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Parallel Session / 7

A Systematic Literature Review on Contextualizing Physics Instruction to Agriculture and Related Fields: Insights for the Philippines

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The promotion and integration of agriculture concepts can be strengthened by teaching physics in the context of agriculture. This is a study of the literature on contextualization of physics education on agriculture and related fields was conducted to determine the agriculture and related fields used to contextualize physics instruction, to determine the parts of physics instruction were contextualized to agriculture and related fields, and to determine the areas of physics in which instruction is contextualized to agriculture and related fields. After reviewing published research articles from ScienceDirect, PubMed, ISI Web of Science, Google Scholar publications, ResearchGate, and other online research repositories used for scholarly literature, results showed that very few studies were conducted that contextualized physics instruction using agriculture and related fields. On the available literatures, 5.26% used farming as context of their physics instruction, another 5.26% used fishing practices as context, 31.58% used environmental context, 15.79% used Indigenous/Cultural Practices as context, and 42.11% used other contexts such as household chores, biking, and other recreational activities. Of the different fields of physics, mechanics is the most contextualized to agriculture with 52.63% of the available studies, while no study contextualized Modern Physics to agriculture and related fields. The teaching-learning/instruction and learning activities are the part of a lesson often contextualized to agriculture and no available study that contextualized the motivation part of the lesson. Most publicly available scholarly works contextualizing physics lessons to agriculture are foreign, thus, efforts in this area should be pushed forward in the Philippines.

Parallel Session / 8

Green Skills and Gen Z's Enthusiasm for Green Jobs as Essential Foundations for Attaining a Golden Indonesia 2045

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Gen Z plays an important role in efforts to realize sustainable development through the development of a green economy that can improve the environment and increase human welfare. Green jobs are very necessary to prepare quality human resources in realizing the four pillars of Golden Indonesia 2045, namely human development and mastery of science and technology, sustainable economic development, equitable development and national resilience and governance. The aim of this research are to identify the green skills needed for green jobs, analyze the influence of green skills on Gen Z's interest in green jobs, and formulate strategies for developing the green skills needed by Gen Z. Data were processed using descriptive analysis methods, multiple regression analysis, and hierarchical analysis processes. The priority green skills based on descriptive analysis from in-depth interviews are green awareness, green integrity, and initiative and entrepreneurship. Based on the results of multiple regression analysis, it can be seen that there is an influence between green skills and interest in green jobs in Gen Z. The most priority green skills development strategy is to create enabling conditions to facilitate the transition to green jobs. This strategy encompasses providing a supportive environment, appropriate policies, and integrated training programs.

Parallel Session / 9

The Influence of Leadership, Organizational Culture on Educator Creativity in East Jakarta State Middle Schools

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Education can only be implemented if teaching staff are able to carry out their main duties persistently and professionally. The task of teaching staff is not only to transfer knowledge, but also to educate, evaluate, train and direct learner. If a quality of teaching staff can be improved not only in terms of intelligence alone, but it is also in terms of their academics, then one of the country's national goals is to make the life of the nation smarter. In providing education, it must be in the process of empowering and acculturating students by teaching staff providing examples, developing creativity, and building learners' desires in the learning process and controlling the quality of educational services. The aim of this research is to analyze the factors that influence creativity through leadership approach theory and organizational culture. This research was uses a quantitative approach with used analysis data a Covariance-based Structural Equation Modeling approach and it was the mechanism for collecting data is carried out through questionnaires and tests did have been prepared first. A Based on the analysis of research results, it has clear that: 1) increased leadership which was characterized by positive attitudes possessed by leaders in leading organizational culture will lead to increased creativity, 2) the ability of organizational culture to become socialized which was characterized by power distance, avoidance of uncertainty, institutional collectivism, humanitarian orientation, and performance orientation will lead to increased creativity, 3) improved leadership potential which was marked by positive attitudes possessed by leaders such as behaving fairly, having integrity, self-confidence, having toughness in leading an organizational culture which was characterized by social understanding, communicative, critical thinking, having the ability to use information technology and understanding safety in using technology will lead to increased creativity.

Parallel Session / 10

Investigating Community of Practice in Sumbawa and Manggarai to Support Environmental Sustainability Through STBM Development Plan

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Climate change, which causes droughts, landslides, floods, and crop failures in provinces such as Manggarai and Sumbawa, disrupts access to clean water and complicates achieving adequate sanitation, highlighting the need for better mitigation strategies. While provincial and district governments understand the global impacts of climate change, this understanding has not yet reached the village level. People feel the impacts but lack awareness of climate change issues or adaptation and mitigation policies. Therefore, it is crucial to develop effective and appropriate sanitation systems as a response to climate change in the Sumbawa and Manggarai areas. This research aims to assess community perceptions and responses to the availability of proper sanitation systems through the Community-Based Total Sanitation (STBM) approach. The study employs a mixed-method approach, combining qualitative and quantitative methods, following the terms of reference (ToR) developed by Yayasan Plan International Indonesia (YPPI) and funded by Plan International for the final evaluation. Quantitative data are gathered from household surveys, while qualitative data are collected

through in-depth interviews with key informants, focus group discussions, and related documents. By examining three domains of community response to STBM: awareness, perception, and participation, the study revealed that after the project implementation, public awareness of STBM increased significantly, with the achievement of 100% open defecation free, and improvements in handwashing habits (75%), stopping open defecation (58%), and food and drinking water safety (33%). However, awareness regarding solid (26%) and liquid (11%) waste management remains low and has decreased. Based on interviews with key informants, the community, including people with disabilities, actively participates in completing the STBM Pillars, with over 70% having received information and 50% having participated. The tendency to avoid Open Defecation is a major driver of change, although financial constraints continue to hinder STBM improvements.

Keywords: STBM, Sanitation, Climate Change, Community of Practice

Parallel Session / 11

Exploring XR-Integrated Serious Games for Therapy in Female Indonesian Students with Autism: A Systematic Literature Review

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Combining serious games with extended reality (XR) technology to provide targeted interventions for supporting patients with autism spectrum disorders (ASD) has garnered increased attention from scholars in recent years. However, there remains a lack of comprehensive investigation into how serious games integrated with XR technologies can be utilized to support therapy, particularly for female students in all levels of education with ASD. Therefore, this systematic literature review (SLR) aimed to synthesize research findings on the feasibility, implementation, and effectiveness of serious games combined with XR technologies in supporting female students with ASD within the Indonesian educational landscape. Following the PRISMA framework as the protocol, this study conducted an exhaustive analysis of a diverse dataset sourced from SCOPUS, Web of Science, ScienceDirect, ACM Digital Literacy, and Google Scholar, specifically focusing on publications from 2015 up to 2024. The results highlight that 455 articles were identified in the Covidence software and included in the first screening step. After the first screening, 49 articles have been finalized that include the eligibility criteria for quality assessment criteria. The study indicates that there is no research setting conducted in Indonesia. Additionally, the utilization of serious games and extended reality are seen as separate interventions for ASD patients. Lastly, the intervention given was not distinguished by gender and only focused on child development in general. Additionally, the paper concludes by proposing several recommendations for further study, urging policymakers and stakeholders to consider and take action toward implementing such interventions in Indonesia.

