with process diagram and PBL without process diagram. This research showed that the syntax of PBL itself could enhance student's scientific literacy skill without giving heavy cognitive load, thus PBL had no disadvantage upon student's scientific literacy.

Keywords : Problem-Base Learning, scientific literacy, experimental research

BE-015-098-DSA-AA69

Integration of Inquiry and Characteristic Values Teaching Model Effects towards Science Process Skills on Gender Differences of SMAN 7 Malang Student

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Abstract. Biology as part of science contains of product, process, and attitude. Students' knowledge is expected to come from process of finding known as Science Process Skills (SPS). Sciemce Process Skills had to be trained through teaching model so that students are facilitated to develop the skills. Internal factor contributed to the development of the skills is gender difference. The 2013 Curriculum stated that character values had to be habituate through learning process. Observation conducted in the XI grade of SMAN 7 Malang during August-September 2018 found that the learning process is dominated by teacher lecture and assignments that had not promoted Science Process Skills yet, and good character values were less reflected from the students' behavior. The development of Science Process Skills can be facilitated through inquiry. This study combines guided inquiry and character values to teach biology to 11th grade students to promote science process skills. The study conducted by quasi experimental research with pretest-posttest non equivalent control group design. Research subject were two classes of grade XI SMAN 7 Malang. Each class consisted of 34 students. Data were measured by validated observation instruments and was analyzed by Anacova. The results of the study were: 1) the implementation of inquiry and character values teaching model improved science process skills (p=0,000), 2) both male and female students showed science process skills at the same level (p=0,394), 3) implementation of inquiry and character values teaching model improved science process skills better in female students (p=0,010).

Keywords : Inquiry, teaching model effect, science process skills

BE-018-109-DSA-AA57

The Influence of Inquiry Learning Integrated Nature of Science Toward Critical and Creative Thinking Skills

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Abstract. Critical and creative thinking skills are very important to develop in students to meet the demands of 21st Century life skills. These skills can be developed through learning that involves active students in physical and mental activities, such as inquiry. The purpose of this study was to determine the effect of inquiry learning integrated the nature of science towards critical and creative thinking skills. This study is a quasi-experimental non-randomized pretest posttest control group design involving students at class VII UM Laboratory Middle School. The class used as the experimental class is class 7d with 30 students who are taught using integrated science essence and 7c class as a control class with 30 students to be taught using the verification practicum module. The data about critical and creative thinking skills were taken using description questions given before and after learning. The data was analyzed using ANAKOVA test. The results showed there is a significant difference between the critical and creative thinking skills of the experimental class and the control class with with a value of p (0,000) <α (0.05). This shows that inquiry integrated nature of science is one of innovative learning that is able to improve critical and creative thinking skills.

Keywords : Inquiry, critical, creative thinking skills

BE-039-180-DGA-AA118

The Effect of RICOSRE on Student Critical Thinking Skills in Biology

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Abstract: Critical thinking skills are the 21st century skills that learners need to develop. Therefore, a learning model implemented in biology classrooms has to facilitate the development of student critical thinking skills. The aim of this study was to investigate the effect of RICOSRE on student critical thinking skills. This study involved 99 students from Public Senior High School Number 1 (SMAN 1) in Turen, Malang, Indonesia and employed a pretest-posttest nonequivalent control group design. An ANACOVA analysis at a significance level of 0.5% ($p < 0.05$) and LSD test 5% were performed to test the hypothesis. The results showed that the learning model had an effect on the students' critical thinking skills. The students' critical thinking skills have been improved by 79.91% through RICOSRE, 19.00% through PBL, and 5.15% through a conventional learning model. These findings suggest that RICOSRE has the greatest impact on student critical thinking skills; thus, it is highly recommended for biology learning.

Keywords: critical thinking skills, RICOSRE learning model

BE-039-180-DGA-AA119

Science Process Skills and Cognitive Achievement: An Examination of Two Different Models of Learning Biology at the Tenth-Grade Level

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Abstract. Higher order thinking skills including science process skills are the foundation to achieve better cognitive learning outcomes. This study aimed to investigate the correlation between the science process skills and cognitive achievement of 171 high school students from Malang and Singosari, Indonesia. The research data were gathered from the pretest and post-test conducted with regards to the implementation of RICOSRE and PBL. The results showed that there was a significant correlation between the students' science process skills and cognitive achievement. The students' science process skills have contributed 89.1% to their cognitive achievement on RICOSRE and 75.9% on PBL. These figures demonstrate the extent to which the participants' science process skills are correlated with their cognitive achievement on each learning model implemented in this study. Based on these findings, it is obvious that RICOSRE is more potential in developing student science process skills and cognitive achievement.

Keywords : science process skills, cognitive achievement, RICOSRE, PBL

BE-046-240-DGA-AA199

RQA Learning Model in the Biology Classroom and its Effect on Students Metacognitive

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Abstract. Student metacognitive empowerment cannot be separated from the learning strategy used in the classroom. One of learning strategy that believed to be able to empower student metacognitive learning strategy is Reading, Questioning, and Answering (RQA). This research aims to determine the effect of RQA learning strategy on student metacognitive in the biology department, FKIP Universitas Sulawesi Barat. The research design used quasi-experimental with Pretest-Postest Nonequivalent Control Group Design. The population in this study are 100 students who programmed low plant taxonomy courses, which were divided into two classes, the experimental class, and the control class. The results of the research data were analyzed using covariance analysis on SPSS software version 23 for Windows and performed at a significant level of 5%. The research instruments used observation sheets and written tests. The results showed that the RQA learning strategy had a significant effect on student metacognitive, where students who taught with RQA learning strategy had better metacognitive compared to students who without learning the RQA learning strategy. Thus, the RQA learning strategy can empower student metacognitively.

Keywords : RQA learning model, Metacognitive, Biology Classroom

BE-019-110-DSA-AA60

The Influence of Science Learning Based on Inquiry Integrated with Nature of Science (NOS) towards Students' Attitudes and Interests in Science

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Abstract. Attitude is a mental position related with facts, feelings, and emotions toward facts or situations. Interest is defined as feeling interested with something, feeling caring, important, and positive feelings about it. Attitudes and interests are factors that influence the process and student learning outcomes. Students' attitudes and interests can be well developed through active learning processes such as inquiry. The aim of this research was to know influence learning based on inquiry and integrated with *Nature of Science* (NOS) towards student attitudes and interests. This research was a quasi-experimental with a non-randomized pretest-posttest control group design. The research was conducted in class VIII of the Laboratory Junior High School of Universitas Negeri Malang. Class VIII-C used as the experimental class with 30 students using inquiry-based learning integrated with NOS. Class VIII-G as the control class with 31 students using learning modules and discussion. Data about the student attitudes and interest were obtained by using a questionnaire that was valid and had been filled in by students before and after the learning process. The results showed differences in attitudes and interests of students in the experimental class and the control class based on the results of the Anacova test with a significance value of p (= 0,000) <α (0.05). This showed that inquiry-based learning integrated with NOS is done able to improve students' attitudes and interests in learn.

Keywords : Nature of Science (NOS), Inquiry

BE-021-113-DGA-AA88

Analysis The Development of EXAIR Learning Model based on BBL (Brain-Based Learning) and its Effect on Learning Outcome on Secondary School in Coastal Area

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Abstract. Coastal area is a marginal area with low education. The orientation of coastal communities lies in work not education. This causes a low quality of education in coastal areas. So that education needs to be improved through fun learning. One of the fun learning is BBL (Brain-Based Learning) approach combined with EXAIR learning model (combination of Example Non Example and AIR learning models). The Brain-Based Learning approach optimizes the brain's work in learning and creates a pleasant learning environment. This purpose of study is to create new learning models and to improve the learning outcomes of junior high school students especially in coastal areas. The study was conducted using the 4D development method (define, design, develop, disseminate), but only until the develop stage. The define phase generates knowledge, the design phase produces a prototype model, and the develop phase produces a manual for BBL-based EXAIR learning models. Data analysis techniques used Anakova analysis. The overall product validation results were 84.47% with a very valid category. The effectiveness of learning outcomes is 0.43, with the medium category. The practicality of the results of the teacher's response is 70.38 and the student response results are 87.17 with a very practical category. The results showed that the learning outcomes significantly affected the BBL-based EXAIR learning model with a probability value of 0.00 <0.05.

Keywords : EXAIR, Learning Model, BBL (Brain-Based Learning)

BE-022-116-DSA-AA61

The Impact of Science Learning Based on Inquiry Integrated with Nature of Science towards Communication and Collaboration Skills

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Abstract. Communication and collaboration are skills that are very needed in the 21st century. These skills can be developed through learning that empowers student activities to conduct investigations, one of which is science learning based inquiry integrated with Nature of Science (NOS). The purpose of this study was to determine the impact of implementing science learning based inquiry integrated with NOS towards communication and collaboration skills. This study was a quasi-experimental study using a nonrandomized control group pretest-posttest design. The research subjects were students of VII-D class as an experimental class with 32 students which are treated with science learning-based inquiry integrated with NOS and students of VII-C class as a control class with a total of 31 students which are treated with module-based learning at SMP Laboratorium UM. Data of communication and collaboration skills are obtained through observation activities measured by observation sheets of communication and collaboration skills. The data obtained were analyzed using the Covariance Analysis test and the results of the study showed a significant difference between the value of communication skills and collaboration skills of the experimental class and the control class with a value of p (0.008 and 0,000) < α (0.05). This shows that science learning-based inquiry integrated with NOS is able to improve communication and collaboration skills.

Keywords : Science Learning Based, Communication, Collaboration Skills

BE-024-128-DSA-AA72

Guided Inquiry Combined with Edutainment in Increasing Junior High School Students' Learning Interest

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Abstract. Learning activities determine the success of students in learning. Learning is an activity that requires comfort to foster students' interest. Interest is the feeling of being happy, interest ed, willingness to be involved in activities so it shows a positive change. Interest related to attitudes toward science, learning atmosphere, learning difficulty, and learning commitment. The aim of this study was to determine the effect of guided inquiry model combined with edutainment in increasing the students' learning interest. This study used a quasi-experimental design. The population in this study were VIII grade students of SMP Negeri 18 Malang while the sample were class VIIIG (experimental class) which was taught with guided inquiry combined with edutainment, VIIIH (positive control class) which was taught with guided inquiry and VIIIE (negative control class) which was taught with conventional learning model. The instrument used was a validated learning interest questionnaire. Students' learning interest questionnaire contains 50 statements done by students before and after the learning process.The results of the test with Ancova showed that F_{value} is 5.919 with P_{value} is (0.004) $<\alpha$ (0.05) which means that there is a significant difference between the experimental and control classes toward students' learning interest. Based on the result, the guided inquiry learning model combined with edutainment has an effect on increasing student learning interest compared to guided inquiry and conventional model.

Keywords : Guided inquiry, edutainment

BE-026-131-DSA-AA68

The Effectiveness of Teaching Materials About Management Invasive Alien Species *Acacia Nilotica* (L.) Willd. Ex Del. Through Problem Based Learning (PBL) Toward Students Scientific Literacy and Cognitive Learning Outcomes

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Abstract. Scientific literacy is a fundamental skill that must have to confront demands life in 21st century. Based the analysis, scientific literacy skills and understanding of students who have taken courses Natural Resource Management still low. One material that not been learned in depth is management invasive alien species, using the example invasion *Acacia nilotica* in Baluran National Park. Invasive alien species problems that occur in contextually suitable manner learned by problem based learning model. The purpose of this research and development is to produce effective teaching materials for students scientific literacy and cognitive learning outcomes. Teaching materials developed by ADDIE model, then applied with one group pretest posttest experimental design. The results of the study can be seen the effectiveness teaching materials for 5 indicators of scientific literacy as measured by the gain score shows that range values between 0,3-0,7 which means the effectiveness teaching materials have low until high category. The effectiveness teaching materials to improve cognitive learning outcomes from the 5 indicators that have been measured have the medium category because it has value range between 0,4-0,6. The conclusions of this study are teaching materials effective to improve students scientific literacy and cognitive learning outcomes.

Keywords : Problem base learning, Scientific Literacy, Cognitive Learning

BE-039-180-DGA-AA120

RICOSRE for the Empowerment of Student Creative Thinking Skills

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Abstract: This study aimed to examine the effect of RICOSRE on the tenth graders' creative thinking skills, compared to PBL and conventional models. This study involved 86 students from Public Senior High School Number 1 (SMAN 1) Turen and employed a pretest-posttest non-equivalent control group design. The pretest and post-test consisted of 8 essay questions each. The students' scores were analyzed using ANACOVA and LSD test. The results indicated a significant effect of RICOSRE on the students' creative thinking skills. The students' average score on creative thinking increased considerably (76.59 %) on RICOSRE and PBL (12.72%) and decreased on conventional learning by 3.96%. It is clear that RICOSRE can be implemented to empower student creative thinking skills.

Keywords: creative thinking skills, RICOSRE, PBL

BE-039-180-DGA-AA121

The Correlation between Student Scientific Argumentation Skills and Cognitive Achievement on Two Learning Models in Biology Classes

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Abstract: Scientific argumentation skills are the 21st century skills that need to be empowered in biology learning because these skills are essential for the students to understand, reason, analyze, and solve a problem. This correlational study was conducted to examine the extent to which students' science argumentation skills were correlated with their cognitive achievement. This study made use of the participants' pretest and post-test scores on science argumentation skills and cognitive achievement. These tests were carried out before and after implementing PBL and RICOSRE. The participants of the study consisted of 175 senior high school students from Malang and Turen, Indonesia. A simple linear regression analysis was run and the results indicated that there was a significant correlation between the students' science argumentation skills and cognitive achievement. It was found out that the students' science process skills have contributed 64% to their cognitive achievement on RICOSRE and 82.8% on PBL. Compared to RICOSRE, PBL has been reported to be more effective in promoting students' science process skills and cognitive achievement.

Keywords: scientific argumentation skills, cognitive achievement, RICOSRE, PBL

BE-052-265-DGA-AA213

Improving Collaboration Skill through Discovery Learning Model Combined with Jigsaw II

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Abstract. Discovery Learning combined with Jigsaw II is a combination of learning models with syntax (1) reading, (2) expert group discussions (stimulation, problem statement, data collection, data processing, verification, and conclusion), (3) team reports, (4) tests, and (5) recognition. This study aims to determine the differences in the collaboration skills of students who are taught with various learning models. This research is a quasi-experimental study with the design of the nonequivalent control group design. The subjects used were 134 tenth grade students at MAN Bangkalan. The results showed that the F value was 16.527 with a significant level of 0.000<0.05. Based on the results of LSD's advanced test, it can be seen that discovery learning combined with Jigsaw II is significantly different from discovery learning and conventional learning, but not significantly different from Jigsaw II. It can be concluded that the collaboration skills of students taught by discovery learning combined with Jigsaw II were higher than positive controls, namely discovery learning and Jigsaw II, and higher than the negative control, namely conventional learning.

Keywords: Collaboration Skills, Discovery Learning, Discovery Learning Combined with Jigsaw II, Jigsaw II

BE-053-267-DSA-AA214

Implementation of Problem Based Learning (PBL) Model Assisted Mind Map to Enhance Student's Critical Thinking Skill and Learning Outcome in the Biology Classroom SMAN 8 Malang

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Abstract. Indonesian Curriculum (2013 Curriculum) emphasizes the formation of competencies and character of students. Education in schools must be directed so that not only on assignments and understanding scientific concepts but also on improving the ability to think, for example, critical thinking. This research is a Classroom Action Research (CAR) which aims to describe the learning process using PBL models assisted by mind maps in improving students' critical thinking skills. The research scene was carried out on 31 students of class XI MIPA 5 of SMAN 8 Malang City. The results showed PBL learning assisted with mind maps with the syntax of student orientation on the problem, organizing students to conduct investigations, investigating individuals and groups, developing and presenting works assisted mind maps, and analyzing and evaluating the problem-solving process can be carried out very well. Students' critical thinking skills experienced an increase from the N-gain score of 0.19 with the low category in the first cycle to 0.36 with the moderate category in the second cycle. From the results of the study, it can be concluded that problem-based learning (PBL) assisted by mind maps can improve students' critical thinking skills.

Keywords: critical thinking skills, mind maps, problem-based learning

BE-055-270-DSA-AA225

Implementation of Discovery Learning Model combined with Think Pair Square Share (TPSS) to Improve Critical Thinking Skills of Class XI MIPA 3 Student's of SMAN 1 Tulungagung

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Abstract. Critical thinking skills are useful for someone to be able to process, evaluate, and make decisions based on their knowledge. The low level of critical thinking skills is due to the use of strategies that lack the opportunity for students to empower their thinking skills in learning activities. Class action research aims to improve critical thinking skills by applying the Discovery Learning model combined with TPSS with stimulation and thinking syntax, problem identification and pairing, collecting data and groups, processing data, proving, generalizing, and communicating. The study consisted of the stages of planning, action, observation, and reflection with research subjects 32 students of class XI MIPA 3 SMAN 1 Tulungagung. The results of the study indicate that learning with the Discovery Learning model combined with TPSS is very well implemented. Critical thinking skills as measured by critical thinking questions have increased from cycle I to cycle II. Based on the results of the study indicate that the Discovery Learning learning model combined with TPSS can improve students' critical thinking skills.

Keywords: Discovery Learning Combined Think Pair Square Share, cognitive learning outcomes, critical thinking

BE-041-185-DGA-AA254

Life-Based Learning: Two Trajectories of Students in Biology Education Program

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Abstract. Life-based learning (LBL) offers new sight to conduct an effective way to engage with the 21st century education. As a pioneer of innovative learning university, Universitas Negeri Malang has been developing a new curriculum named Curriculum 2018 which is underpinned by life-based learning approach. This paper is a preliminary attempt to examine the perspective of students in biology education program who are in the twofold condition which is as a curriculum target and as a curriculum developer. In order to investigate the students' perception on LBL, we employed students' reflective essays about LBL approach which has been explicitly implemented in the innovation biology classroom module. In our replications, there are four elicited aspects of students as a curriculum target namely the students' awareness, attitude, development and impact of LBL implementation. In same way, the students' point of view as the further developer of LBL obtained four aspects that included interest, motivation, challenge and strategy to implement the LBL in their future classroom setting. The implication of our inquiry is to improve the enactment of current curriculum and to promote the implementation of LBL in the higher education or school context.

Keywords : Life-Based Learning, Biology Education

BE-059-293-DSA-AA253

Fostering Student' Critical Thinking Skills in Respiratory and Excretory System Classroom through 5E's Learning Cycle in 11th Grade SMAN 2 Malang

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Abstract. Critical thinking skills must be part of student learning and the school must be responsible for developing and evaluating critical thinking skills through the teaching and learning process. Fostering of critical thinking skills can be done by applying appropriate learning in the classroom. One of them is learning based on constructivism. LC 5E learning can trigger students' critical thinking skills, because it involves prior knowledge, non-routine situations, reasoning, cognitive strategies, and involving students in discussions to carry out exploration. This study aims to determine how LC 5E learning can improve critical thinking. The type of research used in this research is Classroom Action Research. Research data in the form of critical thinking test results by Watson-Glaser Critical Thinking Appraisal. The results showed that the average value of critical thinking indicators in the first cycle was 82.806% and the second cycle was 90.016% with an increase of 7.21%. The conclusion is that LC 5E learning can improve students' critical thinking.

Keywords: Learning Cycle 5E, critical thinking skills

BE-061-300-DSA-AA260

Implementing Group Investigation (GI) Learning Model combined with Socio Scientific Issue (SSI) to Improve Students' Problem Solving Skills in XI Grade IPA 4 SMAN 2 Malang

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Abstract. Problem solving skills in students' daily lives are very needed in the teaching and learning process in the classroom. These skills can be done in group learning by discussing controversial issues in the social scientific community. This study aims to find out how implementing Group Investigation (GI) learning model combined with Socio Scientific Issue (SSI) to improve students' problem solving skills in XI gradeIPA 4 SMAN 2 Malang. The type of research used was Classroom Action Research. The research data is in the form of quantitative and qualitative data. Quantitative data shows the results of the average value of n-gain problem solving skills of 0.57 students in the first cycle with medium criteria and 1.1 with high criteria in cycle II. Qualitative data shows that the application of this model can facilitate students in reviewing and evaluating the truth of facts or myths originating from controversial issues, training students to conduct independent investigations on understanding concepts related to science material by presenting solution recommendation ideas, planning learning actions and applying these actions in learning in the classroom independently, foster motivation and self-confidence of students in their opinions, argue and open to each other in describing the insights they have. Students were also trained to solve problems using a scientific approach as indicated by the fulfillment of stages of problem solving skills in making the right decisions. The conclusion of the overall results shows that the application of the SSI integrated GI learning model has been shown to improve understanding of concepts and problem solving skills of students.

Keywords: Group Investigation, Socio Scientific Issue, Problem Solving Skills

BE-062-301-DSA-AA259

A Comparison of the Effects of Problem-Based Learning and Think Pair Square on Students' Critical Thinking Skills and Learning Outcomes in Biology Classroom

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Abstract. Critical thinking skills are needed by students as a bridge of thinking in order to solve increasingly complex problems. Empowerment of critical thinking skills and cognitive learning outcomes can be done by applying appropriate learning in the classroom. One of them is learning based on constructivism. Problem-Based Learning is focused on improving students' thinking skills. Think Pair Square learning, whose main focus is social skills and academic achievement, can also empower students' critical thinking skills. This study aims to: (1) determine the differences in students 'critical thinking skills in Problem-Based Learning and Think Pair Square (2) to find out the differences in students' cognitive learning outcomes in Problem-Based Learning and Think Pair Square learning. The research design used in this study was embedded design. Quantitative data were collected through pretest and posttest then analyzed with Anacova. While qualitative data were obtained through interviews, observation and student performance. The results showed that Think Pair Square learning was different from Problem-Based Learning in improving students' critical thinking skills, with p-value 0.008 smaller than α (0.05) and average values of 75.5 and 71.2 respectively. Whereas in the student cognitive learning outcomes variable, obtained p-value 0.04 smaller than 0,05 with the average posttest value of Think Pair Square learning and Problem-Based Learning respectively at 82.7 and 80.5. Therefore, it was concluded, Think Pair Square learning was better to empower critical thinking skills and cognitive learning outcomes of students compared to Problem-Based Learning.

Keywords: Problem-Based Learning, Think Pair Square, critical thinking skills, learning outcomes.

BE-041-185-DGA-AA278

Teaching Creative Thinking Skills: Promoting Creativity More Visible in Undergraduate Students of Biology Education

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Abstract. As the society construes the current era as a destructive century, the adaptability, flexibility and innovation are widely deliberated becoming the key points to survive from life challenges. Creativity is one of four core skills that is conceived be able to foster those three features. Variety strategies and approaches have been developed to prompt this skill in the classroom context. This qualitative study analyses the reflection of pre-service biology teacher on their own creativity and their foresight as a future teacher to promote creativity in their classroom further. To examine those two perceptions, we employed the modelling strategy using teaching visible thinking approach integrated with the biology context. Afterwards, the students reflected their experience about bearing with creativity's four indicators – fluency, flexibility, elaboration and originality- and the way to promote them on their reflective essay. They were 25 students participated in this study within three learning cycles setting. The majority of participants showed the positive sentiment about the strategy. The other interesting findings conveyed that the students found themselves had difficulties in articulating the fluency and elaboration. Furthermore, they also showed the eagerness to learn more about the teaching strategy to be implemented in their future classroom setting.

Keywords : Creative thinking, undergraduate, creativity

BE-068-311-DSA-AA272

Effect of Problem Oriented Project Based Learning (POPBL) towards Student's Problem Solving Skills in X Grade SMA Negeri 8 Malang

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Abstract. Based on previous researches, it can be concluded that an proper learning model is needed to foster students' 21st century skills through learning activities. POPBL is a learning model that is in accordance with the scientific approach. Based on the results of the preliminary study at SMAN 8 Malang, the percentage of problem solving skills was 64% and included in the sufficient category. This research was a quasy a experimental which implies nonequivalent pretest posttest control group design. This research aims to known the effect of the POPBL on students' problem solving skills. The sample used in this study were from two groups taken by cluster random sampling technique. The data collection was done by tests. The results of this research showed that the p value of the Anakova test was 0,000 < α = 0.05, so it could be concluded that students who were taught using POPBL had higher increased scores on problem solving skills (23.46%) than students who were not taught using POPBL (15.32%).

Keywords: Problem Oriented Project Based Learning, problem solving skills

BE-075-353-DGA-AA332

The Effectiveness of Brain Based Learning Model (BBL) Integrated With The Whole Brain Teaching (WBT) Model on The Students' Metacognitive Skills of Public Junior High Schools in Malang on Science Lesson In 2017/2018 Academic Year

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Abstract. This study aims to see the effectiveness of the Brain Based Learning (BBL) model which is integrated with the WBT model to students' metacognitive skills. This research was a quasi experiment using *pretest posttest Non-equivalent Control Group design.* The population of this research was the students of State Junior High Schools in Malang in the 2017/2018 academic year. The samples were selected from State Junior High School 1, State Junior High School 4, State Junior high School 6, State Junior High School 8, State Junior High School 15, State Junior High School 17, Junior high school 25 and Junior High School 26. The results of the data analysis showed that the learning model provides significant effect on the metacognitive skills of students' science learning in Junior High schools in Malang. LSD test reults showes that effect of the BBL model integrated with WBT (WBBL) model is significantly different from the WBT model, BBL model and conventional models, where the WBBL model is 10.16% higher than the metacognitive skills in the BBL model, 10.98% higher than WBT models and 26.63% higher than conventional learning.

Keywords: Brain Based Learning, Whole Brain Teaching, Metacognitive Skills

SE-036-287-DSA-AA346

Analysis Creativity Of Students With Global Heating STEM Learning

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Abstract. One way to study science is to use existing skills in the 21st century. 21st century skills are important for students because they can train students to convey solutions to problems around them. One of the important skills possessed by students is creativity and innovation. With creativity students are able to identify problems and make solutions to overcome these problems. STEM is one of the lessons that can be used to enhance student creativity, because in STEM learning links 4 disciplines, namely science, technology, engineering, and mathematics. Increased creativity was measured using 4 generic creativity description questions adapted from Torrance Test of Creativity Thinking (TTCT). Quantitative data were analyzed using paired sample t-test, N-gain test, and d-effect size test. Qualitative data is analyzed using student activities and products produced by students. The t-test results were obtained at 18,815. The results of the d-effect size are 3.649 and the N-gain results are 0.645 with the upper medium category.

Keywords: STEM, Creativity, Global Warming.

Students' Understanding, HOTS, mental model and other issues in Mathematics and Science Education

ME-015-044-DGA-AA10

Relationship between Creativity and Learning Style and Mathematics Learning Achievement of Students of SDN in Surakarta

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Abstract. The research aims to prove the joint effects of creativity and learning style on students' mathematics learning achievement and the relationship between creativity and learning style and mathematics learning achievement of elementary school students in Surakarta. This correlational and ex post facto research uses a quantitative approach, with the sample consisting of fifth grade students at the State Elementary School in Surakarta. The samples are 63 students randomly taken from representatives of SDN Kestalan, SDN Cengklik, and SDN Yosodipuro. The data are collected by distributing questionnaire and documenting. Questionnaire is for getting data on creativity and learning style, while documenting is for obtaining data on mathematics learning achievement. The hypothesis is tested using multiple and correlational regression tests. The results of the research indicate: there is a positive and significant relationship between creativity and learning style and mathematics learning achievement of fifth grade students of SDN in Surakarta, as seen in regression equation $\hat{Y} = 47.155 + 0.218\ X_1 + 0.090\ X_2$, with correlation coefficient value of 0.885 and the determination coefficient value of 0.783, showing that creativity and learning style determine mathematics learning achievement by 78.30%; there is a positive and significant relationship of creativity with mathematics learning achievement of fifth grade students of SDN in Surakarta, as seen in regression equation $\hat{Y} = 63.310 + 0.199\ X_1$,with correlation coefficient value of 0.808 and determination coefficient value is 0.653, meaning that 65.30% of variance in mathematics learning achievement is influenced by creativity variable; there is a positive and significant relationship between learning style and mathematics learning achievement of fifth grade students of SDN in Surakarta, as seen in regression equation $\hat{Y} = 42{,}692 + 0.442\ X_2$, with correlation coefficient value of 0.854 and determination coefficient value of 0.729, meaning that 72.90% variance in mathematics learning achievement is influenced by learning style variable.

Keywords : Creativity, Learning Style, Mathematics Learning Achievement

ME-021-073-DSA-AA22

Problem Solving Geometry of Primary School Teacher Education Student's Through Polya Stage: Devising a Plan in terms of Mathematical Capabilities

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Abstract. Solving problems is a thought process for finding solutions through stages systematically. This study aims to obtain the reasoning profiles of elementary school teacher education students in solving a geometry problem. This research is qualitative research. Data is obtained through problem-solving tasks, interviews, and documentation. The geometry problem given is flat field material. The subject of this study was a female college student from UHO Primary School who had a level of mathematical ability in the medium category. The results of this study indicate that 1) the subject reveals the planning strategy that will be used in solving problems and logical arguments; 2) the subject reveals the concepts and principles that will be used in solving problems and logical arguments; 3) the subject reveals the role of each concept and principle that will be used to solve the problem and logical argument.

Keywords: problem solving geometry, Polya stage, mathematical capabilities

ME-023-078-DSA-AA27

How Occlusion and Unlearning Caused Students' Retroactive Interference in Solving LCM and GCF Problems?

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Abstract. Interference is a thingking disorder experienced students in information retrieval disturbed by other information that has the similar concept. This is a descriptive qualitative research. The primary interest was to find out the occurence of interference experienced students in solving LCM and GCF problems. The task was designed and given to thirty students. Data studied are subjects' test result and interview transcript. The result showed that there is one students experienced retroactive interference caused by occlusion and unlearning. The description of each cause of interference will be discused further in this article.

Keywords: retroactive interference, occlusion and unlearning, LCM and GCF

ME-025-084-DSA-AA31

Student's Quantitative Reasoning in Problem Solving Based on the Cognitive Style

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Abstract. Quantitative reasoning plays an important role for students in solving problem. This research is qualitative descriptive, which aimed at describing the students's quantitative reasoning in solving problem based on the cognitive style. Two female students of the 7th grade of the Ma'arif Sukorejo Junior High School, were selected from the higher score in the mathematics test and represent for cognitive style with carried out group embedded figure test. The chosen students were asked to solve mathematics problem and were interviewed. Student with field dependent cognitive style not revealed the entire quantitative informations and relationships between quantities that presented. In contrast, student with field independent cognitive style were able to revealed the entire quantitative informations that presented in the form of tables and diagrams, and explained the relationship between these quantities. This study suggests that teachers should give more exercises to field dependent students to develop their quantitative reasoning through the appropriate teaching and learning.

Keywords : Quantitative, problem solving

ME-026-086-DGA-AA33

Students' Errors Analysis in Solving the Geometry Word Problem Base on Newman Stage

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Abstract. This study aims to identify students' errors analysis in solving the Geometry word problem base on Newman stage. This type of research is qualitative descriptive research. Subject selection was done by purposive sampling technique. Data obtained from the results of tests and interviews. Based on the results of the study, it was found that students with high abilities made mistakes in writing skill and encoding stage, students with middle abilities are making mistakes at the transformation, process skills) and encoding stage, while student with low abilities are making mistakes at the comprehension, transformation, process skill and encoding stage.

Keyword : Error Analysis, word problem, geometry, Newman stage

ME-028-091-DGA-AA82

Exploring the Creative Mathematical Reasoning of Mathematics Education Student through Discovery Learning

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Abstract. Discovery learning is one of learning model that can improve creative thinking skill. Also, it can develop students' creative mathematical reasoning. Creative mathematical reasoning is a reasoning process include: novelty, plausibility, and mathematical foundation. This research is aimed to describe students' creative mathematical reasoning on geometry of mathematics education department. The collecting of data is based on the observation and individual evaluation of students. The result of this research is: there are three characteristics of students' creative mathematical reasoning based on individual assignment: (1) novelty, plausibility, and mathematical foundation, (2) novelty and mathematical foundation without plausibility (3) novelty without plausibility and mathematical foundation. Based on the result shows that from students' data: (1) novelty, math foundation and plausibility is 35.48%, (2) novelty and mathematical foundation 58.06% and (3) novelty skill is 77.42%.

Keywords : Discovery learning, Mathematics educations

ME-030-094-DSA-AA50

Student Reflective Abstraction of Impulsive and Reflective in Solving Mathematical Problem

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Abstract. The student's reflective abstraction ability in solving problems is necessary, because the result of a person's reflective abstraction is a scheme used to understand something, finding solutions or solving problems. In addition, reflective abstractions are essential to higher mathematical logical thinking as occurs in logical thinking in children. . Therefore, to develop a reflective abstraction notion of high-level mathematical thinking, it is necessary to separate what is an important feature of reflective abstraction, reflect its rules on higher mathematics, recognize and reconstruct it so that a similar theory of knowledge Mathematics and its instructions. The purpose of this research is to describe student reflective abstraction of impulsive and reflective in solving mathematical problem. The method used in this research is descriptive qualitative. Research subjects were four students of Mathematics Education study program semester 2. The result of research shows that the students in cognitive impulsive style do not carry out a reversal process because they are unable to reverse the results obtained. But the process of interiorization and coordination can be done well. The student in cognitive reflective style students can do the process of interiorization, coordination, encapsulation, reversal well but in the weak generalization process

Keywords : Mathematics problem, reflective

ME-032-101-DSA-AA38

Student Mathematical Problem Solving Analysis in Polya Stages based Mind Map and Newman Error

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Abstract. This study aimed to analyze the errors of students in mathematical problem solving through thinking structure in the mind map structure. The study method is a qualitative descriptive involving 28 students of eight grade class in SMP PGRI I Wagir who have received linear system with two variables material. Students are given two linear system with two variables problem. Polya problem solving process stages on the linear system with two variables problem analyzed with student mind map and Newman error. The results showed that the students' fault are *reading error* at understanding the problem stage, c*omprehension error* at understanding the problem stage, *comprehension error* at understanding the problem stage, *transformation error* at designing the settlement of the problem stage, *process skill error* at working solve plan stage.

Keywords. Error analysis, Problem Solving, Thinking Structure, Mind Map, Mathematic, Newman Error, Polya Stage.

ME-033-102-DGA-AA106

Characteristics of Student Statistical Reasoning in Mathematical Problem Solving

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Abstract. The purpose of this study is to describe the characteristics of statistical reasoning in mathematical problems solving. The characteistical of statistical reasoning are: relational, synthesis, understanding, explain, inference, and interpretation. Respondents in this study were 2 MIPA high school students in Malang. The instrument of this research is written test questions about mathematical problem solving and semistructural interviews conducted to reveal more deeply the students' statistical reasoning in mathematical problem solving. The results showed that the students' statistical reasoning characteristics were as follows: 1) relational: students can connect several concepts such as the concepts of space-building volume, comparison of numbers, and system concepts of one-variable equations in mathematical problem solving, 2) synthesis: students can combine various ideas in mathematical problem solving, 3) understanding: students understand the information contained in the problem, understand the steps to solve the problem, 4) explain: students are sble to explain the process of presenting data, the process of analyzing data until the decision making process of which shipping service to choose, 5) inference: students are able to choose the "DEF Express" shipping service to send their order book, and 6) interpretation: students are sble to make decision that the cheapest shipping service costs are chosen.

Keywords: reasoning, characteristics, mathematical problems solving, statistical reasoning.

ME-033-102-DGA-AA240

Intrinsic Cognitive Load of Students in Solving Problems Linear Program

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Abstract. This research aims to describe the intrinsic cognitive load of students in solve linear program problems. This research method used id the research method qualitative with a descriptive approach. This research subject is students with incomplete problem solving steps. The cognitive intrinsic load of students is known based errors and difficulties experienced by students when solving programs linear. The results of the study are students experiencing a burden cognitive intrinsic in solving problems of linear programs that are characterized by existence difficulties and errors in students. Students have difficulty understanding problems, determining symbols, determine objective functions, determine mathematical models, determine equation of line, draw a graph, determine the maximum value.

Keyword : Cognitive, Solving Problems, Linear Program

ME-034-107-DSA-AA40

Analysis of Students Errors in Mathematical Reasoning on Geometry by Sex

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Abstract. The purpose of this study was to identify the reasoning boys and girls in the wake of the geometry based component indicators that researchers propose reasoning. By using qualitative descriptive approach, this study was conducted in two schools in the district Mesuji Lampung, Indonesia. The instrument used was a test essay consists of two problems related to geometry. The findings of this study indicate that girls have superior reasoning ability than boys. Another finding that students can make mistakes in every stage of reasoning is based on five indicators of reasoning primarily on indicator 3) perform mathematical manipulations and provide a reason or evidence to the truth of the solution, 4) checking the validity of an argument, and 5) draw conclusions.

Keywords : Students Errors, Analysis

ME-035-114-DSA-AA49

Analysis of Students' Mathematical Representation in Well-Structured and Ill-Structured Problem Solving

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Abstract. Mathematical representation is one of the important aspect in mathematics learning, because the capability of mathematical representation is one of the terms of success in solving problem. This study aimed to explain how mathematical representation of junior high school students in the middle mathematics level in solving type problems, well structured problem and ill structured problem. The study held in SMPN 2 Kediri with 132 participants from 8th students. From the participant then taken two students with random technique.This study used qualitative explorative methods, with researchers conducting in depth interviews on subjects to explore mathematical representation when solving well-ill social arithmatic problems. Data analyzed by technique triangulation. Based on data analysis, the researchers found that: 1) Both of subjects used verbal representation in each steps when solving well-structure problems and visio-verbal representation in step of problem representation when solving ill-structure problems; 2) Both of subjects failed to solve ill structured problems because their translation of mathematical representation didn't accurate. Subject-1 can't unpacking the source when problem representation. While subject-2 can't determining equivalence between source representation and target representation. From the founded, the researcher concluded that ill structure problem must often be given to students to practice their translation representation capabilities.

Keywords : Problem Solving, Analysis Mathematical Representation

ME-036-119-DSA-AA54

Pre-Service Mathematics Teacher Skills: a Number Line Representations Error Analysis at Fraction Number Sense Task

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Abstract. The study on the analysis of errors number line representations at fraction number sense task in pre-service mathematics teachers is important because the ability of pre-service teachers is still low in the fraction domain. The purpose of this study was to investigate the skills of pre-service mathematics teachers in writing number line representations at fraction number sense task. In our study, the representation of the number line that generated in our fraction number sense task involves the use of estimates, and benchmarks. The study used a qualitative descriptive approach with 25 pre-service mathematics teachers as subjects. Interviews were conducted on 5 selected subjects. At the interview we asked them to describe their answer in representing the number line at fraction number sense task. The findings of the study indicate that pre-service teachers are still weak in using estimates and benchmarks on the number line related to the task of fraction number sense in the number line.

Keywords: skills, pre-service mathematics teachers, errors, representation, fraction number sense, number line

ME-038-123-DSA-AA55

Probabilistic Thinking of Senior High School Students with Low Mathematical Abilities in Solving Probability Tasks

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Abstract. This research aimed to describe the probabilistic thinking of high school students with low mathematical abilities in solving probability problems. This qualitative research was a case study. A subject in this study was student in class 11 science that had learned probability and had low mathematical ability that were selected based on mathematical ability test. The instrument used in this study was Problem Solving Tasks consisting of sample space and probability of an event. Then the subjects was interviewed based on her written answers. Credibility of data used time triangulation. The research result showed that in completing tasks, subjects responded non-statistically by using intuitive strategy that tended to use heuristic thinking patterns by performing an attribute substitution process. The results of this study can complement existing theories and become input for teachers to use approaches and strategies in learning that can accommodate probabilistic ways of thinking of high school students in solving probability problems.