Parallel Session / 12

Assessing the Impact of Climate Change and Global Warming on Crop Yields and Socio-Economic Conditions in Odisha

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Climate change and global warming threaten agricultural productivity and socio-economic stability in Odisha. This study aims to analyze the effects of climate change on crop yields and assess the socio-economic impacts on farming communities in Odisha. Using historical climate data and agricultural yield records, we employ regression analysis and ANOVA through SPSS to evaluate trends and relationships. The findings indicate a strong correlation between rising temperatures, altered precipitation patterns, and reduced crop yields in Odisha. The study concludes that climate change adversely affects the region's agricultural productivity and socio-economic conditions. It recommends adopting sustainable farming practices and policies to mitigate these impacts.

Parallel Session / 13

An experimental and theoretical study black cumin seed extract as environmentally sustainable corrosion inhibitors

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Experimental corrosion tests and theoretical calculation were conducted to investigate the corrosion inhibition mechanism of black cumin seed (BCS) extract for copper in 1 M H₂SO₄ solution. Electrochemical testing using electrochemical impedance spectroscopy (EIS) and potentiodynamic polarization (PDP) method showed that BCS adsorbed to form a protective layer on the copper surface with high inhibition efficiency at 500 ppm concentration (73,35%). The BCS is a mixed inhibitor (anodic and cathodic) that adsorbs physically on the copper surface and obeys the Langmuir isothermal adsorption model. Quantum chemical calculation and molecular dynamic simulation show that the studied BCS molecules adsorb strongly on the copper surface with parallel orientation mode. The methyl linoleate molecules from BCS produce the most stable adsorption energy of the other studied compound molecules as a result of molecular dynamic simulation.

Parallel Session / 14

Assessing Indicators Related to Infrastructure in Sustainable Development Goal 11: A Review

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Sustainable Development Goal 11 (SDG 11) aims to ensure sustainable cities and communities, emphasizing resilient infrastructure. This review scrutinizes infrastructure-related indicators within the SDG 11 framework, assessing their efficacy in measuring progress toward sustainable urban development. The objectives are to evaluate the effectiveness of current indicators, identify challenges and limitations in existing frameworks, explore emerging trends such as GIS and citizen science initiatives, and highlight the importance of stakeholder engagement, interdisciplinary collaboration, and capacity building in refining these frameworks. This study systematically reviews literature, reports, and frameworks using text mining and tag cloud techniques, examining diverse indicators for transportation, housing, water and sanitation, energy, and telecommunications. The review identifies key challenges and limitations in current indicators and discusses innovations in infrastructure

assessment. It underscores the necessity for a holistic approach to infrastructure assessment, considering social, economic, and environmental dimensions, and the interconnectedness of infrastructure challenges with other sustainable development goals. By providing insights into the strengths and limitations of existing indicators, this review contributes to the ongoing discourse on refining measurement methodologies for sustainable urban development. It underscores the importance of robust indicators in advancing the global agenda toward building inclusive, safe, resilient, and sustainable cities.

Parallel Session / 15

Selection And Potential Testing Of Dark Septate Endophyte (Dse) Fungi As A Growth From The Roots Of The Rice Plant

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Abstract. Dark Septate Endophyte (DSE) fungi are a group of endophytic fungi that have dark melanin hyphae, form dark-coloured colonies on CMA, and are able to colonise plant roots without causing disease symptoms. There have been no reports on the selection and testing of the potential of DSE fungi as a biofertiliser to stimulate the growth of upland rice, particularly in Central Sulawesi. This research aims to obtain DSE isolates from Central Sulawesi that have potential as biofertiliser by selecting DSE fungal isolates from upland rice plants. The initial stages of the research were the isolation of DSE fungi from the roots of upland rice plants, macroscopic and microscopic characterisation of endophytic dark septate fungi, pathogenicity tests and in vitro growth potential tests of endophytic dark septate fungi (DSE). In this study, the results of isolation and identification of DSE fungi from the roots of upland rice plants from Central Sulawesi showed seven, namely PDG1.5, PDG1.9, PDG1.11, PDG2.4, PDG2.5, PDG3. 3, PDG3.13 were declared non-pathogenic and have the potential to act as promoters, while 38 other isolates were declared pathogenic. Future research will involve field trials on Gogoh rice plants and it is hoped that the results of this research will provide initial information on the role of DSE fungi on Gogoh rice plants in overcoming abiotic stress due to drought.

Parallel Session / 16

Integration of Local Wisdom in Web-Based Science Teaching Materials: Hots And Cultural Caring Attitudes Analysis

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The purpose of this study was to analyze the effect of web-based science teaching materials with the context of local wisdom on higher-order thinking skills (HOTS) and cultural care attitudes of students. The non-equivalent post-test-only control group design is the quasi-experimental design used. The study population included 140 grade VII SMPN 16 Mataram students, with a total sample

of 35 students in the experimental class and 35 people in the control class. Data were obtained from the HOTS test instrument and a cultural caring attitude questionnaire which were analyzed using one-way MANOVA descriptive statistics. The HOTS test consists of 20 multiple-choice questions and a cultural care attitude questionnaire with 12 statements. The results showed that the average HOTS score of students in the experimental class was 83.75 while in the non-experimental class (the control class) it was 74.29. The average value of students' cultural attitudes in the experimental class was 91.61 while in the control class, it was 88.39. This means that HOTS and students' cultural care attitudes are superior in the experimental class compared to the control class. Based on the Multivariate tests, an F value of 20.32 was obtained with a significance much less than 0.05. This means there were differences in HOTS and cultural awareness between students who used web-based science teaching materials in the context of local wisdom and those who used conventional science teaching materials. Thus, using web-based science teaching materials in the context of local wisdom has an effect on HOTS and the attitude of caring for the culture of students. Web-based science teaching materials with the context of local wisdom can be an alternative contextual learning resource that plays an important role in strengthening character education, especially caring attitudes.

Parallel Session / 17

Predictive Quality Defect Detection using Defect Tracking Matrix (DTM) for Particle Board Industry

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Zero Defect Manufacturing (ZDM) is a quality control tool that prevents defects in the production process. This research aims to predict the cause of product defects in the particle board industry using a defect tracking matrix (DTM) and Principal Component Analysis methods (PCA). Proper quality inspection planning in manufacturing processes has always been a challenge for market competitiveness. In the manufacturing process, quality control is important. To meet consumer satisfaction, there needs to be a suitable quality control tool to predict the cause of defects. DTM is a tool that connects technical attributes and quality defects directly so that the source of defect found during a quality inspection can be easily identified. The application of DTM to predict defects will allow the tracking of defects faster and more accurately during handling. In fact, DTM is a long and less efficient matrix-shaped defect tracking tool that requires simplification. PCA is a matrix simplification tool that is used to convert an original matrix into a new matrix with fewer components without removing the information contained in the original data. Through the integration of these two methods, we obtained a better quality control system for predicting the source of defects. The model was applied to the particle board industry in Indonesia, which has problems in predicting the cause of such defects. In the implementation of the model, 20 technical attributes and 16 quality defects were produced and then processed to obtain the DTM matrix. The group of DTM matrices is stacked into a DTM chain. After obtaining the DTM chain, data dimensions were minimized using the PCA method, and a new DTM chain that was more effective and efficient was formed. From the analysis of the new DTM chain, the causes of product defects can be predicted.