Keywords: probabilistic thinking, solving probability tasks

ME-039-134-DGA-AA83

Student Difficulties when Constructing a Hidden Bridge to Solve Dynamic Event Problems

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Abstract. This study examines the difficulties of students when constructing hidden bridges when solving problems of dynamic events that require covariational reasoning. This research used an explorative qualitative approach. The 40 participants of the Mathematics Education Department, Malang State University, Indonesia. The participants were given a test with a problem of construction of pictorial of dynamic events. The participants were invited to think about the process of construction pictorial, and they were interviewed again to validate the information. The results of this study revealed that 75% of students were unable to solve the problem correctly. Students are not able to find hidden bridges in constructing pictorials. whereas, covariational reasoning is essential to having competence about mathematics.

Keyword: covariational reasoning, pictorial, dynamic events, hidden bridge.

ME-040-135-DGA-AA90

Understanding of Students in Resolving Word Problem on Mixed Fraction

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Abstract. Understanding has an important role in representation. Understanding is the main key to learning mathematics. Fractions are studied by students at all levels of education. Fractions are considered difficult for students. Problem solving in the form of stories can show students' understanding of the concept of fractions. The purpose of this study is to describe understanding of students in resolving word problem on mixed fraction. The research subjects were three class VII students. The results of the study show that students use different strategies in solving mixed fraction problems. The strategy used by students is make to illustration from of problem information, which is then changed to symbolic calculations. Symbolic calculations made by students as an explanation of the illustrations of the images made. Other students in solving problems only using symbolics calculations without changing to other forms, because they only remember the procedures that are commonly used. Thus, students in solving problems depend on the understanding a usually on used a certain level of ability.

Keyword: Understanding, Problem Solving, Word Problem, Fraction

ME-041-136-DSA-AA164

Analysis Of Students' Errors in Solving Higher Order Thinking Skills (HOTS) Problems for The Topic of Sequence

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Abstract. Higher order thinking skills will be active when students faced non-routine problems. Several students can solve non-routine problems and the others can't solve them. The students who having difficulties make errors in solving non-routine problems that involves HOTS. The purpose of this study is to identify and analyze student's errors in solving non-routine problems in the topic arithmetic sequence. This study is a qualitative descriptive research. The subjects in this study were three students from 8th grade student of MTs Negeri 2 Palangkaraya in Palangkaraya. Students were classified into high-ability, moderate-ability, and low-ability. One student from each ability was taken randomly and interviewed to obtain data about students errors. The data were collected through HOTS test and interview. The student's errors were analyzed by using Newman Error Analysis Model consisting of reading, comprehension, transformation, process skills, and encoding. Based on the results, (1) low-ability student made errors in transformation, process skill, and encoding, (2) moderate-ability student made errors in process skill, and encoding, (3) high-ability student made errors in encoding.

Keywords : sequence, students's error, higher order thinking skills, Newman Error Analysis Model

ME-043-141-DSA-AA74

Students' Difficulties in Completing Mathematical Tasks Based on Spatial Ability

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Abstract. The purpose of the study was to describe students' difficulties in solving mathematical problems. This research is a qualitative descriptive study consisting of two stages, namely tests and interviews. The research was conducted at SMPN 1 Ngantang, Kabupaten Malang. The participants consisted of 63 seventh grade students consisting of 39 females and 24 males. This study uses a test instrument consisting of two parts, each part is a question designed based on components of spatial ability. The first part contains questions about spatial abilities in triangular material and the second part contains questions about spatial visualization, spatial orientation and spatial relations. After completing the question, several students were interviewed to complete the data. The results of the study showed that: 1) the students' weak ability to do spatial orientation, 2) did not recognize the characteristics of the triangle and 3) the limited mastery of geometric terms. It can be concluded that there are student difficulties in solving math problems. Research recommends spatial training to improve students' spatial abilities.

Keywords: Spatial ability, geometry, spatial orientation

ME-047-169-DGA-AA108

Visual Thinking Profile of Mathematics Students in Graph- Theory Problem Solving Process

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Abstract. Graph theory can be applied to a number of cases such as shortest path, traveling salesman problem, and map coloring. In Graph Theory course, visualization used as media to make problem solving easier. Visual thinking is an integral part of problem solving, as in using diagram or picture to explain, documenting, count, or demonstrate steps involved in finding a solution. This article comprises a visual thinking profile of mathematics students in solving graph theory cases. We use a descriptive-explorative method using a qualitative approach. Result of research are 1) Visual thinking profile in understanding (when visual input came into mind as well instructions of problem solving, then mental imagination is processed and represented as image/graph model); 2) Visual thinking profile in planning (when visual input of image/graph model came into mind, as well as of previous experience, then mental imagination developed ideas to determine steps/algorithms to solve the problem); 3) Visual thinking profile in implementing (when visual input of understanding and planning came into mind, then mental imagination is processed and used to solve graph theory cases); and 4) Visual thinking profile in crosschecking (when pictures or graph model came into mind, then the visual imagination is used as a basis of recalculation in order to find the final conclusion of the solution). In the graph theory course, implementation of visual thinking for students in the problem-solving process used Powtoon-based multimedia application.

Keyword: graph theory, shortest path, traveling salesman problem, problem solving, visual thinking

ME-047-169-DGA-AA282

Performance of Artificial Bee Colony Algorithm and its Implementation on Graph Theory Application Course

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Abstract. Graph Theory Application is a course in the Mathematic Department which concerned with daily application. One of its application is a distribution problem, that is defining the minimum length route of one (or more) vehicle to distribute goods from one (or more) depot to some customers. In this distribution system, choosing the route is the most important in determining total length, travel time, and cost. The distribution problem is modeled into the Vehicle Routing Problem (VRP). Among variants of VRP, one of them is Capacitated Vehicle Routing Problem with Time Window (CVRPTW) with its main objective is to minimize total length of route and number of vehicles concerning vehicle capacity and time limit given. The Problem of CVRPTW can be solved with Artificial Bee Colony (ABC) algorithm, and the subsequent, namely Improved ABC (IABC) and Modified ABC (MABC) algorithm. IABC is a refinement of the standard ABC algorithm by adding Partial-Mapped Crossover (PMX) parameter in the refinement stage. Meanwhile, MABC is a modification of ABC by adding a parameter in the stage of initialization, refinement of the solution by using neighborhood structures, and optimization by keeping unused solution in tabu list. In performance analysis, MABC produced a better final solution than IABC dan ABC, with regard to total route length and its service time. In this article, ABC and its successor are implemented using Delphi programming language. In practice, the application can be used by students doing field practice (KPL) to optimize distribution problem**.**

Keywords: Graph Theory Application, ABC algorithm, IABC algorithm, MABC algorithm, CVRPTW

ME-048-170-DGA-AA107

Analysis of Layer of Primitive Knowing of High School Students in Linear Function Material: Study of Application of Student Activity Sheets based on Pirie Kieren Theory

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Abstract. Pirie Kieren's theory of mathematical understanding growth divides students' mathematical understanding in eight layers that covers: *primitive knowing*, *image making*, *image having*, *property noticing*, *formalizing*, *observing*, *structuring*, and *inventising*. The process of this mathematical understanding growth is recursive. The success on each layer shows the existence of the success of the previous layer. Therefore, *primitive knowing* as the base layer is the key to the success of the process of mathematical understanding growth. The purpose of this study is to reveal the role of *primitive knowing* abilities of high school students at linear function material. Analysis was carried out toward the completion of the Student Activity Sheet based on Pirie Kieren's theory. The analysis was carried out using qualitative data and presented descriptively. Qualitative data in question includes the results of student work in the student activity sheet and the test results are equipped with learning videos and interviews. The results showed that the success of students' mathematical understanding process depends on the success of students within the layer of mathematical understanding of *primitive knowing*.

Keywords: mathematical understanding, *primitive knowing*, student activity sheet, theory of mathematical understanding growth of Pirie Kieren's

ME-048-140-DGA-AA109

Analisys of Folding Back of Kepanjen Islamic High School Students in Solving the Problems of its Functions and Interventions

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Abstract. The purpose of this study is to describe the growth of mathematical understanding of class X students of Kepanjen Islamic High School in solving functional problems. According to Pirie-kieren, the understanding layer has 8 layers. They are: *primitive knowing, image making, image having, property noticing, formalising, observing, structuring,* dan *inventising.* The subjects of this study were high-ability students. The data fetching technique used the test and interview methods. Data analysis techniques included data reduction, data presentation, and conclusion drawing. According to the results of the study, it was found that the understanding of the subject developed based on the Pirie-Kieren theory with different trajectories from each other. Subjects were *folding back* when they solved a function problem. Furthermore, subjects also received various interventions based on the theory of Piere & Kieren.

Keywords: The Understanding layer of Piere & Kieren, Function, *Folding back,* Intervention, and Kepanjen Islamic High School Students.

ME-051-175-DGA-AA143

The Level of Students' Reading Comprehension on Proof by Mathematical Induction

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Abstract. Proof is one of the centers in learning mathematics not only for students of mathematics programs but also for mathematics education program. The benefits of studying mathematical proof in mathematics education are very important because it increases problem solving skills, persuasive argumentation, reasoning, creativity and mathematical thinking. However, there are still many students who have difficulties in understanding mathematical proof, including proof by mathematical induction. This study aims to identify the extent of the level achieved by students when reading proof by mathematical induction. Obtained data were analyzed through data reduction, data presentation, and drawing conclusions. There were 3 chosen subjects in this study – 1 from higher class, 1 from middle class and 1 from lower class. The results showed that the level of understanding achieved by students on proof by mathematical induction were 1) surface, 2)recognizing elements, and 3)chaining element. On the level of surface in which there is a facet basic knowledge, all subjects have passed this level well because none of the subjects had difficulty in recognizing the symbols and terms in the proof provided. On the level of recognizing elements, subject from higher class has achieved good facet logical status because she has been able to correctly recognize the premise and conclusion, but she still not good at facet summarization. Subject from the middle class has achieved good facet logical status, while subject from lower class are still not good. Both of these subjects are also not good at facet summarization. Whereas at the level of chaining element, only student from the higher class has achieved facet generality and application quite well. She has been able to apply the same idea from the given proof to other similar questions.

Keywords: proof by mathematical induction

ME-052-176-DGA-AA113

Reflective Thinking in Solving of Open Ended Problems in Plane Figure for Seventh Graders

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Abstract. This research aims to describe students' reflective thinking in solving open-ended problems in plane figure. This research is a case study. The subject was seven graders of SMP N 8 Malang 2018/2019. The research instrument was mathematical open ended test about plane figure. Subjects were chosen based on reflective thinking characteristics of the seven graders. The data collection technique was done by giving the test to the subjects, and the subjects solved the test in writing while doing think out loud. Data analysis was done by: (1) reducting data, (2) displaying data (3) making a conclusion. The results showed that the description of students' reflective thinking in solving open-ended problems in plane figure included three characteristics. The first characteristic includes stages: (1) students have difficulty understanding the problem; (2) describe it; (3) compile plans for more than three of these considerations; and (4) implementing a problem solving plan, linking information that is owned by the problem, explaining it well, and checking again. The second characteristic includes: (1) students have difficulty understanding the problem; (2) describe it; (3) draw up a plan on these three considerations; and (4) implementing a problem solving plan, explaining three problem solving solutions, and linking information that is owned by the problem. The third characteristic includes (1) students have difficulty understanding the problem; (2) describe it; (3) develop a plan for each of these considerations; and (4) implementing a problem solving plan, explaining less than 3 problem solving solutions, linking information that is owned by the problem. The implication of this research is to develop the understanding of students and teachers in learning that can improve reflective thinking in solving each mathematical problem solving.

Keywords: solving open-ended problems, plane figure

ME-053-178-DGA-AA126

The Readiness of Mathematics Education Students About HOTS: a Best Pratice to Explore and Describe Their Problems in Understanding the Content of Middle School Mathematics

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Abstract. Based on experiences in teaching, guiding, and testing mathematics for many years, it is a fact that most mathematics education students have difficulty understanding the content of Middle school mathematics. To be a professional educator in mathematics, a middle school mathematics teacher must have the mastery of the content of middle school mathematics. The purpose of this best practice is identifying the students weaknesses when they explain a special middle school mathematics topic with HOTS extension. The best practice is done by descriptive explorative of qualitative research design. Students are grouped into, eight groups, each group consist of three until four students. The weaknesses are identified when the presentation and discussion happened. At the end of the class, the presenter group is asked the reasoning of conceptual and procedural knowledge in its explanation, and given the possible ways to extend into HOTS ways. The result of the research shows that each group (a) is still utilize the usual ways, (b) has difficulties to deliver the content in HOTS model, and (3) feel getting new and inspiring knowledge in creating HOTS models.

Keywords: best practice, hots, mathematics, middle school

ME-055-181-DSA-AA132

Analysis of Student's Mathematical Representation Errors in Solving Problem Solving Math Problem and Giving Scaffolding

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Abstract. This study aims to describe the errors of mathematical representation of students and the scaffolding that is done to overcome mathematical representation errors in solving problems solving mathematical question. The study was conducted in class VIIIe SMP Laboratorium Universitas Negeri Malang. The instrument used consisted of a Preliminary Test and a Problem Solving Test. The results of the study show the fact that the type of mathematical representation is carried out by all subjects. Errors of visual representation made at the beginning of the work cause verbal errors also occur because the form of the image made on the previous question affects the solution in question b which uses verbal representations. Symbolic representation errors occur because the subject is less understand the symbol of inequality, incorrectly to multiplication with distributive property, and students are wrong in solve the inequalities that have been made. Of the four steps to solving the problem, many subjects didn't do looking back step because the subject sure to their answers is correct. Then, some subjects don't write the information and problems from the question as understand the problem step. In addition, subjects who make mistakes when understanding problems step make further problem solving steps wrong. Scaffolding on the reviewing stage that given to subject is probing and prompting question and parallel modeling so that subject can solve the problem or the difficulties. In addition, the researcher also give explaining about matterial in the question.

Keywords: giving scaffolding, the errors of mathematical representation, problem solving math problem,

ME-055-181-DSA-AA219

The Analysis of Student's Mathematical Representation Errors in Solving Mathematical Problem-Solving Problems and Giving Scaffolding

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Abstract. One of the very important thing in solving mathematical problem-solving problems is mathematical representation, where through mathematical representation, a mathematical problem can be clearly described. Mathematical representation errors often occur in solving mathematical problem-solving problems. This research aims to describe the types of errors in mathematical representation of students. Furthermore, the types of scaffolding is carried out to overcome mathematical representation errors. This research was conducted in grade VIIIe SMP Laboratorium Universitas Negeri Malang. The used instrument consisted of a Preliminary Test and Problem-Solving Test. In this study, scaffolding is given when students make mistakes or encounter difficulties while solving the Problem-Solving Test. The results of the study are analyzed so that it can provide an overview of student's mistakes so that the cause of the errors can be known and how to provide the right scaffolding.

Keywords: giving scaffolding, mathematical representation, problem solving math problem,

ME-056-189-DSA-AA192

Analytical Thinking to Solve Contextual Problems

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Abstract. In this information era, we always interact with the data needed for decision making. In making decisions, the information obtained is often not only observed, processed, and displayed but also interpreted. Analytical thinking is needed in interpreting data and information so that someone can take the right decision. This article aims to describe students' analytical thinking in solving contextual problems. The design of this research is qualitative-descriptive. The subject of this research are 4 students of VIII grader State Junior High School 5 Malang. Subjects were taken based on the results of the student's work on the answer sheet and the results of the interviews. Criteria for subjects were selected from students with different strategies in solving contextual problem. The results show that there are some students who use different strategies and there are some students who use more than one strategy that indicate the process of analytical thinking which includes differentiating, organizing, and attributing in finding the solutions of contextual problem.

Keywords: analytical thinking, solving contextual problems

ME-057-201-DSA-AA176

FI and FD Students: Their Mathematical Dispositions towards Solving HOTS Problems

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Abstract. This research aimed to find the differences between field-independent (FI) and field-dependent (FD) students related to their mathematical dispositions towards solving High Order Thinking Skill (HOTS) problems. This is a qualitative-descriptive research. 28 students of a junior high school in Malang were asked to answer test to find their cognitive style. Among those students, 4 students were selected as research subjects: a male FI student, a female FI student, a male FD student, and a female FD student. They were asked to answer some questions related to their perceptions, interests, and efforts in solving HOTS problems. The results showed that field-independent students did different ways in solving the problems depend on their understanding of the problem. Meanwhile, field-dependent students tended to strict on the procedures they were taught to solve the problems. These findings could help teachers to identify students' need in solving HOTS problems such that teacher could decide which help or what kind of hint can they give to each student.

Keywords: field-independent (FI), field-dependent (FD), mathematical dispositions

ME-058-204-DSA-AA178

Profile of Students' Mathematical Problem Solving Skill Based on Students' Perception Toward Mathematics

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Abstract. This research aimed to describe the profile of students' mathematical problem solving skill on trigonometry topic based on students' perception toward mathematics. The type of this research was a qualitative research. This research was conducted at State Senior High School 9 Malang. The subjects of this research were three students of 10^{th} grade, in which it involved of one student who had high perception toward mathematics, one student who had middle perception toward mathematics, and one student who had low perception toward mathematics. The supporting instruments, which used in this research, consisted of students' perception toward mathematics questionnaire; problem solving skill test; and interview that were submitted to each subject to discover the validity of answers that had been done, and to find out more about the students' perception toward mathematics. The results of this research indicated that student who had high perception toward mathematics was able to complete the test items by fulfilling all of the indicators in overall, and the student was also sure about the answer that had been written. The student who had middle perception toward mathematics was able to complete the items by fulfilling all of the indicators in overall but did not sure about the answers that had been written. The student who had low perception toward mathematics was not able to complete the items by fulfilling all of the indicators in overall.

Keywords: mathematical problem solving skill, perception toward mathematics

ME-059-205-DGA-AA177

Analysis of Students' Errors in Completing Mathematics Problems Based on the Students Initial Mathematical Ability

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Abstract. This research aimed to analyze students' errors in solving mathematical problems based on students' initial mathematical abilities. The students' error analysis were assesed through students' writing in solving the problems using *PISA* type. The type of research was descriptive qualitative research. The subjects of this research were the students of 9th grade of Junior High School, in which it consisted of 6 students who had been categorized based on the initial mathematical ability level, namely high, middle and low ability level. The data collection techniques used the methods of test, interview, and documentation. Validation data was done by using triangulation method, of which method was by comparing the results of the data from test method, interview, and documentation. The data analysis technique was done using the stages of data reduction, data presentation, and data verification. The analysis framework was developed based on the problem solving strategies of Polya. The research result were as follows.. The student who had high ability made error in re-checking the obtained solutions. The student who had middle ability got error in implementing the plans and re-checking the obtained solutions. The student who had low ability made error in understanding the problem, arranging the plan, implementing the plans, and re-checking the obtained solutions.

Keywords: initial mathematical ability,

ME-061-208-DSA-AA160

Higher Order Thinking Process of Junior High School Students with Linguistic, Logical-Mathematical, and Visual- Spatial Intelligences in Solving Mathematical Problems

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Abstract. Higher order thinking process of Indonesian students can be seen from the results of the National Examination and the results of the PISA and TIMSS test. However, the results of these tests are not satisfactory because the values obtained are still low. To overcome this, it's necessary to explore the higher order thinking process at the students in solving mathematical problems. This study is aimed to describe the higher order thinking process of junior high school students in Indonesia in solving mathematical problems. The background of the study is based on the results of the National Examination which have decreased. In addition, the results of the PISA and TIMSS test indicate that Indonesia is still in the lower rank. The research subjects consist of 3 students with the type of linguistic, logical-mathematical, and visual-spatial intelligences. The research results show that students with linguistic, logical-mathematical, and visual-spatial intelligences have been able to analyze the interrelationship between information, find relevant ideas/facts to the problem, choose information, modify the wrong conjecture to be correct, submit conjectures, and investigate and provide possible ways of solving and other answers. Student with linguistic intelligence always check each step of the solution. Students with logical- mathematical and visual-spatial intelligence can provide other possible solutions completely.