Parallel Session / 19

Knowledge Generation and AI Validation in Digital Age: A Philosophical Analysis

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The rise of Artificial Intelligence (AI) and machine learning has significant implications for various fields, including computer science, and philosophical sciences. A philosophical reflection is needed to provide direction for AI development in digital era today. This study examines the implications of AI for knowledge and truth in the digital age, analyzes the impact of AI on education, decision-making, and society at large, and speculates on future developments and potential shifts in philosophical discourse. The study's core findings suggest that the development of AI systems that can generate knowledge and challenge traditional methods of knowledge acquisition and validation has significant implications for philosophical discourse. The method used in this research is the method of philosophy, especially phenomenology approach. The impact of AI on education, decision-making, and society at large is significant, but ethical concerns must be addressed. The future of epistemology in the AI era is uncertain, but interdisciplinary education and the integration of ethics in AI education are necessary to prepare for the future. Further research is needed to explore the potential of AI in various fields and address ethical concerns. This paper contributes philosophical thinking to knowledge discovery and the knowledge verification process in the context of AI development by all scientists.

Parallel Session / 20

Predicting Mass and Heat Transfer of Pollutant Gas Mixtures: Transient Air Quality in Poultry Close House Cage

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Air quality in chicken farms significantly impacts the stress levels, health, and mortality of livestock. It is crucial to maintain the stability of airflow velocity, temperature, and humidity in the close house cage to prevent sudden deaths in chickens. To achieve a uniform airflow pattern inside the cage, farmers can install a wetted Evaporative Cooling Pad (ECP) on the inlet side. Insufficient air can lead to heat stroke and the buildup of harmful gases. This study aims to numerically simulate the airflow using the CFD multicomponent method. The ECPs are moistened by water dripping at 0.5 liters per hour. The simulation consider heat transfer and evaporation effect due to heat from walls and chickens. The results will be presented through contours of velocity, RH, and temperature on various iso-surfaces. The simulation results show the time required for the exhaust fan to cool the room and remove pollutants from the room.

Parallel Session / 21

Effectiveness of Science Learning Tools Using Project Models Assisted by Augmented Reality to Improve Students' Literacy and Creative Thinking Abilities

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This research aims to produce an effective augmented reality-assisted project model science learning tools for increasing literacy and creative thinking abilities. This development research design uses a 4D model which consists of four main stages, namely definition, design, development, and dissemination. Effectiveness testing is carried out at the development stage after validity and practicality testing. The instruments used to test effectiveness consist of scientific literacy and creative thinking abilities. Analysis of increasing scientific literacy and creative thinking abilities using the N-Gain test. The effectiveness test was conducted on a limited and broad scale on class VIII SMP/MTs students. Scale trials are limited to one class and wide-scale trials to three classes. The research results in limited trials show an increase in scientific literacy and creative thinking abilities of 0.67 and 0.64, which are included in the medium category. Meanwhile, the results of extensive trials show an increase in scientific literacy and creative thinking abilities on average of 0.66 and 0.65, which are included in the medium category. These results show that the augmented reality-assisted project model learning tools developed is effective to increasing students' scientific literacy and creative thinking abilities.

Parallel Session / 22

Integration of Needs Analysis for Digital Teaching Materials in Realizing Technology Based Learning in the 21st Century

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This research aims to integrate needs analysis in the development of digital teaching materials in order to realize effective technology-based learning in the 21st century. This research was carried out using a quantitative approach. The main research data came from 84 students and lecturers spread across three universities, namely Riau University, Muhammadiyah University of North Sumatra, and Padang State University. Data collection techniques using Likert scale questionnaires. Analysis techniques use descriptive and inferential statistical procedures. The results of the analysis show that the need for digital teaching materials in realizing technology-based learning in the 21st century is categorized as needed from various aspects with an average of 3.50 with a standard deviation of 0.549. Every aspect is valid and normal with the sign. $0.05 < 0.579$. Factor analysis in each section is categorized as relevant in analyzing the need for digital teaching materials, namely above 0.7. The correlation analysis, all data is correlated and has a significant role, indicated by the sign value. $0.000 < 0.05$. The Anova test shows that all aspects of content, language, material presentation, graphics, evaluation, media and learning strategies have their own characteristics and are needed in presenting digital teaching materials for technology-based learning. Proper integration of needs into teaching materials can have an influence on technology-based learning outcomes by 69.9% at a significance level not exceeding 0.05. The integration of needs analysis in the development of digital teaching materials is an important step in realizing effective technology-based learning in the 21st century. Every aspect of need must be carefully considered so that the digital teaching materials produced can truly meet the needs of students and support the achievement of optimal learning goals.

Parallel Session / 23

Science Film Festivals as A Tool for Promoting Climate Awareness And Behaviour Change: A Case Study In Vietnam

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Science films have a significant impact on public awareness and behavior regarding climate change (Culloty, E., & Brereton, P., 2017). Studies indicated that depictions of scientists and real-world scenarios can profoundly influence public perception (Manzo, 2017) (Howell, 2011). To evaluate the impact of scientific films, a festival titled “The Decade of Ecosystem Restoration” was conducted with seven screenings for 338 participants. Each session lasted three hours, including six documentaries and supplementary activities like discussions, sustainability games, and tree-planting campaigns. Post interviews revealed that the documentaries’ stark portrayal of climate change’s impacts catalyzed a profound shift in viewer perspective. By juxtaposing these real-world scenarios with personal actions, participants expressed heightened awareness, reflected on their environmental impact, and a strengthened sense of responsibility. Interactive games further solidified these insights, providing actionable steps for ecological stewardship. Notably, 88.88% of attendees committed to adopting environmental practices, such as tree planting. The festival effectively impacted participants’ everyday behaviours by utilizing concepts like Social Learning Theory, framing effects, and halo effects. These psychological mechanisms (Bandura, 1977) - where viewers emulate behaviours seen on screen and are influenced by how information is presented - played a vital role in raising awareness and encouraging proactive environmental behaviours among the audience. Therefore, the science film festival and complementary activities can contribute to environmental advocacy.

Parallel Session / 24

The Influence of Stem Integrated Project Based Learning (Pjbl) Models On Science Process Skills and Problem-Solving Ability of Light Materials and Optical Equipment In Students

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This research aims to determine the effect of the STEM integrated project-based learning (PjBL) model on Light and Optical Equipment material on students’ science process skills and problem-solving abilities. The type of research is quasi-experimental with a posttest-only control group design. The samples used were VIII-E as the experimental class and VIII-D as the control class. The data analysis technique used is the MANOVA test. The research results mean the average value of science process skills and problem-solving abilities in the experimental class is 68.53 and 60.31, while for the control class, it is 50.00 and 45.00. This shows that the value of science process skills and problem-solving abilities in the experimental class was larger than in the control class. The MANOVA test results show that the sig. in the multivariate analysis of the variance table and the test of between-subject effects both have sig values. The same, namely $0.00 < 0.05$. The results of the research show the project-based learning (PjBL) model Integrated STEM simultaneously influences students’ science process skills and problem-solving abilities.

Parallel Session / 25

The Impact of Climate Change Policies on Carbon Emissions

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Since Paris Agreement, more attention is given to national policies and plans to lower Greenhouse Gases emissions. It is reported in previous studies that there is a positive relation between the number of climate and renewable energy policies and the reduction in Carbon emissions. This study aims to explore the role of specific policy types in reducing Carbon emissions. Using Qualitative Comparative Analysis, the study shows that awareness and supporting voluntary actions policies are effective in reducing emissions, with some evidence on economic-based policies, while other types of policy were found inconsistent in leading to Carbon emissions reduction.

Parallel Session / 26

Analysis of Student Scientific Argumentation Skills on Static Fluid Topics

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The purpose of this study is to identify the scientific argumentation skills of high school students on the topic of static fluid. This quantitative research with survey design used a sample of 125 students in one of the high schools in East Java, Indonesia. This research data was obtained through the Scientific Argumentation Ability Test (Cronbach's Alpha reliability of 0.66) in the form of 5 essay questions with 1-3 ordinal scale scoring. Descriptive statistics were used to analyze the research data. The results showed that the average scientific argumentation ability of students was 13.98 with level 3. Based on the indicators of scientific argumentation skills, students have an order from highest to lowest, respectively Data, Warrant, Claim, Rebuttal and Backing. Archimedes' Law is the easiest static fluid sub chapter for students followed by Hydrostatic Pressure and Pascal's Law. Scientific argumentation in physics learning activities allows students to engage in group discussions, express different perspectives, demonstrate their conceptual understanding, practical skills and scientific reasoning abilities. Therefore, it is recommended that appropriate learning that can support the growth of these abilities such as project-based learning collaborated with Science, Technology, Engineering, Art, and Mathematics (STEAM).

Parallel Session / 27

The Facile Synthesis of Monodisperse Ag/SiO₂ Core-Shell Composite

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The versatile application of monodisperse Ag/SiO₂ core-shell composites in disciplines including biosensing, photonic devices, and catalysis make their fabrication important. The controlled synthesis of these composites was developed employing TEOS precursor, ammonium hydroxide catalyst, and APTES as an amine functionalization reagent. Homogeneous silver nanoparticles as a composite core generated by microwave radiation contribute to the creation of a uniform Ag/SiO₂ core-shell composite. The composite solution was pale yellow in color and exhibited a distinct peak at 434 nm. TEM revealed a monodisperse spherical nanocomposite with core-shell structure. XRD results confirmed that the composite core of the Ag crystals had a fcc structure. The FTIR spectra of the composite indicate the success of silica coating and NH₂ group functionalization. As a result, this approach can be utilized to create monodisperse, homogeneous, and stable nanocomposites.

Keywords : synthesis, monodisperse, Ag/SiO₂ core-shell, composites

Parallel Session / 28

Modelling Hippocampal Degeneration in Rats: Which Toxicant Is “Better”?

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Introduction: Despite extensive research on Alzheimer’s Dementia (AD), a proper treatment for this disease is still largely undetermined. Thus, an effective, simple, cheap, and minimally invasive animal model for hippocampal-related AD is highly needed. This study compares the influence of trimethyltin (TMT), scopolamine, and D-galactose-AlCl₃ (DgalAl) on the rat’s hippocampus spatial memory, pyramidal cell quantity, and oxidative stress status. **Methods:** Male Wistar rats were divided into 4 groups: one control group and three treatment groups. They were treated with a specific dose of TMT, scopolamine, and a combination of D-galactose and AlCl₃ at different durations. Then, the Morris water maze was employed to examine the rat’s spatial memory. Unbiased stereological procedures were applied to project the number of hippocampal pyramidal cells. Finally, hippocampal antioxidant enzyme (Cu-ZnSOD, GPx, and catalase) levels were measured using ELISA procedures. **Results:** During the escape acquisition phase, the TMT group declined spatial learning in most trials. The same finding occurred in several trials of the scopolamine group but not in the DgalAl group. Deterioration of the memory retention also occurred in TMT probe trials, but not in the other two treatment groups. This research also reported the number of pyramidal cells in the CA1 region. It revealed a significantly lower number than in the other groups. No significant difference was observed across groups in pyramidal cells of the CA2-CA3 region. Besides, the levels of antioxidant enzymes in the rat’s hippocampus also did not record any significant difference. **Conclusions:** TMT induced hippocampal-degeneration more than scopolamine and D-galactose-AlCl₃.

Key-words: Alzheimer’s disease, spatial memory, stereology, pyramidal cells, antioxidant enzymes

Parallel Session / 29

Peat soil characterization for anticipation of peat fire mitigation: A case study in Siak area, Indonesia

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Peat soil is found abundantly on the surface of the Central Sumatra basin. In fact, for coastal areas, peat dominates at depths of up to several meters. In the dry season, fires are the most frequent natural disasters in peatlands, especially in Riau Province. Several significant problems have developed in the process of extinguishing peatland fires, so that peatland fires are difficult to prevent at this time. The purpose of this study was to determine whether early mitigation of peatland fire disasters can be predicted by utilizing groundwater as a water source. The depth of the aquifer and the thickness of the peat are included in the subsurface geological data predicted using a geoelectric resistivity survey. The peat soil in the study area has variations in the percentage of organic content so that it provides a different electrical character response from 20 ohm.m to 80 ohm.m. Based on the analysis of geoelectric resistivity data used to calculate the geometry of the peatland, the thickness of the peat soil ranges from 4.5 meters in the north and decreases in the south. At this depth there are shallow and deep aquifers so that if a peatland fire occurs, the water resources to meet the peatland are sufficient to stop the fire disaster.