Keywords: HOTS, linguistic, logical-mathematical, visual-spatial intelligences.

ME-064-226-DSA-AA175

Mathematical Creative Thinking Skill of Middle-Ability Students in Solving Contextual Problems

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Abstract. The purpose of this study was to describe mathematical creative thinking skill of junior high school students who have middle ability in solving contextual problems. This study was a case study on a junior high school which has average-ability students in mathematics. There were 6 students who had middle math ability from 17 students who took mathematics test. Based on the results of students' answers and communication skills, 4 subjects were chosen. Data were collected by observation, tests, and interviews. The result of the research was there were differences of students achievement based on indicators of creative thinking skill: fluency, flexibility, and novelty. Two subjects can fulfil two indicators, namely fluency and flexibility, and 2 other subjects can fulfil one indicator, namely fluency. The differences are expected to be used as a reference for teachers in providing various open ended contextual mathematical problems so that students are accustomed to write more than one answers or strategies in solving problems, so that they can improve their creative thinking skill.

Keywords: average-ability, mathematical creative thinking skill.

ME-065-227-DSA-AA179

Analysis of Junior High School Students Difficulty in Solving Linear Equation in Two Variables Word Problem

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Abstract. This qualitative research aims to describe the difficulties experienced by junior high school students and the causes of these difficulties in solving linear equation in two variables word problem. Data collection is done through observation, tests, interviews, and documentation. Data analysis activities are carried out based on 1) data reduction, 2) data presentation, and 3) drawing conclusions. Based on the results of data analysis, the difficulties experienced by students are 1) difficulty in transforming relevant information into variables *x* and *y*, 2) difficulty in identifying the appropriate mathematical material to solve word problem, and 3) difficulty in formulating the linear equation in two variables requested in the word problem. Factors that cause these difficulties are the use of strategies that are not appropriate, students 'reading comprehension skills are still lacking, students' do not fully understand the problem and the complexity of the relation between linguistic and numerical components in the word problem.

Keywords: solving linear equation, two variables word problem.

ME-069-239-DGA-AA197

Children's Response Role in Mathematics Elementary School

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Abstract. Every child has different abilities to response a problem. Problems can arise from anywhere one of them in learning. In learning activities, students are often faced with problems that must be solved. In mathematics learning, the problem faced by students is in the form of mathematical questions. In solving mathematical problems, students must be able to apply their knowledge, understanding and skills. Students' ability to respond to mathematical problems will affect the results they get. Therefore, students' responses to mathematical problems are important in mathematics learning. This study uses literature analysis to determine students' abilities related to their response to problems in mathematics learning in elementary schools. This study found that students' ability to problems respond was divided into 3, namely those who always tried (climbers), those who easily gave up (campers) and those who did not want to try (quitters). Climbers who always try to solve problems and not easily discouraged are able to achieve better results in mathematic problems solving than campers and quitters.

Keywords: Respons, problem solving, mathematic, elementary student

ME-072-248-DSA-AA205

Communication Skill to Improve the Students' Ability in Algorithm Problem Solving Process: the Case of Number Pattern Test

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Abstract. This research is aimed to explore the students' ability in problem solving through their communication skill in accomplishing plane test. The data collected from the written test about the number pattern problem and the interviews for the unclear things. The data was analyzed with the constant comparative method. This research was applied to 30 students of Nurul Huda Junior High School in Malang. The research result was the steps of problem solving through communication skill in solving Math test, such as: Understanding the problem, planning the problem solving, executing the plan, and reviews. Our finding showed that communication skill has an important role in exploring the researchers through building the ability for students' problem solving. The students who are able to communicate well both spoken and written could accomplish the test/ question about problem solving and so interested in facing the challenge, also a willingness to solve the problem. The result and finding of this research could give a knowing contribution to the teachers in building the students' ability in problem solving through their communication skill in all of the question matters.

Keywords: Problem Solving, Communication Skill, Number Pattern.

ME-074-261-DGA-AA212

Analysis of Students' Skills on Derivative of a Function

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Abstract. The AIP Proceedings article template has many predefined paragraph styles for you to use/apply as you write your paper. A lecture in general involves a lecturer as a source of knowledge. A lecturer has significant role in determining the aims of the learning and in associating technical matters in order to fulfill the targetted aims. How to organize a class needs to be associated with the preparation that a lecturer should not be ignored. Students' prior knowledge needs to be checked to give plausibe accurate information about how to make better technical organization of a class. Derivative of a function is the fundamental concept that must be mastered by prospective students of Ordinary Differential Equations. Analyzing students' skills on concept understanding of derivative will have a better impact on how to organize a class. Therefore, the aim of this study is to analyze students' skills on concept understanding on derivative of a function. The study is conducted by giving basic problems on derivative of a function to 64 prospective students of the course of Ordinary Differential Equations. Data obtained from students' answers to the problems is analyzed from integral construction of their conceptual understanding. The study reveals that 84% of participants have poor conceptual understanding on derivative and only 16% of them have procedural skills. The data can be made as a reference and as a feedback for a lecturer on the learning model that has been applied. It also can be used as supporting tool in building a lecturer's confidence in teaching ability.

Keywords: students' skills, derivative of a function.

ME-078-288-DGA-AA247

Analyisis of Critical Thinking Skills Students of Grade X SMAN 1 Lawang in Solving Trigonometry Problem

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Abstract. This research aims to describe students' critical thinking skills in solving trigonometry problems. This type of research is qualitative. Furthermore, to facilitate the description of critical thinking, the critical thinking criteria used are, focus, reason, inference, situation, clarity, and overview.The researcher gave a test of critical thinking skills, namely two trigonometric story questions given to class X MIA 7 students of SMAN 1 Lawang. Next to describe critical thinking skills, one of the high categories, one of the medium category, and one of the low category was chosen to be interviewed. From the results of the research, for the high category, students were able to formulate information and the subject matter (focus), able to provide reasons based on relevant facts at each step in making decisions and conclusions (reason), able to draw conclusions correctly and be able to choose R (Reason) it is appropriate to support the inference made (inference), able to use all information in accordance with the problem (situation), and be able to provide further explanation of what is meant in the conclusions made (clarity). Students with the medium category are able to formulate information and the subject matter (focus), are able to provide reasons based on relevant facts at each step in making decisions and conclusions (reason), and are able to use all information in accordance with the problem (situation). While students with low categories are able to formulate information and the subject matter (focus) and are able to provide reasons based on relevant facts at each step in making decisions and conclusions (reason).

Keywords: analysis, critical thinking, trigonometry.

ME-078-288-DGA-AA264

Analysis of Critical Thinking Abilities in Solving Mathematical Problem Calculus for Prospective Teachers Departement of Mathematics FMIPA UM Malang

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Abstract. The goal of this study is to describe analysis towards critical thinking skill of Mathematics college students about Calculus. Levels of development of critical thinking start from the lowest are: unreflective thinking, challenged thinking, beginning thinking, practicing thinking, advanced thinking and master thinking. Critical thinking abilities which will be observed and studied are the elements of reasoning and a standard of intellectual reasoning. The research's subjects were prospective teachers of Mathematics Department, State University of Malang. The results of this research are: (1) there are some prospective teachers are still in unreflective thinking level, (2) the most prospective teachers are challenged thinking, and (3) there are some prospective teachers are beginning thinking.

Keywords: critical thinking, intellectual reasoning, calculus.

ME-080-316-DGA-AA285

An Analysis of Students' Difficulties in the Conjecturing Process of Pattern Generalization Problems

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Abstract. This study aims to describe students' difficulties in the process of conjecturing in solving the problem of pattern generalization. The type of this research is descriptive qualitative. The research subjects are 15 students of class VIII SMP Negeri 7 Mataram, with subject selection is done continuously to obtain saturation data. Data were collected by using auxiliary instrument that is Pattern Generalization Problem (PGP) and interview. After the subject completed the PGP, they will be interviewed based on the answer sheet of each subject to know the students' difficulties in the conjecturing process. The results showed that students' difficulties in the process of conjecturing in solving problems of pattern generalization occurred after the students passed the stages of observing cases, organizing cases, searching and predicting patterns. At the stage of searching and predicting patterns, students have found a different pattern. However, students face difficulty to proceed in formulating conjecture stage, because they cannot connect the different between general formula. Thus for the stage of validating conjecture, generalization of conjecture and justify generalization are not done by students.

Keywords: difficulty, process of conjecturing, pattern generalization.

ME-082-334-DSA-AA307

Semiotics in Solving Problems Geometric Diagram Viewed from Peirce Perspective: Case Study

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Abstract. In mathematics, semiotics is a critical element in understanding and constructing meaning, not least in understanding and solving mathematical problems. Everything associated with signs, symbols and relations between symbols is called semiotics. The geometry diagram is one of the mathematical topics that contain the semiotic structure of the visual features of an object. This feature is represented to convey the meaning of the intended object. Based on case studies through a qualitative approach, this article aims to describe the semiotic process of students in solving problems related to the construction process of meaning in the geometry diagram based on the sign relationships, from the perspective of Charles Sanders Peirce.

Keywords: Peirce prespective, semiotics, the geometry diagram.

ME-083-340-DSA-AA312

Students Higher Order Thinking Skills in Solving Gemetry Problem

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Abstract. The development of higher order thinking skill is important for students in facilitating the transision of knowledge and skill into real activity. Since there are many developed problems in society, the use of higher order thinking skills could extend the students' knowledge. The aim of this study is describing cognitive process in higher order thinking skills in solving geometry problem based on Bloom's Taxonomy. The subjects of this study are students in 9th grade of SMPN 1 Srono. The implemented techniques of data collection are higher order thinking test and interview. Three levels in higher order thinking skills: analysis consists of differentiating, organizing, and attributing, evaluate that consists of checking and critiquing, and create consists of generating, planning, and producing. Based on results, students at analysis level have cognitive process order from differentiating, organizing, and then attributing. students at evaluate level have cognitive process order from checking and then critiquing, and students at create level have cognitive process order from generating, planning, and then producing.

Keywords: higher order thinking skill, Bloom Taxonomy, cognitive process

ME-084-342-DGA-AA316

Categorization of Student Thinking Types Based on Dual Process Theory in Solving Cognitive Reflection Test Problems

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Abstract. Dual process theory is a theory that discusses human thought processes and decision making. In decision making, the process can be done quickly or slowly. System 1 is identical to a fast process (intuition) while System 2 is identical to a slow (analytical) process. The purpose of this study is to categorize the types of thinking and describe the types of thinking of students in solving reflection cognitive test problems. The approach used in this study is a qualitative approach, and the instrument used is a 3-digit cognitive reflection test (CRT). The results showed that students tend to use System 1 more than System 2. Searching students 'thought processes shows that there are four categories of students' thinking types, namely 1) incomplete thinking type, 2) non-verify thinking type, 3) complete thinking types, 4) thinking types with verification. Types of thinking incomplete and without verification are categorized in students who think using System 1 (intuition), whereas types of thinking complete and with verification are categorized in students who think using System 2 (analytic).

Keywords: Thinking process, dual process theory, cognitive reflection test (CRT)

ME-081-323-DGA-AA317

Interpersonal Intelligence to Solving Mathematical Problems

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Abstract. The expected ability by students as a result of the mathematics learning process is the ability to solve problems. Problem solving is important part of mathematics learning because in the learning process it allows students to use their previous knowledge to solve problems. The steps to solve mathematical problems are to understand the problem (question), arrange plan, do the plan and then interpret the results. This research was conducted by examining various sources of literature on solving mathematical problems in terms of students' interpersonal intelligence. Interpersonal intelligence of students is divided into 3 namely high interpersonal intelligence, moderate interpersonal intelligence and low interpersonal intelligence. This study found that students who have high interpersonal intelligence will easily solve mathematical problems, students who have moderate interpersonal intelligence have little difficulty in solving mathematical problems, while students who have low interpersonal intelligence will experience difficulties when solving mathematical problems.

Keywords: interpersonal intelligence, problem solving.

ME-086-347-DGA-AA324

Adaptive Reasoning Profile of Students in Solving Mathematical Problems Viewed from *Field Dependent* and *Field Independent* Cognitive Style

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Abstract. Adaptive reasoning was a logical process of thinking to provide a solution of mathematical problem. Every student had different characteristics in processing information (cognitive style). The differences of cognitive style could affect students' ability to understand the problems. This study was to describe students' adaptive reasoning in solving mathematical problems in terms of cognitive style in field dependent and field independent. This research usedqualitative descriptive method. The subjects in this study consisted of four students with the provisions that two students were field dependent cognitive style and two students were independent field cognitive style from class VIII-I of SMPN 1 Menganti. The data collected by task-based interviews. The results of the problem solving task data and interviews were then presented and analyzed using descriptive analysis. The results of this study concluded that: (1) Students who had a field dependent cognitive style in solving mathematical problems were less able to make adaptive reasoning that was less able to make guesses or logical conjectures based on mathematical properties, less able to check the arguments of the problems given, i.e., accompanied by systematic steps and could provide logical reasons for the answer, less able to provide answers by finding the patterns presented from the problem, then generalized the pattern to solve the problem and less able to provide answers by drawing conclusions based on solving of the problem. (2) Students who had an independent field cognitive style in solving mathematical problems were able to make adaptive reasoning that was able to make guesses or logical conjectures based on mathematical properties, able to examine the arguments of a given problem, that is, accompanied by systematic steps and could give a logical reason to the answer, able to provide answers by finding the patterns presented from the problem, then generalized the pattern to solve the problem and be able to provide answers by drawing conclusion based on the solution ofgiving the problem.

Keywords: Adaptive reasoning, Mathematical problems, Cognitive style

ME-085-345-DGA-AA325

Profile of Student Cognition Regulations in Solving Mathematical Problems of Mathematical Capabilities

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Abstract. Cognitive regulation is a person's awareness of his thought process in developing planning, monitoring and evaluation when students solve problems. The stages in solving the problems raised by Polya are understanding problems, planning problem solving, implementing problem solving plans, and checking again. This study aims: 1) describe the regulation of cognition of students with high mathematical abilities in solving SPLDV problems, 2) describe the regulation of cognition of students who are mathematically capable in solving SPLDV problems, and 3) describe student's cognitive regulation with low math skills at solving the SPLDV problem. This research is a descriptive study with a qualitative approach. The subjects in this study are 6 people that taken from students of class VIII-3 of SMPN 5 Sidoarjo in the Even semester of the 2018/2019 academic year consisting of 2 students with high mathematical abilities, 2 students with moderate mathematical abilities and 2 students with mathematical abilities. Data collection with written assignments and task- based interviews. Written assignment data and interviews were analyzed based on regulation of cognition indicators. The results of the analysis and discussion in this study that students who have high mathematical abilities are able to fulfill all activities of regulation of cognition at all stages of problem solving. Students who have moderate mathematical skills in solving mathematical problems are doing all the koginsi regulatory activities in all problems solving polya but only optimal at the stage of understanding the problem and planning problem solving. students who have low mathematical abilities in solving SPLDV problems are not carrying out cognitive regulation activities at the stage of re-examining the results obtained and carrying out cognitive regulation activities at other stages but only optimally at the stage of understanding the problem.

Keywords: cognition regulation, problem solving, mathematical ability.

CE-001-001-DGA-AA1

Chemistry Students' Attitude Towards Mathematical Knowledge

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Abstract. Mathematical knowledge is a supportive and essential competence to be mastered by chemistry students. This study aimed to investigate chemistry students' attitude towards mathematical knowledge. 100 chemistry students from first to final years participated in the study. A semi-open questionnaire was applied. Students' attitude toward mathematical knowledge is analyzed descriptively. The implication forproper mathematics teaching as well as the curriculum for chemistry students are also discussed.

Keywords: students' attitude, mathematical knowledge, chemistry students

CE-004-029-DGA-AA7

Correlation between Understanding NOS, Conceptual Understanding, and Science Process Skill on General Chemistry Classroom

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Abstract. The aim of this research was to study the correlation between Understanding NOS and Conceptual Understanding and between Understanding NOS and Science Process Skills. This correlation research was carried out by Ex-post Facto method at the Faculty of Mathematics and Science Education of IKIP Mataram. The research subjects were 75 students participating in the General Chemistry course for the academic year 2018-2019 that taken by the saturated sampling method. Data were collected using an NOS understanding questionnaire, Concept Understanding Test, and observation sheet of Science Process Skills. The data is described and the correlation test is done by product moment test. The results showed that there was a significant and very strong correlation between Understanding NOS and Conceptual Understanding and between Understanding NOS and Science Process Skills.

Keywords: Understanding NOS, Conceptual Understanding, and Science Process Skill

CE-006-046-DGA-AA11

Analysis Of Higher Order Thinking Skill (HOTs) In The National Examination Questions

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Abstract. The purpose was to determine the profile of the high school national chemistry examination based on HOTs perspective and to analyze the representation of national chemistry examination questions on HOTs types. The design used descriptive qualitative approachment consisting of content analysis methods. The analyzed data sources were from the 2009/2010 academic year national examination questions to the 2017/2018 academic year. Research variables consisted of HOTs types including: 1) contextual assessment, 2) PISA, 3) transfer, 4) critical thinking, 5) creative thinking, 6) judgment, 7) logic and reasoning, and 8) problem solving. Data collecting was done by the documentation techniques and the result validity was tested by reliability procedures that were calculated manually through reliability of Cohen-Kappa. The test results reliability of Cohen-Kappa were obtained the analysis of national chemistry examination questions conducted including HOTs and Non-HOTs, categorization of contextual assessment, PISA, and transfer "strong agreement" (0,60-0,80). The results showed that the national chemistry exam questions had fulfilled the targets set by BNSP regarding to the proportion of HOTs questions in the high school national chemistry exam questions. This was shown by the results of analysis that contextual assessment, PISA, and transfer.

Keywords: national examination, chemistry, HOTs.

CE-017-111-DSA-AA45

Misconceptions On Rate Of Reaction And It's Impact On Chemical Equilibrium

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Abstract. Study on misconceptions of reaction rate and its effect on chemical equilibrium had been investigated to 245 students of eleven-grade Senior High School in Gowa South Sulawesi, Indonesia. Misconceptions data were collected using three-tier tests and semi-structured interviews. The Rate of Reaction Diagnostic Test (RRDT) to probe Rate of reaction misconception and Chemical Equilibrium Diagnostic Test (CEDT) to investigation Chemical Equilibrium misconception. The reliability of RRDT and CEDT with the Cronbach alpha respectively 0.78 and 0.95. The effect of rate of reaction misconceptions on chemical equilibrium was sufficient with limited predictions (r = 0.39). The misconception related was 1) reaction rate was the rate of increasing number of reactants and reducing number of products with time, related to the misconception the rate of increasing number of reactants in equilibrium conditions which was faster than the reducing number of products; 2) the irreversible reaction rate was getting higher with time-related to the forward reaction rate that was greater than the reverse reaction rate in equilibrium conditions; 3) The irreversible reaction rate changed continually as it correlates with misconceptions the reaction rate of forward and reverse changes in dynamic equilibrium; 4) Catalyst could increase the activation energy related to misconception catalyst increasing the activation energy, so that the forward reaction was faster than the reverse reaction rate; 5) The irreversible rate reaction is proportional with the subscript an element in formulas associated with increasing volume of gas equilibrium system would shift the equilibrium to a larger number of subscript; 6) The increasing of concentration will greater surface area, so as to give rises to a greater number of effective collisions. This is related to misconception that changes in the amount of solid phase at heterogeneous equilibrium which would shift the equilibrium system. It was proven that there was a misconception relationship between the reaction rate and chemical equilibrium, so it is recommended to importance of identify and eliminating misconception of prerequisited concept to prevent students' misconceptions on the related concepts.

Keywords: Reaction Rate, Chemical Equilibrium, and misconception.

CE-011-069-DGA-AA48

Do Heavy Metals Disadvantage Human's Health? Using Argument-based Learning to Promote University Chemistry Students' Argumentation Skills on Socio Scientific Issues

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Abstract. Argumentation skills are crucial for students in understanding science concepts including chemistry. This study had used issues about the effect of heavy metals on human's health retardation to promote the argumentation skills of the Indonesian university chemistry students. Three learning strategies that include Jigsaw learning, Argument-based Learning (AbL), and think talk write (TTW) had been utilized and the effect of these strategies on the students' argumentation skills had been studied. Affecting factors that made the differences between those strategies had also been identified. Data were collected using open-ended tests and fieldnotes. Thus, quantitative and qualitative methods were employed to analyze the data. Finding showed that AbL had been the most effective learning strategy amongst the three strategies in enabling the students to produce good quality of arguments. The results of Tukey-test confirmed that AbL was significantly different [p-*value*<.05] from the other strategies in promoting such skills. Fieldnotes data showed that different opportunities provided by the strategies for the students to debate their answers was the factor that caused the differences between the strategies. This finding suggests that using a learning strategy that encourages students with large opportunities to conduct debates is extremely recommended to promote students' skills in scientific argumentation.

Keywords: argumentation skill, argument-based learning, socioscientific issues, chemistry

CE-022-167-DGA-AA111

Analysis of High School Students' Metacognitive Knowledge on The Topic of Solubility and Solubility Product

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Abstract. This study aimed to describe the level of students' metacognitive knowledge which includes three aspects, namely: declarative, procedural, and conditional on the topic of solubility and solubility product. Data on students' metacognitive knowledge were collected using instrument consisting of 7 items of declarative, 3 procedural, and 2 conditional questions. The results showed that students' declarative and procedural knowledge on the topic of solubility and solubility product were included in the low category, while conditional knowledge was included in the very low category. Student procedural knowledge is higher than declarative and conditional knowledge. This is probably due to the process of learning chemistry in schools emphasizing algorithmic aspects rather than conceptual.

Keywords: metacognitive knowledge, solubility, solubility products

CE-024-187-DGA-AA125

Critical Thinking Skills Analysis of MIA XI Class Students in Hydrocarbon Topic

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Abstract. In the 21st century, students need to have one of life skill that is critical thinking that can be develop and trained through various aspects and one of which is chemistry aspect. One of the topics in the chemistry aspect is a hydrocarbon topic. The purpose of this study was to measure the percentage of hydrocarbon contribution towards student's critical thinking skills and to know the level of critical thinking skills in 11th MIA grade students 2018/2019 academic year at SMAN 1 Lawang. The study used a descriptive quantitative research design. The research subjects which amount to 133 students. Instrument for assessing critical thinking skills used in hydrocarbon topic developed by Rodliyah (2018) with critical thinking indicators Ennis (2011). The results of the analysis of the level of critical thinking skills of students using the number of students who scored three on reasoned multiple choice questions and score four on the description questions divided by the total number of sample students, then categorized by percentage according to Karim (2015). The results showed that the hydrocarbon topic taught by the teacher was able to bring up the students' critical thinking skills with a level of think critically which was still very low with an average of 1) organic and inorganic carbon compounds by 39.10 %, 2) identification and source of carbon compounds by 13.53 %, 3) specificity of carbon atoms by 27.82 %, 4) nomenclature of hydrocarbon compounds by 16.29%, 5) isomer hydrocarbon compounds by 9.62 %, 6) physical and chemical properties of hydrocarbons by 29.32 % for the subject matter of the physical properties of hydrocarbons, the subject matter of the hydrocarbon compound combustion reaction by 5.71 %, the subject of substitution reactions alkane compounds by 0.94 %, the subject matter of the reaction of alkene compounds by 11.58 %, the subject matter of the reaction of alkaline compounds by 3.57 %, and the sub-topics of identification were saturated and unsaturated hydrocarbons by 0.75 %, and 7) the use of hydrocarbons by 14.43 %.

Keywords: analysis, contribution, hydrocarbons, critical thinking skills

CE-001-001-DGA-AA130

Does Students' Confidence In Chemistry Boost Their Understanding?

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Abstract. The relationship between students' attitude towards chemistry and their success to the subject have reported in many published studies. However, a similar study uncovering the correlation between students' confidence to be a success in chemistry and their achievement in chemistry subject is still limited. This study aimed to investigate how students' confidence toward chemistry subject as well as towards chemical kinetics topic boost their achievement in the area of chemical kinetics. 23 first year chemistry students at Universitas Negeri Malang, Indonesia participated in the study. A four-tier instrument in the area of chemical kinetics accompanied by a questionnaire uncovering students' general confidence in chemistry, in the area of physical chemistry and in the topic of chemical kinetics was implemented. The survey was carried out two times, before and after the students experienced chemical kinetic learning in their basic chemistry course. Students' confidence towards chemistry, physical chemistry and chemical kinetics were mirrored to their achievement in the chemical kinetics test provided. The correlation between students' confidence and students' understanding of chemical kinetics concepts are further discussed.

Keywords: Students' Confidence, understanding of chemical kinetics, four-tier instrument

CE-030-202-DGA-AA141

Effect of Conceptual Change Texts on Physical Inorganic Chemistry Students' Misconceptions of Matter and Its Changes

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Abstract. The purpose of this study was to investigate whether Conceptual Change Texts are effective in overcoming misconceptions of matter and its changes. This study used one group pretest-posttest design with 131 physical inorganic chemistry students of State University of Malang. Students' misconceptions were determined by Matter and Its Changes Diagnostic Test. Nine misconceptions were found in pretest. The results showed that the application of Conceptual Change Texts was successful in overcoming the misconceptions of matter and its changes.

Keywords: Conceptual Change Texts, Misconceptions, Matter and Its changes

CE-033-211-DSA-AA149

Understanding of Acid Base Concept Based Multiple Representation in Cross Education Levels

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Abstract. Deep and comprehensive understanding of acid base concept, one is determined by student's ability in connecting between the chemistry representations during learning the concept. This research was aimed to analyze the understanding of acid base concept in across education levels using multiple representation tests. Research method was descriptive-quantitative. Research subjects were 224 peoples of 88 students in IX class, 38 students in XII class, 42 university students in the second semester, and 56 university students in the fourth semester. The questions used included three-tier test of 30 questions for all education levels with reliability of 0,753, and 2 additional questions for university students with reliability of 0,626. All questions have validity of 0,197-0,798. The result shows that average percentages of the understanding in acid base concept from high school students IX class to university school students in fourth semester were 24.09%, 6.49%, 37.50%, and 40.01%. Generally, understanding of acid base concepts is lowest in students and university students related submicroscopic representation.

Keywords: acid base concept, cross education levels, multiple representation

CE-040-259-DGA-AA292

Identification of Students' Conseptual and Algorithm Understanding on Buffer Solution

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Abstract. The aims of this study were: 1) describing of students' conceptual and algorithmic understanding on the buffer solution, 2) finding the correlation between students' conceptual and algorithmic understanding of the buffer solution. The design of this study used a descriptive research design. The research subjects were 11th grade students of public high school in Ponorogo Indonesia. The research instrument was a multiple choice question with open ended reason consisting of 10 conceptual and 10 algorithmic questions. The research instrument has a content validity of 86.4% and a reliability coefficient of 0.684. The research data were analyzed by calculating the percentage of students' conceptual and algorithmic understanding, and continued with correlation analysis between of students' conceptual and algorithmic understanding. The results showed that the students' conceptual understanding on the buffer solution was very low (18%), the students' algorithmic understanding on the buffer solution was low (25%), and there was a significant correlation between students' conceptual and algorithmic understanding on buffer solution with a correlation coefficient of 0.433.

Keywords: algorithmic understanding, conceptual understanding, buffer solution

PE-011-077-DGA-AA94

Implementation of Students'misconception Remediation Use Teaching Materials With a Refutation Text Structure on The Fluid

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Abstract. The study examines the effect of remediation on fluid with a refutation text to decrease the number of student misconception on Senior High School. The research employed the experimental method using pre–experimental design with one group pretest-postest design, and was conducted at SMAN 7 Pontianak involving 35 students of class X MIA taken by the intact group through ramdom sampling technique. A diagnostic test which 18 multiple choice questions. The misconception decrease was analyzed for significance by using McNemar test and DQM (The decreasing of Quantity of the student that Misconception). The result shows that the integrated remediation of misconception on physics learning has positive effect on students misconception.

Keywords: integrated remediation, misconception, refutation text, fluid

PE-017-105-DSA-AA44

Conceptual Understanding and Difficulties Profile of Archimedes Principles between High School Students in City and Rural Area

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Abstract. The aims of study to determine the differences conceptual understanding of physics in archimedes principle between high school students in city and rural area. This research method is descriptive quantitative. The sample involved 60 students consisting of 30 students in city high school and 30 students in rural area. The instrument consist of nine open ended questions about archimedes principles with a reliability value of 0.664 (high category). The conceptual understanding average of city high school students is 47.77 (sufficient category), while for rural area students is 35.55 (less category). The results of non parametric inferential statistical tests showed that there were significant differences of conceptual understanding between high school students in the city and rural area ($p < 0.05$). The analysis shows that high school students from cities and rural area have difficulty in distinguishing between the concepts of hydrostatic pressure and the concept of archimedes. The implication of the results is expected to the government to provide balanced attention between schools in the city and rural area, so that the problem of disparity can be overcome. Furthermore, the findings of students' difficulties are able to help teachers in designing the better learning.

Keywords*:* Conceptual Understanding, High School Students, Archimedes Principles

PE-020-126-DSA-AA71

Students's Creativity of Nature School and Conventional School: A Comparative Study

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Abstract. Creativity is one of the 21st century skills that is needed to be mastery by students. Many efforts have been made to develop students' creativity, one of the effort is through the nature school program. The fundamental difference between nature schools and conventional schools is learning environment. Nature schools often do outdoor learning than indoor learning. Several studies have proven that outdoor learning can enhance creativity. However, there was no research has shown that with the outdoor learning environment, the student of nature school are more creative than student of conventional school. Therefore, this study aims to compare the student's creativity of natural and conventional schools. This study were conducted by giving creativity test to 23 students of nature school and 29 students of conventional school. The interviews were conducted to the teacher to find out the learning process. The results of the creativity test show that the student's creativity scores of nature schools are higher than students of conventional school. Outdoor learning environment makes students more active and free to explore knowledge, provides more inspiration, more aware to the environment, and more often do collaboration peer to peer. Some of these impact can enhace students' creativity.

Keywords: creativity, nature school, conventional school.

PE-006-056-DSA-AA154

The Improvement of the Students' Kinematics Concept Acquisition Through Multi-Representation Learning

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Abstract. This study reports an effectiveness in multi-representation based on kinematics learning to improve student acquisition of concepts. The research subjects consisted of 58 students from one of the Senior High Schools in Malang City. The effectiveness of learning is obtained by N-Gain based on the results of the pretest and posttest using 20 multiple choice questions. The students in answering do not only choose answers but also give a reason. The reason for the answer is used to see the mindset of students towards the problem. The results of the data analysis show that, the applied learning is proved to be effective in increasing the students' concepts acquisition with N-Gain of 0.35. In addition, students can qualitatively use operational definition to determine the velocity of motion diagrams, students can determine the magnitude and direction of acceleration correctly through operational definition acceleration, and students can improve their ability to work with vectors in kinematics.

Keywords: kinematics, N-gain

PE-034-216-DGA-AA155

Problem Solving Ability and Self-Efficacy of Students in Static Fluid Materials at Flipped Classroom Integrated STEM

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Abstract. 21st century skills that students must have as individuals in facing world developments are (1) life and career skills, (2) learning and innovation skills, and (3) Information media and technology skills. These skills are needed by students to face more complex problems. In addition, students' communication skills to convey ideas and ideas are also very needed and can grow by teaching students self-efficacy, especially in science learning. These skills can be grown and taught to students with active learning and involving students directly. Therefore the problem solving abilities and self-efficacy of students can be grown well. This study aims to determine how students 'problem solving abilities and students' self-efficacy in science learning are learning by flipped classroom integrated STEM. This study uses a mixed method method that combines quantitative and qualitative methods. The design used is embedded experimental design. The sampling technique is random sampling. The problem solving test instrument consisted of 7 essay questions with reliability of 0.795 and 28 statements of self-efficacy questionnaire. The data analysis used is the T test. The results showed that there were changes in the problem solving abilities of students in STEM integrated flipped classroom learning seen from changes in the value of the pretest and posttest. Based on the results obtained, students' problem solving abilities can be categorized as increasing from very low to high. Self-efficacy of students also experiences positive impact on each meeting. Student self-efficacy scores at each meeting tend to be constant. This shows that this learning has a positive impact on maintaining student self-efficacy. Suggestions for further research use instruments that are more detailed and specific and more careful because analyzing student self-efficacy requires careful accuracy.

Keywords: flipped classroom, STEM, problem solving, self-efficacy, static fluid

PE-036-223-DGA-AA168

Analyzed The Student's Epistemic Game based on The Physics Understanding

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Abstract. Epistemic game showed the connection between the physics understanding of problem solving and the developing of student's intellectual. The research aimed to describe epistemic game of students who have average physics understanding for solving electrical circuits test. This research was qualitative research. The research result showed the average physics understanding of the first test were physical mechanism, mapping meaning to mathematics, pictorial analysis and transliteration to mathematics. On the second test, students used mapping meaning to mathematics, physical mecahnism, pictorial analysis, transliteration to mathematics. Students solved the third test physical mechanism, mapping menaing to mathematics and transliteration to mathematics. The student's solving of fourth test showed mapping mathematics to meaning and pictorial analysis. The result of student's solving of fifth test were mapping mathematics to meaning and pictorial analysis. On the sixth test, students used mapping meaning to mathematics and transliteration to mathematics. Students solved the seventh test transliteration to mathematics, physical mechanism and recursive plug and chug. The eighth test pictorial analysis and mapping mathematics to meaning.

Keywords: epistemic game, electrical circuits, physics understanding

PE-035-222-DSA-AA193

Improve Scientific Literacy and Problem Solving Abilities in Newton's Law through E-Scaffolding Conceptual-Procedural in Hybrid Learning

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Abstract. This study aims to determine whether students who learn through e-scaffolding conceptual-procedural in hybrid learning have scientific literacy and problem solving ability better than conventional methods. The research applied the mixed method with the explanatory design. Subjects were 71 students of SMAN 5 Malang, 36 students as an experimental group and 35 students as comparison group. The results showed that scientific literacy and problem solving ability of students who learn through e-scaffolding conceptual-procedural in hybrid learning better than conventional methods. E-scaffolding conceptual constructs the student's thinking pattern more systematically in solving Newton's problem, so it helps students to construct fundamental conceptual understanding to identifying goals and finding solutions. E-scaffolding procedural by vee-maps can improved student's ability to explain scientific phenomena, evaluate and design scientific inquiry, and improved their understanding of how interpret data and evidence for their ideas in physics.

Keywords: e-scaffolding conceptual-procedural, hybrid learning, scientific literacy, problem solving abilities

PE-057-331-ISA-AA306

Investigating the Purposes of Students in Conducting Thought Experiments While Solving Physics Problem

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Abstract. Throughout the history of physics, there have been several exemplary cases in which physicists used thought experiments either to formulate new theories or to refute existing theories. For instance, as the most representative example, Schrödinger introduces a thought experiment about a cat, a bottle of poison, and a radioactive source in a closed box to criticize Copenhagen's interpretation of quantum mechanics. This study sought to investigate the purposes of students conducting thought experiments while solving physics problems. There were 12 voluntary participants in this study. They were master and undergraduate students at the Muhammadiyah University of Makassar and the State University of Makassar in Indonesia. The participants were divided into three groups, so that each group consisted of four students. Physics problem-solving activities were used to set the necessary conditions for observing the processes of students in conducting thought experiments. The results show that while solving physics problems, students design and run thought experiments as a tool: to predict solutions to the problems, to check whether their hypothesis is true or false, and to provide further explanation about their hypothesis. Based on the results, we discuss the similarities and differences in goals between scientists and students in conducting thought experiments. We also discuss the importance and implications of thought experiments to both current and future physics teachers.

Keywords: goal, problem-solving, thought experiments

SE-014-147-DSA-AA99

Creative Thinking Skills on Junior High School Students in Science Learning by Gender

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Abstract. Creative thinking is one of the important skills in science learning. Creative thinking skills becomes a source of strength in the development, invention, and investigation to face the obstacles in 21st century. The aim of this study was to determine creative thinking skills on junior high school students in science learning by gender. This study uses descriptive analysis. Data collection was done through tests, interviews, questionnaire, and observation sheets. The participants of this study were 94 students from three different schools consisting of 35 male and 59 female students. They were chosen by purposive sampling. Indicators of critical thinking are fluency, flexibility, originality, and elaboration. Creative thinking skills in this study are divided into three categories: high, medium, and low. The result of this study showed that the male students have high percentage in flexibility, medium percentage in originality, and low percentage in both fluency and elaboration. Female students have high percentage in fluency, medium percentage in elaboration, and low percentage in both originality and flexibility.

Keywords: Creative thinking skill, Science learning, Gender, 21st Century

SE-014-147-DSA-AA100

Profile of Students' Creative Thinking Skills in Learning Science

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Abstract. Creative thinking skill is one of the 21st century skills or also known as 4C that students must have. Creative thinking skill is useful as a source of encouragement, drive and strength in development, research and investigation to deal with the industrial revolution 4.0. This study aimed to determine the profile of secondary schools students' creative thinking skills in learning science. Science is one of the subjects that requires creative thinking skills. The method used in this study is descriptive analysis. Data were collected through observation sheets and interviews. Subjects in the study were 126 students from four different secondary schools. The results of this study show that the percentage of thinking fluently is 71%, thinking originally is 40%, thinking flexibly is 63% and thinking of elaboration is 59%.

Keywords: *Creative Thinking Skills, Learning Science, 21st Century Challenge, Industrial Revolution 4.0*

SE-026-190-DSA-AA140

Exploration of Student Creativity in Science, Technology, Engineering, Mathematics (STEM) Learning

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Abstract. The Creativity is one of the important skills for students to face the challenges of the 21st Century. Some studies find the low creativity of Indonesian students. STEM learning is predicted to improve student creativity. This study aims to explore students' creativity in STEM learning for light material and optical devices. Mixed methods embedded design was implemented to 32 students of one of the SMP in Malang City. The research data were obtained from the pretest and posttest using 10 creativity test items adapted from Torrace Test of Creativity Thinking (TTCT) with aspects including fluency, flexibility and originality. Quantitative data were analyzed using paired sample t-test, N-gain test, and d-effect size test, while qualitative data were analyzed by reducing and categorizing student answers. There is a development of student creativity because of the influence of STEM learning. This finding is supported by the results of the N-gain test with a value of 0.39 (medium) and the d-effect size obtained by the value of 1.48 (very high). Implementation of STEM at a longer duration is recommended for further research.

Keywords: generic creativity, STEM, light and optical devices

SE-033-266-DGA-AA239

Analysis of Students' Conceptual Understanding of Electricity in Fundamental Physics III Short-Term Program

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Abstract. Electricity is one of the contents delivered through Fundamental Physics III course. In Physics Study Program, this course is provided alongside the Fundamental Physics II course in the regular-term program. It might cause difficulties since students have to understand physics concepts in Fundamental Physics II and III together. Moreover, Fundamental Physics III course only offers 3 credits while the Fundamental Physics II course offers 4 credits making students put less attention to Fundamental Physics III rather than the Fundamental Physics II. The method used to deliver the course content also made an impact on students' conceptual understanding of electricity. Thus, an interview has been conducted to know students' thought about their ability, their previous study of electricity, their opinion about exact cases of electricity, and their opinion about the short-term program. Students' conceptual understanding progress on electricity has been tested using conceptual understanding inventories by pretest and posttest technique. The pretest was done prior to joining the short-term program and the posttest was done after the electricity chapter has been delivered. The pretest was done to diagnose students' initial understanding, and the posttest was done to know the progress of their physics understanding. The results show that by joining the short-term program, students understanding is improved shown by the 0.44 gain and increased average score from 25 to 39.5.