Parallel Session / 30

Determination of Sediment Deposition Speed in Slide Plane and Mitigation Efforts

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ABSTRACT

Landslide disasters generally occur in areas with steep slopes. When rainwater hits the slopes, it will saturate the soil-rock mass covering the slopes. This mass will disintegrate, slip away, and be dragged by the water down the slopes because it is influenced by gravitational force. During a slip, the water leaves the debris mass, and the debris mass follows the water down the slopes until it finally settles. Some settle along the way, and some reach under the slopes and even downstream of the river to the sea. So during the movement of the mass of debris dragged by the water flow, it experiences resistance with the water and slip slopes. The research aims to formulate a theoretical equation model to determine the settling speed of sediment grains in landslide areas. The research seeks to develop a theoretical equation model to determine the settling speed of sediment grains in landslide areas. The research results obtained two-equation models to determine the settling speed of sediment grains, namely the slip equation model for dragging debris/sediment in the form of a rigid sliding ball and a rigid slab. The deposition of sediment grains in the rigid sliding ball and sliding slab models has a fast time at high speed. This shows that there is a buildup of sediment in the landslide area. Meanwhile, sediment that has not yet settled (fine-grained and slightly coarse) will move along with the water down the slope until it finally settles on a flat surface below the foot of the slopes. Mitigation efforts carried out to prevent or control the entry of surface water into landslide and landslide-prone areas are by creating water toll roads adjusted to topographic conditions and planting vetiver grass in landslide areas.

Keywords: deposition speed, sediment, slip plane, mitigation efforts

Parallel Session / 31

Identification of Functional Groups of Compounds in the Nginang Process: Ethnochemistry-Based Teaching Module for High

School

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The Nginang (betel chewing) process is one of the Sasak tribe's cultures that can be integrated into SASAMBO ethnochemical learning. The basic ingredients of the betel chewing process consist of betel leaves, lime, and areca nuts. These ingredients contain organic compounds that are identified as including hydroxyl (-OH) and carbonyl (C=O) groups. This study aims to determine the functional groups in betel leaves, areca nuts and residues after the betel chewing process in the functional group area and fingerprint area. Identification of organic compounds in this study was carried out in 3 stages, namely: (1) grinding the "betel chewing" material, namely the refining and sieving process using 100 mesh; (2) washing using 20% isopropyl alcohol and (3) functional group analysis using Fourier Transform Infrared Spectroscopy. Based on the results of the Fourier Transform Infrared Spectroscopy analysis of betel leaves, areca nuts, and residue after chewing betel in the functional group area containing -OH groups respectively at wave numbers 3165.73 cm⁻¹, 3280.67 cm⁻¹ and 3406.03 cm⁻¹, the C=O group shows peaks at wave numbers 1728.86 cm⁻¹, 1649.00 cm⁻¹ and 1728.08 cm⁻¹, while in the fingerprint area the C-O group appears at wave numbers 1059.61 cm⁻¹, 1056.89 cm⁻¹, and 1056.80 cm⁻¹.

Parallel Session / 32

Exploring the Impact of Serving Methods on Food Consumption: Gaps and Opportunities in Sustainability and Consumer Behavior

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Amid growing global concerns about food waste and the urgent need for sustainable consumption practices, recent academic studies examining the effects of serving methodologies on dietary consumption have revealed a wide range of focal areas and conclusions. Much of the existing research predominantly focuses on the influence of portion sizes and visual presentation, investigating how these factors shape consumption behavior and overall food intake. Consistent findings suggest that smaller portions and aesthetically pleasing presentations can notably reduce food waste and encourage healthier eating patterns. However, there remains a significant gap in research addressing the psychological aspects of consumer behavior and the ecological sustainability of serving practices. The limited attention to these dimensions leaves critical questions about optimizing serving methods for both consumer satisfaction and environmental impact largely unexplored. This imbalance in scholarly focus underscores the need for more comprehensive research integrating consumer behavior, sustainability, and serving techniques to better understand and enhance dietary consumption practices.

Keywords: food consumption, serving methods, portion size, visual presentation, consumer behavior, environmental sustainability.

Parallel Session / 34

Investigation of the Influence of Project-Based Learning-STEAM with Visual Simulation Media on Students' Critical Thinking Skills in Optics

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Optics is closely related to everyday technology but is often difficult for students to understand because of its abstract nature. This difficulty is caused by students' low critical thinking skills, which include the ability to interpret, analyze, infer, evaluate, and explain, which are important skills in the 21st century. This study aims to improve students' critical thinking skills in optics by applying the Project-Based Learning model with the STEAM approach and Visual Simulation Media (PjBL-STEAM-MSV). This study used a mixed method with an untreated control group design with pretest-and-posttest. The study subjects were 54 students of SMAN 1 WOHA, Indonesia, who were distributed into an experimental class taught through the PjBL-STEAM-MSV model, and a control class taught through a conventional model. The research instrument was a critical thinking ability test consisting of 5 essay questions with a reliability of 0.636, and an interview guide. Quantitative data were analyzed using the T-test, N-gain, and effect size, while qualitative data were analyzed through data reduction, coding, and concluding. The results showed that the implementation of PjBL-STEAM-MSV had a significant effect on improving students' critical thinking skills in optics material ($\alpha = 0.01$). This result was supported by the N-gain of the experimental class of 0.48 (medium category) higher than the control class of 0.20 (low category). The highest and lowest increases in the experimental class occurred in the evaluation and explanation indicators, while in the control class the analysis and explanation indicators. Experimental class students still had difficulty developing explanation skills in presentation activities due to limited time, while control class students had difficulty in almost all indicators because they focused on memorization. Recommendations for further research are further development of learning media and support for student mentoring so that the results are more optimal.

Poster / 35

Development of Chemistry Teaching Modules Based on Technological Pedagogical Content Knowledge and Culturally Responsive Transformative Teaching

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This research is a research and development that aims to produce teaching modules based on Technological Pedagogical Content Knowledge (TPACK) and Culturally Responsive Transformative Teaching (CRTT) on grade X chemical bonding that is feasible and practical. The development design used in this research is the Borg and Gall model with five stages of development. The limited trial in this study was conducted on 36 respondents of class X students at SMAN 1 Narmada. Data collection techniques used validity test on three experts, response questionnaires for teachers and students. Testing the validity of aspects of content feasibility, suitability for learning models, language, assessment and completeness of attachments obtained an average score using the Aiken's V index of $V = 0,88$ which indicates that the TPACK and CRTT-based teaching module on chemical bonding is classified as very valid. Meanwhile, the practicality test of teaching module showed that the teacher'

s response to the aspects of ease of use, practicality, attractiveness and benefits of the teaching module obtained an average practicality of 90% classified as very practical, and student responses to the aspects of presentation, ease of use and benefits of learning devices obtained an average practicality of 83% classified as practical. Thus, it can be concluded that the TPACK and CRTT-based teaching module on chemical bonding class X SMAN developed is feasible to use in terms of validity and practicality.

Parallel Session / 36

Antidiabetic activity and mechanism of action of *Phaseolus vulgaris* Linn (bean) extract

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Diabetes management using medicinal plants is still widely practiced in many developing countries. Interestingly, phytochemicals contained in the bean plant have been proven to possess antidiabetic activities, such as lowering blood glucose levels, stimulating insulin secretion, and reducing diabetes complications. This study aims to investigate the antidiabetic activity and mechanism of action of *Phaseolus vulgaris* (bean) extract. Blood glucose levels were measured using enzymatic methods at hours 0, 1, 2, 3, 4, and 5 after treatment with *P. vulgaris* extract at a dose of 300 mg/kg body weight. The mechanism of action of *P. vulgaris* extract was also analyzed based on the ¹⁴C-D-glucose uptake response of the soleus muscle at hours 0, 1, 3, and 5 after treatment. *P. vulgaris* extract showed the most significant blood glucose-lowering effect in diabetic rats at the 5th hour after treatment. This antidiabetic activity was compared to metformin, an oral drug for diabetes and transient hyperglycemia. Maximum glucose uptake occurred at the 5th hour after administration of *P. vulgaris* extract. Based on these findings, *P. vulgaris* has demonstrated blood glucose-lowering activity in diabetic conditions and is safe without causing severe hypoglycemia in normal rats. The mechanism of action of *P. vulgaris* occurs through increased muscle glucose uptake.

Keywords: *Phaseolus vulgaris*, antidiabetic, glucose uptake, bean.

Parallel Session / 37

The Rising Tide of Ocean Literacy: A Bibliometric Study of Global Research Trends (2003-2023)

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The concept of “ocean literacy” has gained increasing recognition in academic research since its initial indexing by Scopus in 2004. This paper presents a comprehensive bibliometric review of ocean literacy literature published over the past two decades, from 2004 to 2023, to assess the development, impact, and evolving trends within this field. The review identified 266 documents from 114 distinct sources, encompassing a diverse range of publication types, including journal articles, book

chapters, conference papers, and reviews. The analysis revealed a significant annual growth rate of 20.76% in scholarly output, with key thematic areas such as “climate change,” “oceanography,” and “education” emerging as central to the discourse on ocean literacy. The findings underscore the interconnectedness of ocean literacy with broader themes of marine conservation, ecosystem services, interdisciplinary collaboration, and the integration of science, policy, and practice. Furthermore, the bibliometric analysis highlights the prominence of international collaborations, particularly among leading countries such as the United States and the United Kingdom, which dominate both document production and citation counts. The study also explores the evolution of keyword usage, identifying shifts in research focus toward more integrated and holistic approaches to understanding and promoting ocean literacy. This paper concludes that a bibliometric review is essential for mapping the development and trends in ocean literacy research, providing valuable insights for guiding future studies and informing policy initiatives. By enhancing our understanding of how ocean literacy has been studied, applied, and integrated across various contexts, this review contributes to the broader goal of fostering sustainable ocean management and increasing public awareness and education on marine environments.

Parallel Session / 38

Embedding Sustainability into English Language Learning Environment: Using Storyboards in Non-Formal Learning

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This study investigates the effectiveness of utilizing storyboards as an instructional tool to enhance comprehension of ocean literacy and sustainability issues among primary school students in non-formal ESL (English as a Second Language) classes. The research involved analyzing 241 storyboards created by students, focusing on their understanding of oceanic ecosystems and related sustainability challenges. By engaging students in creating visual narratives, this approach aims to align with the objectives of Sustainable Development Goals (SDG) 14 (Life Below Water) and SDG 4 (Quality Education). The study employed thematic analysis to examine the content and quality of the storyboards, assessing how this creative method contributes to students’ conceptual grasp of marine life and environmental stewardship. The principal results indicate a substantial improvement in students’ ocean literacy, with many demonstrating a nuanced understanding of the importance of protecting marine ecosystems and the impact of human activities on the ocean. Additionally, the use of storyboards fostered greater engagement and motivation among students, enhancing their overall learning experience in ESL contexts. In conclusion, this research highlights the potential of integrating creative pedagogical tools like storyboards in non-formal education settings to promote environmental awareness and sustainable practices. The findings suggest that such innovative approaches can significantly contribute to achieving broader educational and sustainability goals, providing valuable insights for educators and policymakers aiming to enhance environmental education in diverse learning environments.

Poster / 40

Optimizing the Development of P5 Worksheets for Teachers: Shaping Student Character at SMAN 1 Terara, East Lombok Regency

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This research examines the development of the P5 Worksheet (Projek Penguatan Profil Pelajar Pancasila) at SMAN 1 Terara to shape student character. The results show that the majority of training participants strongly agreed that the material was well-delivered, interesting, and easy to understand. The presenters were also considered capable of fostering creativity among the participants. No participants gave negative feedback. Overall, the development of the P5 Worksheet is considered effective in improving the quality of learning and shaping student character in accordance with the Pancasila Student Profile.

Poster / 41

Implementation of the Demonstration Method on Students' Learning Outcomes in The Subject of Science Physics on Work and Energy at SMP Negeri 3 Pringgarata

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This study aimed to: 1) Determine how the demonstration method affects student learning outcomes in Work and Energy topics for grade 8 students at SMP Negeri 3 Pringgarata, 2) Assess student learning outcomes after applying the demonstration method, and 3) Evaluate the effectiveness of the demonstration method in Science-Physics lessons. The research used a Pre-Experimental design with a purposive sampling technique, involving 17 students from class 8B. Data was collected through tests and student interviews. The results showed that: 1) Student scores significantly improved from an average of 61.05 on the pre-test to 80.64 on the post-test, 2) The demonstration method increased student engagement and comprehension, and 3) The method was highly effective, as indicated by a t-value analysis ($-8.13 < -1.74$).

Parallel Session / 42

Partial Purification and Characterization of Lipase From Galip Nut (Cannarium indicum L.)

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This study aims to characterize lipase of galip nut (*Cannarium indicum* L.). The stages of research in this study included: germination of galip nut, isolation of crude lipase extract, partial purification of lipase with ammonium sulfate fractionation and dialysis, lipase activity assay, effect of sprout length, optimization of temperature and pH of lipase, determination of molecular weight, effect of metal ions, effect of organic solvents, and effect of surfactants. The lipase samples were obtained from various germination phases starting from early imbibition phase to germinated seeds. The lipase sample was precipitated stepwise with 0-25%, 25-50%, 50-75%, and 75-100% saturated ammonium sulfate. Lipase activity of galip nut was 0.94 U/mL with a specific activity of 0.14 U/mg. The optimum temperature and pH of lipase galip nut were at 30°C and pH 7. SDS-PAGE analysis revealed the crude extract consisted of five major protein bands. Metal ions Cu²⁺, DMSO (dimethyl sulfoxide), Tween-80 and Triton x-100 increase lipase activity while metal ions Na⁺, Zn²⁺, Mg²⁺,

Fe²⁺, DMF (dimethyl formamide), acetonitrile, DCM (dichloromethane), ethyl acetate, diethyl ether, SDS (sodium dodecyl sulfate), SLS (sodium lauryl sulfate), and SD (sodium deoxycolate) reduce the activity of the lipase.