SE-040-313-DGA-AA273

The Views of Nature of Science (NOS) Expressed by Junior High School Students From East Java, Indonesia

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Abstract. The goal of science education around the world is achieving a scientific literate society and one of important components in developing scientific literacy is understanding the nature of science (NOS). This study aims to describe a profile of junior high school students' views of NOS. The research was descriptive in nature using survey for data collection. The subjects were 840 junior high school students selected from nine districts in East Java province, Indonesia. The instrument of NOS developed was a questionnaire consisted of 24 items with a Likert scale (alpha Cronbach = 0.802). The six aspects of NOS addressed in the instrument were observation and inference, tentativeness, scientific theory & laws, social & cultural embeddedness, imagination & creativity, and scientific methods. The results of the study showed that in general the junior high school students' views of all NOS aspects were lacking. In detail, from the six aspects of NOS: the percentage of students who held Well Informed Views, Informed Views, Less Informed Views, Uninformed Views and Uncodeable/Doubt of NOS were 8%, 17%, 10%, 2%, and 63%, respectively. Students understood well in the aspect of tentativeness while they understood least in the aspect of scientific theory and laws. Majority of students, however, doubted in understanding of NOS. The study has implication that knowledge about the NOS should be taught in junior high school explicitly. Moreover, the textbooks they used should also include NOS expicitly so that students will have well informed views of NOS.

Keywords: science education, NOS

SE-042-315-DSA-AA274

Acquiring Scientific Reasoning from Guided Inquiry: How Students Integrate Key Concepts in Science

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Abstract. As far as the fast-growing world of science education is concerned, the goal of teaching is not merely how to make students understand the key concepts in science, but it is also to prepare students accomplish the prerequisite of higher order thinking skills, i.e. scientific reasoning. It covers problem-skill and reasoning abilities, from gathering to revising hypothesis, as the manifestation of knowledge change and knowledge achievement processes obtained by inquiry activities. Therefore, studies on exploring students's scientific reasoning have magnetized experts in science education. Herein, guided inquiry model was conveyed to investigate the scientific reasoning of students in junior high school on the topic of pressure. The model was implemented for three consecutive meetings. The analysis was based on the students's answers on 10 two-tier multiple choice questions and the questions comprised of 7 scientific reasoning indicators. After implementing the quided inquiry model and conducting the pretests and postests in the classroom with 32 students, some important findings are found as follows: (1) increased points of students's tests are observed for each scientific reasoning indicator and each question and (2) every syntax of the guided inquiry provides an uplift to students's scientific reasoning ability. The detailed evaluation on each two-tier question and indicator is described in this present paper.

Keywords: *Guided inquiry, scientific reasoning, pressure.*

SE-048-338-DGA-AA310

The Relationship between Capability Dimension and Cognitive Dimension Ability of Grade VII Middle School Students in Malang City

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Abstract. Data from PISA and TIMSS shows that the literacy ability of students in Indonesia is still lacking. Based on this, the literacy ability of junior high school students needs to be improved and measured again. Scientific literacy assessment can be focused on two dimensions, namely the content dimension and the cognitive dimension. The purpose of this study is to determine the correlation between the dimensions of content and cognitive dimensions. This type of correlational research with the ability variable dimensions content (x) and cognitive dimension capabilities (y). The population in this study were all VII grade students of SMP in Malang, and the sample was VII grade students of SMP in Malang, totaling 76 students. Data collection techniques using the test. Data analysis techniques using regression. The results of data analysis and hypothesis testing show (1) there is a positive relationship between the ability of the dimensions of content with the ability of the cognitive dimensions, (2) there is a positive relationship between the ability of the dimensions of content with the ability to: a) use knowledge or concepts in a meaningful way, b) identify problems , c) analyze and evaluate data or events, d) design investigations, e) use and manipulate tools.

Keywords: Scientific literacy, dimensions content, cognitive dimension

BE-013-079-DGA-AA28

Ferns Misconception Study with Concept Approach in Biology High School Textbook

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Abstract. The concept that is brought by students when they join learning activity in campus sometimes is not fit with the right scientific concept. The teacher's explaining and the text books can increase this comprehension, but the explaining that is accepted by students from teachers or textbooks is not consistent with the scientific concept, or there is misconception. The misconception in the beginning can make the next academic process is disturbed. Ferns are one of the material that is learned by students of grade X in the even semester. Misconception can block students to understand this material. The purpose of this research is to search the misconception on high school biology textbooks, on ferns material that are used by teachers and high school students in Malang city. The result of this research show that from 3 textbooks that are researched, there are concept mistake, principal mistake, the writing of taxon's name mistake, and the writing of language mistake so it is recommended, in writing book of fern material, the writer should understand the right concept so there will not be misconception.

BE-048-243-DGA-AA202

The Profile of High School Students' Literacies of Science, Information, And Technology In Pasuruan

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Abstract. Strategical learning in Biology is intended to help students. The strategy includes the use of information and communication technology. Regarding this, students must have technology literacy to support the development of information and scientific literacy. The aim of this research is to study (1) the level of scientific, information, and technologicy literacy of students and (2) the correlation among scientific, information, and technological literacies. This research is quantitative descriptive research using survey methods. The number of samples is 311 out of 3464 students of SMAN 1 Bangil, SMAN 1 Purwosari, and SMAN 1 Pandaan, taken based on simple random sampling technique. The research data is quantitative data obtained from filling out the HS-21CSI questionnaire in Google Form which is analyzed descriptively. According to (1), the students who have scientific, information, and technology literacy with good and excellent levelswith the percentages of 18.33%, 24.44%, 23.47%, and 54.98%, 61.09%, 45.02% respectively, and (2) the relationships between scientific literacy with information literacy, scientific literacy with technology literacy, and information literacy with technology literacy are in the moderate category. The researcher concluded that (1) most high school students in Pasuruan have literacy of science, information, and technology in the levels ofexcellent and good, and (2) the literacy of science, information, and technology are interrelated.

Keywords: biology, science literacy, information literacy, technology literacy

BE-021-113-DGA-AA86

Analysis of Critical Thinking Ability of High School Students in Malang and Lumajang

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Abstract. One of the needs that must be owned by students in the 21st century is the ability of critical thinking. The purpose of this study was to examine the ability of high school students in Malang and Lumajang. This research is a descriptive qualitative study to describe students' abilities in building intelligence. The research subjects were grade X students at SMAN 3 Lumajang (32 students), SMA Panjura Malang (27 students), and SMA Surya Buana (23 students) 2019/2020 total 82 students. The instrument used consisted of 9 essay questions developed from Catalina's critical thinking skills which consisted of 3 indicators. The analysis carried out was categorized into four categories, namely beginners (1), basic (2), advanced (3), and advanced (4). The results showed that students critical thinking skills were low in the basic category with a percentage of 70.73%, category novice with a percentage 24.39%, and category proficient with a percentage 4.87%. This shows that critical thinking students need to be trained, so students have a good critical thinking.

Keywords: critical thinking ability, descriptive qualitative study

BE-023-117-DGA-AA80

Collegiality as the Key to Improving Student Learning in Sustainable Lesson Study Practices

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Abstract. Collegiality plays an important role in the profession of educators, especially teachers. Some schools have not yet developed to try to maintain the quality of learning and even improve their learning at school with responsibilities among peers. This study illustrates the development of collegiality among teachers, especially improvisation and increasing teacher confidence. Some schools in Malang City and Batu City, East Java, Indonesia have implemented Lesson Learned to improve the quality of their colleagues, especially in improving teacher improvisation in learning. This qualitative research illustrates the development of collegiality between teachers, improvisation and increasing teacher self-confidence, especially in learning. Some schools also fail to implement Lesson Study continuously because of the unsuccessful beliefs and learning practices. Only a few studies focus on aspects of the responsibilities of colleagues in developing teacher professionalism. Most studies still focus on pedagogical competencies as teaching skills while still ignoring the role of the learning community. Thus, developing the quality of collegial learning in schools is very important to support a shared learning atmosphere.

Keywords: collegiality, lesson study

BE-029-139-DSA-AA91

Comparative Study of Three Levels Inquiry Viewed from Critical Thinking skills in the first grade class of Senior High School

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Abstract. Self Directeted Inquiry - Socio Scientific, Guided Inquiry, and Structured Inquiry are inquiry level strategies to improve critical thinking. The three strategies implemented in the learning of biological subjects in virus, bacteria and fungi material were then evaluated and compared. The purpose of this study was to compare the three levels of inquiry strategies in improving critical thinking. The critical thinking test used as a measurement tool in this study refers to the results of integration indicators between WGCTA, Ennis, California and Cornell. The results show that the three levels of inquiry can significantly improve critical thinking and there are significant differences in effect size between the three levels of inquiry. These results indicate that the three lessons have the same effectiveness in improving students' critical thinking.

Keywords: three levels inquiry, critical thinking skills

BE-058-289-DSA-AA250

Scientific Literacy Profile Of Science And Non-Science Students In Senior High Schools

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Abstract. One of skills that must be possessed in the 21st century is scientific literacy for help students solve problems using scientific concepts. The purpose of this study was to describe the scientific literacy profile of science and non-science students in senior high schools and the factors that influenced scientific literacy. This was a descriptive research study with qualitative and quantitative approaches. Quantitative data in this study was a test of differences in scientific literacy skills of science and non-science students by using ANOVA. Qualitative data intended in this study was a description of the questionnaire results and interviews of biology and geography teachers, as well as science and non-science students. The profile of scientific literacy was derived from the results of tests of scientific literacy that had been logically and empirically validated. Factors that influenced scientific literacy were derived from questionnaire answers and interviews with biology and geography teachers, as well as science and non-science students. The results showed that the scientific literacy skills of science students was 45.27% (less), and non-science students was 42.38% (less). There was no significant difference in scientific and non-scientific students' scientific literacy. Factors that influenced scientific literacy were the learning process, students' reading interest, and student attitudes towards science.

Keywords: scientific literacy, science and non-science students, were the learning process, students' reading interest, and student attitudes towards science.

BE-060-296-DSA-AA251

Profile and Factors Involved in Students' Scientific Literacy of Senior High Schools

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Abstract. The aim of this research was to describe the profile students' scientific literacy of Senior High Schools and describe the factors involved in scientific literacy. This research used descriptive research with quantitative and qualitative approaches. Quantitative data in this research was the results of tests that have been logically and empirically validated. Qualitative data in this research was description of the results questionnaires and interviews regarding factors involved in scientific literacy and the results of validator suggestions. The results of scientific literacy test were analyzed by using percentages to determine the profile students' scientific literacy of Senior High Schools. Factors involved in students' scientific literacy were analyzed by using the Pearson Product Moment Correlation test. The results of this study showed that the profile student's scientific literacy of Senior High Schools was included in the "less" criteria with a mean score of 43,8%. Factors involved in students' scientific literacy include the learning process, students' science attitudes and students' reading interest.

Keywords: scientific literacy, learning process, students' science attitudes and students' reading interest.

BE-039-180-DGA-AA280

Critical thinking skills of prospective biology teachers: A preliminary analysis

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Abstract. The ability to think critically and have character is one of the competencies that must be possessed by future biology teachers. Biology teachers need to have critical thinking skills to be able to analyze, evaluate, and overcome problems in daily life. For this reason, preparation is needed in empowering critical thinking skills of biology education students as prospective biology teacher, one of which is to explore the initial skills of critical thinking. This study aims to describe the initial ability of critical thinking prospective biology teacher. The study was conducted on 109 students of the Biology Education study program at Universitas Negeri Padang. The instrument used is a critical thinking test consisting of 25 multiple choice questions that refer to Watson Laser Critical Thinking Appraisal (WGCTA). Data were analyzed by descriptive statistics. The results showed that the average critical thinking ability of prospective biology teacher was 60.8 with a moderate category. The ability to reason has the highest average (X = 74.67) and makes inference has the lowest average (X = 33.36). For this reason, efforts are made to overcome the lack of critical thinking skills. One effort that can be done is to train students to solve problems through integrated cultural problem-based learning.

Keywords: critical thinking skills, prospective biology teachers, preliminary analysis

BE-065-307-DSA-AA268

Identification of Concepts for Class X Students Viral and Bacterial Material in East Java

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Abstract. This study aims to identify students' concepts of viral and bacterial material in class X students in East Java. This type of research is quantitative descriptive research. The study sample consisted of 156 students who were determined by purposive sampling in the X class of SMA in East Java including SMA Islam Malang, SMA Panjura Malang, SMA Surya Buana Malang, MAN 2 Lamongan, SMA Muhammadiyah Babat, dan MA Raudlatul Muta'allimin. The research data collection used an interview sheet and questionnaire with Guttman's scale which contained 60 questions about odd grade X grade biology material. The results showed that 45.16% of students did not know the concept of the virus and 56.33% of students did not know the concept of bacteria. Suggestions for improving students' conceptual knowledge are necessary research related to identification of misconceptions of viral and bacterial material in East Java by using three tiers. Identification of three tier misconceptions is needed because it not only knows students 'conceptual knowledge but can know students' conceptual understanding of the beliefs that students have when answering.

Keywords: Bacterial, Concept, East Java, Viral

BE-069-317-DSA-AA287

Exploration of Biology Scientific Students Reasoning Ability at Universitas Negeri Malang

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Abstract. Scientific reasoning ability is an ability that is needed by students in learning Biology. Scientific reasoning abilities are needed by students to improve cognitive abilities in learning. The purpose of this study is to explore the scientific reasoning abilities of Biology students at Universitas Negeri Malang. The sample of this study was 37 students of the 2018 class of Biology Department, Universitas Negeri Malang. This type of research is exploratory research using quantitative and qualitative approaches. The data collection technique used is using essay tests of scientific reasoning abilities to students. The results showed that the students' scientific reasoning abilities were in the very poor category of 72.97% and the less category 27.02%. The next step of research is to find the right solution to be able to accommodate the increase in scientific reasoning abilities in Biology learning.

Keywords: exploration, scientific reasoning, students

BE-066-308-DGA-AA321

Relationship Between Pro-Environmental Attitudes and Teaching Practice from The Student's Perception in Sidoarjo City.

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Abstract. Pro-Environmental attitude could be used in order to predict environmental behaviour for nature protection. Student's perceptions from practice and learning process affect student's attitude in protecting nature and solving environmental problem. The purpose of this study is to find out relationship pro-environmental attitudes and teaching practice from the student perception in Sidoarjo city . The method for this research using correlation test between pro – environmental attitudes and teaching practice from student perception with N= 178 student participant in Senior high school in sidoarjo city. The data were analyzed using Spearman Test. The result showed positive relationship with P value (0,000 < 0,05) between pro-environmental attitude and teaching practice from student's perception. The correlation between pro-environmental attitude and teaching practice from student perception (r) is 0.506. This finding suggest that there is an average (Moderate) relationship between pro-environmental attitude and teaching practice from student perception. The researcher suggested that improving student attitudes to protect nature by improving the quality of teacher teaching methods. The students with a positive attitude will influence nature protection act. The attitude for nature protection act from science learning process.

Keywords: pro-environmental attitude, teaching practice, student perception

BE-004-033-DGA-AA16b

Variance, Amount and Distribution of Cognitive Levels Class 10 Biology Subjects in Curriculum 2013

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Abstract. The 2013 curriculum implemented in biology learning is a competency-based curriculum (KBK). In simple terms what is meant by KBK is after students have finished learning, they receive a number of competencies or abilities which include 4 core competencies (KI), namely (1) spiritual attitude competencies, (2) social attitudes, (3) knowledge, and (4) skills. The minimum cognitive competence in biology subjects that must be mastered by 10th grade students is listed in the basic competencies (KD) contained in the 2013 Curriculum content standards. Cognitive competence in KD is indicated by the verbs used in the KD formula. This paper reveals the variety, amount and distribution of cognitive levels based on the formulation of competency indicators (IK) and question indicators

Cognitive level of operational verb (KKO) data using research data on multiple choice questions (PG) biology subjects in 10th grade high school conducted in 2017 by Hanifah, Wawan, Tania and Atika from the Biology Education Study Program FMIPA State University of Malang (UM). The four students developed a PG question grid from KD 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 3.10, 3.11, 4.1, 4.2, 4.3 grade 10 biology subjects. Question grid has been validated by an evaluation expert validator, material expert validator, and teacher. Suggestions from the validator and the teacher are also used for the revision of the problem grid, so that the question grid is appropriate as a source of cognitive level data diversity. However, before being taken as data, a review of operational verbs (KKO) on the question indicator was compared to the KKO according to the 2017 SMP / MTS and KKO Curriculum Writing Guide for the Curriculum 2013, and KKO revised 2018. The KKO in the question indicator is determined as the data source because it is a translation of the IK so it is assumed to be more diverse, the amount more certain and the distribution more clear. KKO data of item indicators for each KD of class 10 were collected so that the cognitive level, amount and distribution of levels can be determine.

Based on the research, it is known that all cognitive levels from C1-C6, appear as competencies that must be mastered by 10th grade students, but the number and distribution are not in all KD. Cognitive levels C4, C5, C6 which are competencies for the ability to think critically and creatively also exist even though the numbers are not many. The highest number of cognitive levels in grade 10 is C2 (56); followed by C1 (32), C3 (24), C4 (17), C6 (6) and C5 (1). The large number of C2 is found in KD 3.2 (22), KD 3.3 (27). C3 is the most in KD 3.9 (11). C4 on KD 3.10 (6) and KD 3.11 (5). KD 4.1, 4.2, 4.3 only bring up C6 because the formulation requires students to convey ideas or work. The number and distribution of cognitive levels are influenced by verbs used in the KD formula because the IK and question indicators are derived from KD.

Mathematics and Science

ME-001-006-IGA-AA2

Convergence to Walrasian Prices in Random Matching Edgeworthian Economies with Bounded Rationality

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Abstract. We study a model of Edgeworthian economies where participants meet at random to exchange goods. Two participants from a collection of N participants are paired at random with equal probability of selection at each trading period, according to a given probability distribution satisfying the p-statistical dual- ity condition. The objective of each participant is to maximize his utility, which is described by a concave, continuous and increasing utility function, where n goods are traded. The participants have different level of information, allowing trade to deviate from the bilateral equilibrium. A more informed participant trade with a less informed participant with advantage to the more informed one, two highly informed participants lose by not trading, while two non informed or equally less informed participants will trade at the bilateral equilibrium . We show that the expectation of the limiting equilibrium price coincides with the equilibrium price of the related Walrasian economies. The result of our work extends to the study of economies in the presence of uncertainty within the multi-period Arrow-Debreu model, supporting understanding of how beliefs survive and propagate through markets.

Keywords: edgeworthian economies, random matching economies, and walrasian equilibrium.

ME-008-020-DGA-AA4

Prediction of Rainfall by Using Ordinary Kriging Near of Train Stations in Bogor

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Abstract. In measuring rainfall, there is a limitation that certainly not all points have a measuring device. With this limitation, a method is required to estimate a value for a point that has not been measured. Kriging method is used to estimate the value of a location of the sample value found around the location to be predicted. It can be identified with spatial dependency. A close area having similar values will show a positive value of spatial autocorrelation. Whereas, if the value in the close area is not similar indicates a negative spatial autocorrelation value and for the random spatial autocorrelation value indicates that there is no spatial autocorrelation between the two places, where the correlation is shown through variogram. Ordinary Kriging is the most widely used kriging method. The experimental variogram compared to some theoretical variograms (Spherical, Exponential, Gaussian, Cubical, Cardinal) was chosen by one of the best semi-variogram models to estimate the value to be searched. In this study, rainfall estimates were carried out every 10 days at twelve stations in Bogor City in January 2013 to December 2014 where 10 locations were used for modeling and 2 locations were used for their estimates.