Keywords: lipase, galip nut, characteristics of lipase, partial purification

Poster / 44

Thermodynamics-Augmented Reality Sebagai Media Pembelajaran Visual Untuk Meningkatkan Kreativitas Peserta Didik

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Di era digital, integrasi teknologi dalam pendidikan memberikan peluang besar untuk meningkatkan kualitas pembelajaran. Penggunaan perangkat pintar dan aplikasi edukasi menciptakan pengalaman belajar yang interaktif, memperluas akses terhadap sumber daya global, serta memfasilitasi pembelajaran berbasis kolaborasi. Dalam konteks ini, mobile learning (M-learning) berbasis smartphone, terutama Android, telah menjadi salah satu media pembelajaran yang populer di kalangan remaja. Teknologi ini menawarkan potensi besar dalam meningkatkan efektivitas proses belajar-mengajar, terutama pada materi-materi yang memerlukan visualisasi kompleks, seperti termodinamika dalam fisika. Konsep abstrak termodinamika sering kali sulit dipahami oleh siswa tanpa bantuan visualisasi yang memadai, sehingga sering menyebabkan miskonsepsi. Untuk mengatasi masalah ini, teknologi Augmented Reality (AR) dapat digunakan sebagai media pembelajaran yang mampu menggabungkan dunia nyata dengan konten digital secara real-time, memungkinkan visualisasi yang lebih jelas dan konkret. Pengembangan media pembelajaran berbasis AR pada materi termodinamika, seperti Thermodynamics-Augmented Reality, diharapkan dapat mengurangi miskonsepsi, meningkatkan kreativitas, dan memfasilitasi pemahaman siswa secara lebih mendalam terhadap konsep-konsep yang kompleks.

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Experimental and Theoretical Studies of Black Cumin Seed (*Nigella sativa*) as Corrosion Inhibitor for ASTM A36 Steel

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Black cumin seed extract (*Nigella sativa*) effectively controls corrosion of ASTM A36 steel in 1 M HCl solution. This study analysis black cumin seed extract as a corrosion inhibitor at 0, 100, 200, 300, 400, and 500 ppm by electrochemical methods including Potentiodynamic Polarization (PDP) and Electrochemical Impedance Spectroscopy (EIS). The results revealed that with the PDP method the highest inhibition efficiency (IE) was obtained 84.26% at a concentration of 500 ppm and with the EIS method an IE value of 77.77% was obtained at the same concentration. The black cumin seed extract functions as a mixed type inhibitor and adsorption of the inhibitor on the ASTM A36 steel surface through a physisorption mechanism at 298 K. The compounds of the extract were analyzed by GCMS an obtained major compounds namely linoleic acid (25.12%), methyl linoleate (22.70%), 4-cyclopentene-1,3-dione,4-3-methyl-2-butenyl (7.64%), methyl palmitate (6.66%), and palmitic acid (5.14%). A theoretical approach with computation was also carried out to investigate the interaction of major compounds in the extract that play a significant role as inhibitors. This was done using

Density Functional Theory (DFT) method and Monte Carlo simulation. The results showed that methyl linoleate compound played the most significant role.

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CORROSION INHIBITION TEST OF SPEARMINT (*Mentha spicata* L.) LEAF OIL AGAINST IRON: ELECTRONIC MAGAZINE FOR REDOX REACTIONS MATERIALS

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This research aims to test the efficiency of spearmint leaf oil as an organic corrosion inhibitor on iron in hydrochloric acid media and develop an electronic magazine for redox reaction material. The research was carried out in 2 studies, namely experimentally in the laboratory and theoretically using computational chemistry. The experimental study used the weight loss method with variations in inhibitor concentrations of 0, 1000, 2000, 3000, and 4000 ppm and variations in soaking times of 2, 4, 6, 16, and 24 hours. The theoretical study was carried out using the DFT method with the B3LYP function and the 6-31G (d) basis set as well as Monte Carlo simulation. The research results show that spearmint leaf oil can inhibit corrosion in iron with the highest efficiency of 43.05%. The compound that plays the most role in the corrosion inhibition process is the carvone compound. The feasibility of the magazine being developed was tested by expert validators and an average V value of 0.9 was obtained. This value shows that the electronic magazine developed is in the very valid category or very suitable for use and testing on students.

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CORROSION INHIBITION TEST OF SPEARMINT LEAF OIL (*Mentha Spicata* L.) ON COPPER: AN ELECTRONIC POCKETBOOK AS A SUPPLEMENT TO REDOX REACTION CHEMISTRY LEARNING

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ABSTRACT: Corrosion is a metal degradation process that can lead to significant losses, making corrosion prevention efforts crucial. One environmentally friendly method to inhibit corrosion is the use of organic inhibitors. Spearmint leaves (*Mentha spicata* L.) have potential as an organic corrosion inhibitor for copper, due to their content of heteroatoms and pi bonds. The purpose of this study is to evaluate the corrosion inhibition efficiency of spearmint leaf oil on copper with varying inhibitor concentrations and immersion times, to study the inhibition process based on quantum chemical parameters and adsorption energy, and to assess the feasibility of developing an electronic pocketbook for high school (SMA/MA) students. The methods used include the weight loss technique for experimental studies and a computational chemistry approach to identify the compounds most responsible for corrosion inhibition. The pocketbook development was conducted using the 4D model. The results showed that the highest inhibition efficiency achieved was 66.77% at a concentration of 4000 ppm with an immersion time of 24 hours. Based on the theoretical study of quantum chemical parameters, the compound carvone was found to play a dominant role in copper corrosion

inhibition, supported by the most favorable adsorption energy value of -66.93072477 kJ/mol. The developed pocketbook was validated with a score of 0.87, categorized as highly valid, making it suitable for use at the high school level (SMA/MA).

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Experimental and Theoretical Investigations Oil of *Cymbopogon citratus* as Corrosion Inhibitors on Copper in Sulfuric Acid Solution

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Experimental and Theoretical Investigations Oil of *Cymbopogon citratus* as Corrosion Inhibitors on Copper in Sulfuric Acid Solution

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Abstract:

Lemongrass oil (*Cymbopogon citratus*) is effective in controlling corrosion of copper in sulfuric acid solution. This study analyzed lemongrass oil as a corrosion inhibitor at 0, 100, 200, 300, 400, and 500 ppm using electrochemical methods including potentiodynamic polarization (PDP) and electrochemical impedance spectroscopy (EIS). These methods are used to determine the corrosion rate, inhibition efficiency, and adsorption isotherm value. The results revealed that with the PDP method the highest inhibition efficiency (η) was obtained at 93.15% and with the EIS method the η value was obtained at 97.70% at the same concentration of 500 ppm. Lemongrass oil functions as a mixed type inhibitor and is included in the Langmuir isothermal adsorption type and inhibitor adsorption on the copper surface through a physisorption mechanism at a temperature of 298 K (room temperature). The extract compound components were analyzed by GCMS and the major compounds obtained were citrol/geraniol (32.48%), Z-citral (28.00%), and trans-Geraniol (14.69%). A theoretical approach with computational chemistry was also carried out to confirm the efficiency of lemongrass inhibitors against copper and to analyze the interaction of compounds in the extract that play a significant role as inhibitors. This was done using the Density Functional Theory (DFT) method and Monte Carlo simulation. The results showed that the citrol/geraniol compound played the most significant role.