Keywords: ordinary kriging, rainfall

ME-011-026-DGA-AA97

Customer Service Application Simulation Credit Payment with Softcash Flat Method in Green Citayam City Company

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Abstract. Business property, likes housing and apartments continues to increase. Developers in the housing sector continue to build housing with various types of buildings with a different land area and building area. Housing sold to the community is divided into 2 types, namely subsidized housing and commercial housing. Almost every day the Green Citayam City Company marketing office is always visited by prospective buyers who want to find complete information about the house and how to pay the monthly installments even if in the end not a few of them eventually become buyers of the housing. But unfortunately in providing services to customers there are still manual ways. When someone registers as a prospective buyer, the data relating to the customer is still manually recorded such as full name, ID number, current address, telphone number or cellphone number, email, gender, closest family name, nearest family telphone number, date of birth, basic salary, housing prices that can be taken whether commercial or subsidized, as well as the age that determines the term of payment for housing if the prospective buyer will pay on credit. In fact, when prospective buyers want to ask for installments to be paid monthly, the marketing still explains manually by counting on paper and using a calculator. Of course this is very time consuming. One customer only needs approximately 1 hour so that the customer understands. Marketing is trying to convince prospective buyers to buy a house on offer. By looking at conditions like this to improve service to prospective buyers and customers, it is necessary to make customer service application simulation credit payment with softcash flat method in green citayam city company

Keywords: flat method, property

ME-016-047-DGA-AA13

Coordinating Multiple Composite Units as a Conceptual Principle in Time and Money Learning Trajectory

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Abstract. This paper contributes to the development of students' learning trajectory when constructing an understanding of the concept of time and money in the primary school. Previous research has provided insight into children's natural developmental progression within the topics of time and money. The learning trajectory in this study provides researchers and teachers with a snapshot of the sequence in which students develop elaborated bidimensional thought when dealing with time and money, thus providing us with some insight as to which skills are building blocks for others. More importantly, however, is the concurrent provision of tasks and instructional strategies that occasion the development of students' reasoning in more or less fruitful directions toward a flexible understanding of coordinating multiple composite units in the context of time and money.

Keywords: time and money concept, composite units, conceptual principle, learning trajectory

ME-024-080-DGA-AA46

Multiclass Classification of Brain Cancer with Multiple Multiclass Artificial Bee Colony Feature Selection and Support Vector Machine

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Abstract. Cancer is one of the biggest causes of death in the world. In particular, brain cancer is cancer that occurs in the central nervous system. One of the things that can be done to research brain cancer using machine learning is to detect the types of brain cancer by utilizing data microarrays. These problems are multiclass classification problems. Using the one versus one approach, there will be as many as $\frac{k(k-1)}{2}$ two-class problems, where k indicates the number of classes. This study aims to classify the types of brain cancer using support vector machines with the selection of multiple multiclass artificial bee colony based features. In this study the Artificial Bee Colony method will be implemented as a feature selection method and Multiple Multiclass Support Vector Machine (SVM) as a classification method. In the multiclass problem, an Artificial Bee Colony (ABC) training was carried out on each problem in two classes, so that each problem in the two classes had sequencing of each feature. As a classification method, SVM aims to find each class's hyperplane so that first-class data is as close as possible to a hyperplane but as far as possible to other hyperplanes. The outputs of this study are (i) Scientific articles that will be presented at international seminars and (ii) HKI Computer Program classification of brain cancer using the selection of MMABC features and SVM classification. The results of this study are expected to be useful for the community in classifying types of brain cancer more accurately and quickly so that the treatment process can be carried out more specifically and will be able to extend the life expectancy of brain cancer patients.

Keywords: Artificial Bee Colony, Brain Cancer, Multiple Multiclass Artificial Bee Colony, Support Vector Machine

ME-071-247-DSA-AA204

The Construction of Implicit Warrant Derived from Explicit Warrant in Mathematical Proof

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Abstract. This research aims to construct implicit warrant derived from explicit warrant when students did mathematical proof. It is done to seventeen students of mathematics study program through the test of vector in elementary linear algebra courses. The test resulted five students can finish the test and can proof well by using warrant. Out of those, only one student can be a research subject because she can construct implicit warrant to explicit warrant. Subject selection is based on her skill in communicating verbally about the thinking process that can be done in constructing implicit warrant to explicit warrant when she did proof. The research data are taken from thinking aloud, test, and interview from the researcher to the subject. The research shown that the warrant used by the subject can appear directly in the form of her writing. If it can not appear in her writing, it can be through interview. The warrant that she wrote in mathematical proof is called explicit warrant. On the other hand, warrant that can not directly appear but through her mind is called implicit warrant. Implicit warrant is formed by the subject which is derived from explicit warrant according to subject's thinking process. She used her knowledge about define vector, the characteristics of operation, and theorem to construct implicit warrant to explicit warrant. Both are the guarantor used by the subject in solving mathematical proof to get valid result.

Keyword: construction, mathematical proof, warrant

ME-074-261-DGA-AA245

Modified Fourier Transform for Solving Fractional Partial Differential Equations

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Abstract. In recent years many physical phenomenons have been successfully modelled using fractional partial differential equations such as in electromagnetics and material sciences. Fractional partial differential equations involve derivative of non integer order. Many researchers attempted to solve various types of fractional differential equations using various methods. In this paper, new fractional derivative definition is used, that is conformable fractional derivative. The fractional derivative using this definition satisfies many properties which the usual derivative has. By applying some similar arguments on Fourier transform for solving partial differential equation, some modification on Fourier transform is discussed to handle the fractional order. Application of the method to solve some fractional differential equations is given as an example.

Keywords: modified Fourier transform, fractional partial differential equations, conformable derivative.

MA-005-096-DGA-AA36

Hahslm 472319 In Allah Mathematics For Creating Universe

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Abstract. Finding the consistency in the different phenomenon of mathematics such as triangular numbers and the creation of the universe is the aim of this research. The triangular numbers have represented of the equation number as 72319. And also God equation to create the universe has the same digital number of 72319. The Quran and real factor in-universe are the research data. System approach based on prophecies development and empirical values is used as the methodology. Descriptive analysis with comparative advantages is the approach of the study. Triangular numbers have a group of 319, 913, 616 to form the reflexivity equation. To create the universe as Quran Al-Anbiya 21.30, Allah math has the algorithm of 725. As explained in the Quran Al-Hijr 15.87, these 2 (two) method have the same digital numbers of 472319. Both approaches have consistency numbers of 472319 or Hahslm equation is concluded. Islam as the integral parts of Universe guidance Theory (UGT) is what this Hahslm equation consists of.

Keywords: hahslm, 472319, triangular number, the universe, god equation

MA-004-043-DGA-AA53

A Generalized Statistical Convergence in *n*-Normed Spaces

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Abstract. In this paper, we study one of the generalizations of statistical convergence sequences, namely λ-statistically convergent sequence in *n*-normed spaces. Furthermore, we investigate the relationship between statistically convergent sequences, λ-statistically convergent sequence, and Cesaro summable sequence in *n*-normed spaces.

Keywords: statistical convergence sequences, *n*-normed, λ-statistically

MA-006-142-DGA-AA77

Prediction of Palm Oil Agricultural Production in Riau Province with Newton's Interpolation Approach

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Abstract. Agricultural land for palm oil in Riau continues to increase. Many people are clearing land that previously was only empty land and shrubs were converted into oil palm farms. Riau Province is one of the largest oil palm producing provinces in Indonesia. In this study, we used data taken from Riau Province BPS from 2011-2015. At first we did smoothing data using Moving Average (MA), then we predict the yield of palm oil on the area of oil palm plantations using Newton's Interpolation approach for the coming year.

Keywords: Data, Palm Oil, Newton's interpolation

MA-007-196-DGA-AA133

A Case on Study Ring: $g(x)$-nil-clean and Strongly $g(x)$-clean, but not Strongly $g(x)$-nil-clean

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Abstract. Let $g(x) \in C(R)[x]$ be a polynomial in variable x with coefficients in the center of a ring R with unity. Every strongly $g(x)$-nil-clean-ring is $g(x)$-nil-clean and also strongly $g(x)$-clean. But, its converse is incorrect. We found out polynomial $g(x) = \sum_{k=1}^{m} x^{2k} \in C(M_2(\mathbb{Z}_2))[x]$, where m is an even integer and is not divided by 3 such that the matrix ring $M_2(\mathbb{Z}_2)$ over the field $\mathbb{Z}_2$ integer modulo 2 is $g(x)$-nil-clean and strongly $g(x)$-clean, but not strongly $g(x)$-nil-clean. All nilpotent elements of $M_2(\mathbb{Z}_2)$ and all roots of $g(x)$ have been founded by constructing a partition of the ring $M_2(\mathbb{Z}_2)$, i.e. $\{\{A|A^2 = I\}, \{A|A^2 = 0\}, \{A|A^2 = A, I \neq A \neq 0\}, \{A|A^3 = I, I \neq A \neq 0, A^2 \neq A\}\} \subseteq M_2(\mathbb{Z}_2)$.

Key Words*:* Strongly $g(x)$-nil-clean, strongly $g(x)$-clean, $g(x)$-nil-clean.

MA-011-272-DGA-AA227

A Web-Based Template Intelligent Tutoring System Design

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Abstract. One aim of 2013 curriculum is to prepare future challenges and competing in the globalization era. The factors that influence the process of running Curriculum 2013 are teachers, students and student learning tools. One of the student learning tools is the Intelligent Tutoring System (ITS). ITS is an artificial intelligence program that makes computers can help replace the teacher's role in delivering material and practice questions when the teacher is unable to attend. In previous studies, ITS only present one specific material and is made using Adobe Flash or the C + programming language. In this research, we will create Template Intelligent Tutoring System Program. This program can be used by teachers and students in all subjects. The program is made web-based with the aim for making it more dynamic. In this program an assessment of exercises is based on the material indicator using the Forward Chaining Method so that student remediation process is only done for material indicators that have not been understood. We hope, this program can help teachers to deliver material and practice questions and measure the level of understanding of students in each material provided.

MA-009-251-DSA-AA232

The Existence of Nil Clean Ideal of a Matrix Ring over $\mathbb{Z}$

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Abstract. A ring R with unity is called clean, if every element $x \in R$ can be written as a decomposition of an idempotent and a unit element in ring R. Based on the idea in another article for matrix ring $M_2(\mathbb{Z})$, we will extend the result to be subring of matrix ring $M_3(\mathbb{Z})$, that is $X_3(\mathbb{Z}) = \left\{ \begin{bmatrix} a_{11} & 0 & a_{13} \\ 0 & a_{22} & 0 \\ a_{31} & 0 & a_{33} \end{bmatrix} \middle| a_{ij} \in \mathbb{Z} \right\}$. First, we will find out the existence of clean element in matrix ring $X_3(\mathbb{Z})$ and then investigate the matrix ring $X_3(\mathbb{Z})$ which is clean or not. Furthermore, we will provide an example to show that decomposition of clean element might not be unique.

MA-013-278-DGA-AA234

Perturbation Operator Analysis on ILS-RVND Algorithm to Complete Capacitated Vehicle Routing Problem (CVRP)

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Abstract. Vehicle Routing Problem or VRP is a problem to determine a distribution route with minimum distance. VRP has many variants, one of them is to determine distribution of goods with limited vehicle capacity or also called Capacity Vehicle Routing Problem (CVRP). Solutions from CVRP can be determined by a calculation using the right algorithm to get the minimum solution. Various algorithms can be used to determine CVRP solutions, one of them is the ILS-RVND algorithm. The calculation of the ILS-RVND algorithm is carried out in a multi-start manner in which each iteration produces different initial solutions. In the calculation of ILS-RVND algorithm, there are two steps of improvement, namely the local search step and the perturbation step. In this research, a trial will be conducted to determine the combination of perturbation operators which produces the most optimum solution. Perturbation operators used in this research are Double Replace, Double Cross, Triple Shift, Triple Replace and Triple Cross. To facilitate the calculation, the program of the CVRP solution with the ILS-RVND algorithm is needed. This program is made using Delphi which then will be tested on different perturbation operators and also the number of different operators.

MA-012-277-DGA-AA235

Factors of Length Ratio and Mass at Chaos of Double Pendulum System

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Abstract. The double pendulum consists of two pendulums attached together with the pivot of the second pendulum located at the end of the first pendulum by rigid bar, massless and consider the effect of gravity. Double pendulum system has strange and difficult behavior. Chaos in double pendulum system is usually used as an example for chaos in mechanical systems. The chaotic system is characterized by sensitive system to the initial condition, its means that giving the initial condition with a small difference will give a different sollution. Lyapunov Exponent is used to calculate the range of two trajectories with a small difference of initial condition, where the positive exponent value shows two different solution, whose the value is close at the beginning then the more different. Its is used to see indicatted of chaos in the system. In this paper, we determine parameters that will cause the double pendulum system reach chaos easily. To facilitate this, the equations of the double pendulum motion are simplified by $\alpha = \frac{l_1}{g}, \beta = \frac{l_2}{g}, \delta = \frac{m_2}{m_1}$. In particular, we focus on determine mass ratio of the double pendulum system.

MA-014-294-DSA-AA248

Parameter Estimation of Poisson Inverse Gaussian (PIG) using the MLE Method and its Application to Maternal Mortality Rate in East Java in 2017

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Abstract. Regression analysis is a statistical method that can be used to see the relationship between response variables and predictor variables. One method of regression analysis is Poisson regression. In Poisson regression there is an assumption that must be satisfied, namely equidispersion, where the average value of the response variable must be the same as the variance value. In fact, equidispersion assumptions are often not fulfilled, since the value of variance is greater than the average, called overdispersion. If overdispersion occurs than the results are invalid because the estimated standard error value is underestimated. Poisson Inverse Gaussian (PIG) regression is one of the regression analysis methods to overcome the overdispersion problem in the data. Poisson Inverse Gaussian (PIG) regression is also a regression of mixed Poisson which consists of two parameters. In this study, we determine the parameters estimation of Poisson Inverse Gaussian regression using the Maximum Likelihood Estimation (MLE) method. One example of overdispersion is the Maternal Mortality Rate (MMR) data..

MA-015-295-DGA-AA249

Jackknife Ridge-Robust Regression use MM-Estimator with Welsch Weight Function to Handling Multicolinierity and Outlier

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Abstract. Regression analysis is a modeling technique used to investigate relationship between dependent variables with one or more independent variables and estimate regression coefficients on a model. There are several test assumptions that must be satisfied, including normality test, multicollinearity test, autocorrelation test, heterocedasticity test, and outlier detection. In reality, lots of data are often find that does not satisfying assumptions, for example cases of multicollinearity and outliers. Multicollinearity occurs when there are two or more variables having a high correlation, so that it can raise the standard error and decrease the accuracy of the coefficient. While outliers show inconsistent observations of most of the data presented, so that it can cause the model to be inappropriate and inaccurate conclusions. Ridge regression and Robust regression are methods used to overcome data containing multicollinearity and outliers. Jackknife Ridge is an extension of Ridge regression. In this study, Jackknife Ridge-Robust regression was used to solve multicollinearity and outliers problems simultaneously in the regression model. One robust estimator that can be used to estimate ridge parameter is MM-estimator. MM-estimator is a combination of S-estimator and M-estimator which results in high breakdown values and high efficiency. To maximize parameter estimation, Welsch weight function is used in MM-estimator. The results obtained by doing parameter estimation in Jackknife Ridge-Robust regression use MM-estimator with Welsch weight function.

Key Words: Jackknife Ridge, Robust, MM-estimator, Welsch weight function.

MA-016-299-DGA-AA257

Odd Star Decomposition of Complete Bipartite Graphs

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Abstract. Let $G_1, G_2, G_3, \dots, G_n$ be connected subgraph of G. If $E(G) = E(G_1) \cup E(G_2) \cup \dots \cup E(G_n)$ and $E(G_i) \cap E(G_j) = \emptyset$ for any $i \neq j$, then $(G_1, G_2, G_3, \dots, G_n)$ is a decomposition of G. The even star decomposition $(S_2, S_4, \dots, S_{2t})$ of a complate bipartite graph $K_{m,n}$, where S_i is a star with i vertices of degree 1, has been studied by Merley and Goldy in 2016. In this paper we study an odd star decomposition $(S_1, S_3, S_5, \dots, S_{2t-1})$ of a complete bipartite graph $K_{m,n}$ when $1 \leq m \leq 5$.

MA-015-295-DGA-AA261

Parameter Estimation of Spatial Durbin Model (SDM) Using Moment Method

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Abstract. Regression analysis is an analysis that aims to show the mathematical relationship between the dependent variable and the independent variable. The spatial regression model is a model that analyzes the relationship between one variable with several other variables including the spatial effect of several locations that are the center of observation. Spatial Autoregressive Model (SAR) is a model where the dependent variable is influenced by the value of the adjacent dependent variable that is defined accordingly. In its development, the SAR model is not able to overcome the problem if there are spatial interactions in the dependent variable and the independent variable. For this reason, Spatial Durbin Model (SDM) appears. In this article, SDM parameter estimation will be discussed using the Method of Moment approach. The basic principle in the moment method is to choose parameter estimates that are related to sample moments which are equal to zero. The estimation results with this method provide a very reliable estimator, which is an unbiased and consistent estimator for $\hat{\beta}$.

MA-018-333-DGA-AA304

Simulation of Hyperbolic Mean Curvature Flow with an Obstacle in The Closed Curve

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Abstract. The Hyperbolic MBO (HMBO) algorithm has been modified to handle the obstacle problem. In this paper, we use this algorithm to simulate the interface motion according to the curvature dependent acceleration. In this work, we consider a closed curve as the initial curve and the obstacle. We set that the obstacle is located inside the initial curve. We investigate the motion of the curve. In this case, the curve lie on the obstacle after touching the obstacle.

MA-019-344-DGA-AA319

On Ramsey (P_4, P_4) −minimal graphs for small- order

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Abstract. For any given two graphs G and H, the notation $F \rightarrow (G, H)$ means that any red-blue coloring of all the edges of F will create either a red subgraph isomorphic to G or a blue subgraph isomorphic to H. A graph F is a Ramsey (G, H)minimal graph if $F \rightarrow (G, H)$ and $F - e \nrightarrow (G, H)$, for every edge e in F. The set of all Ramsey (G, H)-minimal graphs (up to isomorphism) is denoted by $\mathcal{R}(G, H)$. The pair (G, H) is called Ramsey-finite or Ramsey-infinite depending upon whether $\mathcal{R}(G, H)$ is finite or infinite, respectively. Several articles have discussed the problem of determining whether $\mathcal{R}(G, H)$ is finite or infinite. It is known that the set $\mathcal{R}(P_m, P_n)$, for $3 \leq m \leq n$ is Ramsey-infinite. Some partial results in $\mathcal{R}(P_4, P_n)$, for $n = 4$, have been obtained. However, the characterization of all graphs in the infinite set $\mathcal{R}(P_4, P_4)$ is still open. In this paper, we give all graphs of order at most six in $\mathcal{R}(P_4, P_4)$. By these graphs, we generate some graphs for small-order in $\mathcal{R}(P_4, P_n)$, for each $n \geq 4$.

Keywords: graphs, ramsey, small-order

MA-020-352-DGA-AA330

Products of Fuzzy Graphs on Complete, Strong, and Regular Fuzzy Graphs

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Abstract. We consider to products of fuzzy graphs in the form of homomorphic, box dot, and star products. These products were applied on complete, strong, null, and regular fuzzy graphs. These results were a continuation of the previous work by Dogra.

Keywords: homomorphic, box dot, star, complete, strong, null, regular

MA-017-332-DGA-AA323

Some Properties of Indigent Module

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Abstract. An R-module M is said to be indigent if its subinjectivity domain consist only injective module. In this paper we study some properties of indigent module. We prove that subinjectivity domain of a module is preserved and reflected under equivalence. We also investigate some properties of injective module in view of its subinjectivity domain. Furthermore, we give some connection between a module M being indigent, and the subinjectivity domain of modules in the category $\sigma[M]$.

Keywords: indigent module, R-module M

CH-002-118-DSA-AA76

Enhancement of Electroflotation using Papaya Seeds (*Carica papaya*) for Chemical Laboratory Wastewater Treatment

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Abstract. In this study was evaluated of chemical laboratory wastewater treatment for environment parameter remediation. Wastewater treatment using a combination of electroflotation method with adding biocoagulant agent herein was called electroflotation-biocoagulant process. In this work electroflotation batch system using stainless steel as cathode and graphite as an anode was evaluated in 21 V for 60 minutes. Biocoagulant addition used is tannin category papaya seeds floured with the variation of dose 0.05; 0.1 and 0.2 g/500 mL. The effectiveness of electroflotation-biocoagulant process was evaluated for decreasing Total Dissolve Solids (TDS), Electrical Conductivity (EC) and Turbidity. The chemical laboratory wastewater samples which have been diluted 20 times have the initial condition have TDS, EC, pH, and Turbidity respectively 312 mg/L; 0.43 ms/cm; 7.6 and 34.3 NTU. The result showed that the electroflotation-biocoagulant process reduced the TDS and EC respectively as much as 36.5385% (198 mg/L) and 37.2093% (0.27 ms/cm) at the coagulant dose of 0.2 g/500 mL while for turbidity as much as 71.2245% (9.87 NTU). Therefore, the electroflotationbiocoagulant process reduced the environment contaminant in the chemical laboratory wastewater treatment.

Keywords: biocoagulant, chemical laboratory, electroflotation, papaya seeds, wastewater treatment

CH-003-322-DSA-AA295

Effectiveness of Anthocyanin Extraction in Purple Cabbage *(Brassica oleraceae)* Using The Ultrasonic Bath Method was Reviewed in physicochemistry

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Abstract. Purple cabbage (*Brassica Oleraceace*) is a vegetable with a myriad of benefits for human health. Purple cabbage contains anthocyanin which is characterized by its striking characteristic, which is purple. Anthocyanin has a function as a natural antioxidant and has antioxidant power 150 times stronger than flavonoids. Anthocyanin extraction in purple cabbage can be done using several methods (maceration, socletation, and ultrasonic). The purpose of this study was to examine the effectiveness of the ultrasonic bath method on anthocyanin extraction in purple cabbage. The design of this study uses descriptive analysis by comparing the Ultrasonic extraction method and the maceration method which are affected by extraction time (30 and 45 minutes). The results showed that anthocyanin extraction in purple cabbage extract used the ultrasonic bath method better than the maceration method. Analysis of ai purple cabbage content was 90.47%. The yield test with the average yield of purple cabbage extract using the ultrasonic bath method ranged from 6.99 to 13.91% while the maceration method with magnetic aids of stirrers ranged from 5.17 to 13.15%. The residual solvent test showed that the residual content of the solvent using the ultrasonic bath method ranged from 94.39 to 94.73% while the maceration method with the magnetic assisted stirrer ranged from 95.15 to 94.82%. Test the total anthocyanin content using a Uv-Vis spectrophotometer

Keywords: anthocyanin, extraction, purple cabbage, ultrasonic bath

CH-004-349-DSA-AA327

Characterization of Adsorbent from Pine Strobilus Active Charcoal (*Pinus merkusii*) and Its Performance in Adsorption of Methylene Blue

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Abstract. Indonesia is a tropical country which has forest area around 162 million hectares. One of the forestry results is pine trees. The pine trees has male and female reproductive organs called strobilus. Strobilus pine has a high potential for charcoal fiber. However, the use of pine strobilus is still limited. Whereas strobilus can be converted into activated charcoal as an adsorbent. This study aim to analyze the characteristics of activated charcoal from pine strobilus with activators of $ZnCl_2$ and Na_2CO_3 and to determine the ability of its adsorption to methylene blue. The research steps begin with making pine strobilus activated charcoal with activators of $ZnCl_2$ and Na_2CO_3. Then, the active charcoal characteristics test was carried out in the form of water content, ash content, and activated charcoal adsorption ability of methylene blue which analyze by UV-Vis spectrophotometer at a wavelength of 665nm. The selection of activators in the form of $ZnCl_2$ and Na_2CO_3 is based on previous research which states that activated charcoal with activator $ZnCl_2$ has greater adsorption energy than other activators. The result of the study showed differences in the characteristics of activated charcoal with activator of $ZnCl_2$ and Na_2CO_3. Characteristics of activated charcoal strobilus pine has a water content with the activator $ZnCl_2$ of 22% and activator Na_2CO_3 of 46%. The ash content test result with $ZnCl_2$ activator was 15.75% and with Na_2CO_3 activator was 14.06%. Pine strobilus activated charcoal with activator Na_2CO_3 has a higher adsorption capacity of methylene blue, which is 2,4131 mg/g sample, compared with $ZnCl_2$ activator which only 2,3508 mg/g sample.

Keywords: adsorbent, pine strobilus, methylene blue

PE-031-210-DSA-AA157

Static Fluid Conceptual Change trough Authentic based on Phenomena

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Abstract. Students' static fluid conception contradicts scientific concepts, such as the magnitude of different hydrostatic pressures at the same depth. Students' conception is built on experience and observation of phenomena in everyday life. This student's conception is a wrong conception. Student conception can be improved by conceptual change. Students have a good understanding of scientific concepts. The learning is applied to conceptual change should be varied learning and support students' conceptual changes. That learning challenges students to explain concepts and learning that uses their knowledge in real situations. The learning is authetic learning. Phenomenon is used according to real-worl elements. Conceptual changes in students in fixed categories or no conceptual changes from understanding some to understanding part and understanding the concept to understand the concept. Experimental reference in physics matter requires for expand student knowledge and explanation from simple simulation of folating objects because there ar still many students who has difficulty and dissapoints.

Keywords: conception , phenomenon, static fluid.

SE-004-018-DGA-AA3

Determining Promotion Route of Indraprasta University Using Greedy Algorithm

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Abstract. Data production on campus environment are abundance and sometime causing waste of data. Therefor if we use data wisely data can be analyze into something that useful. Geographic Information System (GIS) is a System designed to capture, store, manipulate analyze, manage and present all types of geographical data. Greedy Algorithm is a simple, quick and easy algorithm to optimization problems, it is an algorithmic paradigm that follows the problem solving approach of making the locally sourced optimal choice at each stage with the hope of finding a global optimum. Data were collected and analyzed in line with system requirements. Steps of this research are system requirement analysis; System modeling; Database design; User interface design. Aim of this study is to help campus management in making policy regarding promotion route and to propose system to determine promotion route using greedy algorithm.

Keywords: geographic information system, waste of data

SE-006-032-DGA-AA8

Optimation Mobile Ad Hoc Network DSDV and OLSR Using Evolutionary Algorithm

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Abstract. The common problem that's mostly found in urban areas and the organizations that Efficient message delivery in (MANET) Mobile Ad hoc Network is something that is problem to achieve. To get good and efficient communication, the Algorithms used must pay attention to several aspects such as the density of neighbouring node, shape and network size, channel priority level and used of message. Several studies have attempted to propose a solution for delivering messages. But it is very difficult to find which optimal problem solution should be used. In our research proposed a message relay optimization method on Mobile Ad hoc Network using an Evolutionary Algorithm, were using the algorithm will provide several solutions to the problem of sending messages to Mobile Ad hoc Network. Our research aims to determine the optimal communication strategy for each node. In this research, the author tries to combine (ns-2) network simulators and (EA) evolutionary algorithm which are expected to optimize message delivery to the destination.

Keywords: evolutionary algorithm, MANET, message delivery

SE-016-157-DSA-AA162

The Effect of Washing Methods On Hygienic And Quality Level of Industrial *Moringa Oleifera* Leaves

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Abstract. *Moringa oleifera* has many function such as food, cosmetic and medical product. *M. oleifera* leaves processing consists of washing step by clean water and salt solution. The purpose of the study was to determine the effect of washing method to hygienic and quality of industrial *M. oleifera* leaves. In this study, four types of *M. oleifera* leaves washing method were applied to obtain comparation between several types of water sources namely well water, government water treatment, refilled water and bottled water. Further, two types of salt sources were as well applied namely commercial salt and raw salt. The parameter of *M. oleifera* hygienic were total plate count, MPN coliform, *Salmonella* sp. present, and *Staphylococcus aureus* cell number. Meanwhile, the antioxidant capacity and flavonoid level were as well determine as quality level of *M. oleifera* leaves. The results showed that the most effective washing method were using a combination bottled water and commercial salt with total plate count, MPN, *S. aureus* value as 0.9×10^4 CFU/ gram, 0.55/ gram, 0.2×10^2 CFU / gram respectively with all positive results in *Salmonella* sp. test. The best *M. oleifera* quality was achieved by washing the leaves with refilled water and raw salt with number of level of flavonoid and antioxidant capacity percentage were 8.57 mgQE/ gram and 69% respectively.

Keywords: antioxidant, flavonoid, hygienic, *m. oleifera*, washing.

SE-017-158-DSA-AA136

Immobilization of *Bacillus* sp. SLII-1 on Chitosan-Alginate Hybrid Material for Promising Feedstock Supplement

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Abstract. The increase of the poultry industry led to an increase of feed demand. On the other hand, poultry industry produce feather waste which composes 5-7% of the total body weight. Feed diversification by utilizing feather waste can be an alternative to overcome the problem of the high price of feed and reduce environmental waste. The use of feather as feed has a disadvantage because of the low digestibility of feather waste. The strategy to increase digestibility of feather waste was to deliver keratinolytic bacteria to poultry intestine using immobilization technique. Bacillus sp. SLII-I as keratinolytic bacteria was able to increase dissolved protein in feather meal liquid medium from 7.69 ± 0.35 mg / ml to 16.74 ± 0.31 mg / ml. Our study was conducted to determine the most effective composition of immobilization matrix in poultry digestive system simulation. The composition of 2% sodium alginate and 0,8% chitosan was most effective in delivering bacteria to poultry intestine as much as 2.54 ± 0.04 CFU per gram bead in poultry digestive system simulation.

Keyword : Bacillus sp. SLII-I, Chitosan, Feather, Sodium Alginate

SE-018-159-DSA-AA145

Microbial Consortium Synergism for Promising Freshwater Culture Probiotic

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Abstract. Freshwater culture productivity can be improved by intensification. One of the most effective intensifications is the addition of probiotic agents. Bacillus subtilis, Lactobacillus lactis and Saccharomyces cerevisiae have great potential as freshwater culture probiotic. Those microbes have the potential to improve water quality in freshwater culture. In the microbial consortium, the member of microbes has to have the ability to form synergism relationship to perform probiotic functions. Synergism interactions can be based on material transfer that relates to the energetic, cell to cell communication or physical protection. Advantage of microbial consortium synergism as a probiotic candidate have higher effectiveness and cause a broad spectrum effect than a single culture. The purpose of this study was to establish a synergism relationship between B. subtilis, L. lactis, and S. cerevisiae as probiotic candidates in freshwater culture by measuring synergism test using cross streak method. The results showed synergism between all culture microbes thereby depicting none inhibition zones between isolates.

Keyword: Cross streak, Freshwater Culture, Microbial Consortium, Probiotic, Synergism

SE-019-160-DSA-AA147

The Effect of Drying Methods on Hygienic and Quality Level of Industrial *Moringa oleifera* Leaves

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Abstract. *Moringa oleifera* leaf widely used as a food and medical purposes since it contains plenty amino acid, anti-inflammatory compound and high antioxidant capacity. There are several step to process *Moringa oleifera* leaf before is used as food and medicine. Drying is a part of processing to reduce water in order to inhibit microorganism growth and to extend shelf life. The purpose of this research was to determine the effect of drying methods (oven, sun drying, room temperature and roasting) on hygienic *Moringa oleifera* leaf by measuring MPN Coliform level, TPC (Total Plate Count), *Salmonella* sp. and *Staphylococcus aureus* meanwhile the *Moringa oleifera* quality measured by the level of total flavonoid and antioxidant capacity. All hygienic standard based on SNI (National Standard Indonesia):7388 where all drying method were classified in those standard. Further, the result showed that the oven drying was the best method than others resulting total flavonoids and antioxidant capacity as 14.29 mgQE/g and 69% respectively.

Keyword: antioxidant, *moringa oleifera*, drying, flavonoid, hygienic

SE-020-161-DSA-AA148

Effect of Laccase Oxidation On Phenol Content And Antioxidant Capacity of Roasted Coffee

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Abstract. The endogenous enzyme in fresh coffee beans mostly are from class of oxidoreductase. However, those enzyme have low effectiveness in phenolic compound oxidation. The fermentation time of conventional coffee processing requires longer therefore need exogenous enzyme such as laccase. Laccase (EC 1.10.3.2) is a ligninolytic enzyme that able to degrade lignin, in this study laccase produced by Trametes versicolor. The addition of laccase as an exogenous enzyme is to increase the effectiveness of phenol compounds oxidation in coffee beans, then it could reduce the coffee bitterness. Bitterness taste of coffee beans is caused by phenolic compounds such as caffeic acid, chlorogenic acid, and ferulic acid. The purpose of this study was to determine laccase oxidation in coffee beans quality by measuring phenol content and antioxidant capacity. The results showed that the lowest total phenol (0.73 ± 0.103 mg/ml) was achieved by laccase oxidation using ABTS with antioxidant capacity 91.58 ±0.001%.

Keywords: coffee, enzymatic fermentation, laccase, oxidation, phenol.

SE-021-162-DSA-AA173

Effect of laccase from White Rot Fungus *Trametes versicolor* on Roasted Cocoa Bean

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Abstract. Cocoa beans (Theobroma cacao) processing consist several stages, including fermentation. Fermentation actually is a process of oxidation to reduce polyphenol compounds which leads lowering of bitter taste, astringency and as well increase cacao beans aroma. Oxidation can be done by artificial oxidation or natural agent such as enzyme. Laccase is an enzyme that has many functions and roles in industrial fields such as delignification, coloring or stain bleaching, bioremediation, and also in the food industry. The purpose of this study was to determine the effect of enzymatic oxidation of laccase on the quality of cocoa beans by measuring at the total polyphenol compounds, antioxidant capacity, reducing sugar, and fermentation indices (IF). Trametes versicolor laccase showed the highest activity of 1081.2 U/ml, with the highest specific activity of 36040 U/mg and total protein content of 0.003 mg/ml using ABTS as a substrate. The Km value of the enzyme was obtained as 0,98 mM with the corresponding Vmax as 424 U/mg. The best Cacao bean quality was obtain in the treatment of laccase-ABTS oxidation with the lowest levels of polyphenol compound is 0,493 mg/l 0,28, highest antioxidant capacity is 90,77 % 0,22, lower reducing sugar level is 0,756 ppm 0,13 and showing fermentation index (IF) greater than or equal to 1, thus allowing an increase in distinctive taste and aroma of cocoa.

Keywords: cocoa, fermentation, laccase, oxidation, polyphenol.

SE-022-163-DSA-AA144

Effect of Laccase Oxidation Pretreatment On Coffee (*Coffea Arabica*) Bean Processing Waste for Composting Substrate

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Abstract. Laccase oxidation pretreatment on coffee pulp and husk in this study is expected to improve the quality of compost produced by removing phenol compounds which can be toxic for microorganisms. The purpose of this study was to determine the effect of pretreatment of laccase oxidation on coffee bean processing waste (Coffea arabica) consisted pulp and husk by determining the total phenol, reducing sugar, organic materials and compost quality. Optimization of laccase production was carried out on 5 types of fermentation medium. All parameters except organic materials were measured spectrophotometrically. The results showed that the highest laccase activity (1081.2 U/ml) was achieved by E medium which contained rice husk as carbon source. The lowest total phenol and reducing sugar were 0.007 ± 0.07 mg/ml and 3.29 ± 0.19 ppm respectively, which obtained from coffee pulp and husk with laccase oxidation and ABTS pretreatment. Pretreatment of laccase oxidation did not affect the levels of organic matters. All experiment group of pretreatment showed higher of Total Plate Counts (TPC) comparing to the control. The best quality of compost was obtained from Laccase oxidation pretreatment ABTS based on SNI 19-7030-2004 criteria.

Keywords: compost, coffee pulp, laccase, waste.

SE-027-192-DSA-AA161

Enzymatic Conversion of *Brewer's Spent Yeast* as Raw Material for Glutamic Acid Production

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Abstract. Brewer's Spent Yeast (BSY) is a fermented waste from the brewery industry, which is abundant and contains high levels of glutamic acid and glutamine. BSY has potential as a raw material for glutamic acid for natural food flavoring. The purpose of this study was to determine the potential of BSY as the glutamic acid source through the enzymatic protease conversion process. Protease was produced by Bacillus sp. SK II-5. Protease characterization was carried out through activity testing and protein content testing. BSY was converted enzymatically, then analyzed the amino acid content qualitatively by TLC (Thin Layer Chromatography) test and analyzed the MSG (Monosodium Glutamate) content quantitatively by spectrophotometric method. The results of this study can be concluded that BSY has the potential as glutamic acid source through the protease enzymatic conversion process and can be an alternative raw material for natural food flavoring. Detection of glutamic acid with TLC showed that all samples contained glutamic acid which was characterized by 1 purple band and the same Rf value as MSG markers which was 0,61. The highest MSG content was found in sample with a 6% protease concentration of 0.166 M after 12 hours incubation.

Keyword: *Bacillus sp*., brewer's spent yeast, glutamic acid, msg, protease.

BE-070-320-DGA-AA290

Enzymatic Pretreatment of Paper Printing Waste for Biogas Substrate

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Abstract. Paper waste from pulp and paper mills is a potential material for producing compost. Cellulose as the main component of paper, requires some modification in order to be used as an alternative energy source. Anaerobic digestion can be applied to decompose cellulose become a biogas substrate. This aims this study was to find utilization of paper printing waste to produce biogas prior oxidation by several combination of laccase pretreatments. The anaerobic decomposing was carried out under mesophyll temperature (29˚C) at the average pH 7 for 30 days. The results showed that laccase with ABTS as mediator was the best for al parameters namely C/N ratio (6,85), lowest total phenols (0.036 mg/l) and the highest reducing sugar (0.034 mM). methane concentration 25.22% and total biogas 200 ml/VS for. Further, all pretreatment groups in this study had nitrogen and phosphate concentration classified as Indonesian National Standard (SNI) for fertilizer.

Keyword: biogas, composting, laccase, paper printing, waste

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On Ramsey (P_3, C_6)-Minimal Graphs

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Abstract. We write notation $F \to (G, H)$ for graphs *F*,*G* and *H* to mean that if any two-coloring, say red and blue of all edges of *F*, then the red subgraph contains a copy of *G* or the blue subgraph contains a copy of *H*. The graph *F* is Ramsey (G, H)-minimal if $F \to (G, H)$ but $F - e \nrightarrow (G, H)$ for any $e \in E(F)$. The class of all Ramsey (G, H)-minimal graphs will be denoted by $\mathcal{R}(G, H)$. Numerous papers study the problem of determining the set $\mathcal{R}(G, H)$. In 2005, Borowiecki, Schiermeyer and Sidorowicz found all graphs in $\mathcal{R}(K_{1,2}, K_3)$. Then, Baskoro, Yulianti and Assiyatun (2008) gave a family of graphs with diameter 2 that belongs to $\mathcal{R}(K_{1,2}, C_4)$. An infinite family of Ramsey $(K_{1,2}, C_4)$-minimal with diameter ≥ 4 is found by Vetrik, Yulianti and Baskoro (2010). Then, in 2013, Ahsanunnisa found some graphs in $\mathcal{R}(P_3, C_5)$. In this paper, we prove that there is only one graph that has 6 vertices and 9 edges in $\mathcal{R}(P_3, C_6)$ and we determine some graphs in $\mathcal{R}(P_3, C_6)$.

Keywords: ramsey, graphs

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Degree of a Vertex in Bipolar Anti-Fuzzy Graphs

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Abstract. In this article, we discuss some basic results of bipolar anti fuzzy graphs. A bipolar anti fuzzy graph can be obtained from two bipolar anti fuzzy graphs using union, join, cartesian product, and composition of them. Further, we find out the degree of a vertex in the given bipolar anti fuzzy graphs in some particular cases.

Keywords: bipolar, graph