Keywords: Corrosion Inhibitor, PDP, EIS, DFT, Monte Carlo, Isothermal Langmuir, Lemongrass Oil (*Cymbopogon citratus*).

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THE EFFECTIVENESS OF THE THINK TALK WRITE (TTW) ON THE ABILITY TO SOLVE MATHEMATICAL PROBLEMS OF STORY PROBLEMS FOR VIII CLASS STUDENT OF SMPN 11 MATARAM IN THE 2024/2025 SCHOOL YEAR

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This study aims to determine how the effectiveness of the Think Talk Write (TTW) learning model on the ability to solve mathematical problems of story problems in class VIII students of SMPN 11 Mataram. The type of research used is quasi experimental research using a quantitative approach with a posttest only control design. The instruments used in this study were observation sheets of teacher and student activities, and tests of mathematical problem solving skills. Data analysis in this study was descriptive analysis and t-test of two independent samples. The results of descriptive data analysis showed that the experimental class teacher activity was 96.15%, the experimental class student activity was 90.15%, the control class teacher activity was 94.74%, the control class student activity was 87.75%, the average experimental class posttest score was 85.14, and the control class average was 78.86. Independent sample t-tests showed a significance (2-tailed) of $0.21 < 0.05$. The conclusion of this study is that the Think Talk Write (TTW) learning model is effective on the ability to solve math problems about story problems of class VIII students of SMPN 11 Mataram.

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ANALYSIS OF STUDENTS' ERRORS IN SOLVING STORY PROBLEMS MATEMATIKA REVIEWED FROM LEARNING STYLES OF STUDENTS OF CLASS VII SMP NEGERI 13 MATARAM IN THE 2023/2024 ACADEMIC YEAR

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This study aims to describe the level of tendency and causes of students' errors in solving mathematical story problems. Error analysis was carried out based on the Polya procedure reviewed from the students' learning styles. This type of research is descriptive qualitative. The sampling technique used purposive sampling and consideration from the mathematics teacher so that class VII H of SMP Negeri 13 Mataram was obtained as the research subject. The sample used was 34 students, of which only 29 students took the test. Data collection techniques used learning style questionnaires, test questions, and interviews. Data analysis techniques were data collection, data reduction, data presentation, and drawing conclusions. The results of the analysis obtained (i) all students' errors based on the type of Polya procedure error were understanding the problem by 35%, devise a plan by 36%, carrying out the plan by 55%, and checking back by 73%. (ii) the results of error analysis reviewed from learning style are 16 students with a visual learning style are more likely to make errors in the type of error carrying out the plan by 63% and checking back by 86%, 7 students with a auditory learning style are more likely to make errors in the type of error carrying out the plan by 46% and checking back by 58%, 4 students with a kinesthetic learning style are more likely to make errors in the type of error checking back by 44%. (iii) the causes of student errors in solving mathematics problems are less able to understand the problem, sometimes students forget the formula or procedure for working on the problem, are not careful in calculations, are not accustomed to writing conclusions

Keywords: Error analysis; Story problems; Polya; Learning style

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EXPERIMENTAL AND THEORETICAL STUDY OF BLACK CUMIN SEED EXTRACT AS COPPER CORROSION INHIBITOR IN H₂SO₄

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Experimental corrosion tests and theoretical calculation were conducted to investigate the corrosion inhibition mechanism of black cumin seed (BCS) extract for copper in 1 M H₂SO₄ solution. Electrochemical testing using electrochemical impedance spectroscopy (EIS) and potentiodynamic polarization (PDP) method showed that BCS adsorbed to form a protective layer on the copper surface with high inhibition efficiency at 500 ppm concentration (73,35%). The BCS is a mixed inhibitor (anodic and cathodic) that adsorbs physically on the copper surface and obeys the Langmuir isothermal adsorption model. Quantum chemical calculation and molecular dynamic simulation show that the studied BCS molecules adsorb strongly on the copper surface with parallel orientation mode. The methyl linoleate molecules from BCS produce the most stable adsorption energy of the other studied compound molecules as a result of molecular dynamic simulation.

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THE EFFECTIVENESS OF THE PROBLEM BASED LEARNING (PBL) MODEL IN IMPROVING THE CRITICAL THINKING ABILITY OF STUDENTS CLASS VIII SMP NEGERI 3 GERUNG in the 2024/2025 school year

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Critical thinking skills are needed by students in facing the challenges of the 21st century which has many innovations and new information. This study aims to determine the effectiveness of the problem-based learning model in improving the critical thinking skills of students in class VIII SMP Negeri 3 Gerung. This type of research is quasi experimental with a quantitative approach. The instruments used were observation sheets and critical thinking skills tests (post-test). The results of descriptive data analysis obtained the average value of the experimental class was 74.47, while in the control class was 65.60. The independent sample t-test showed a significance (2-tailed) of 0.001 < 0.05 and the effect-size test showed a value of 1.00. Based on the results of descriptive analysis where the average value of the experimental class is higher than the average value of the control class, the independent sample t-test and the effect-size test, it can be concluded that the problem-based learning model is effective in improving the critical thinking skills of students in class VIII SMP Negeri 3 Gerung.

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optimization of traffic light waiting time using monte carlo simulation at the Tanah Hajj intersection in Mataram city

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Urban mobility is a crucial aspect of modern city life, where transportation systems play a vital role in supporting daily activities. The increasing use of transportation demands optimal traffic management to prevent congestion. One of the frequent congestion points of concern is the Tanah Hajj intersection in Mataram City, which often experiences long queues due to inefficient traffic light management. To address this issue, the Monte Carlo simulation method was employed to evaluate

and optimize the traffic light duration in each direction of the intersection. The study results indicate that the optimal green light duration is 22 seconds for the westbound direction with a vehicle flow difference of 3.56%, 20 seconds for the eastbound direction with a difference of 8.13%, 35 seconds for the southbound direction with a difference of 6.96%, and 30 seconds for the northbound direction with a difference of 14.56%.

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The Effectiveness of the Problem Based Learning (PBL) Model on Mathematical Problem Solving Skills in IX Grade Student of SMPN 16 Mataram in the 2024/2025 School Year

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This study aims to determine the effectiveness of the Problem Based Learning model on students' Mathematical Problem-Solving Skills. This type of research is experimental research with a quantitative approach. This research was carried out in the odd semester of the 2024/2025 school year. The population in this study is all students of IX grade of SMPN 16 Mataram, with the subjects of the study being IX A as an experimental class and IX B as a control class. The research instruments consist of post-test sheets, observation sheets and interview guidelines. The statistical calculation of the results of the student problem-solving skills test was analyzed using an independent sample t-test where a value of $t_{hitung}=2,075$ was obtained and the t_{tabel} score obtained was 2.002 so that it can be concluded that there is a difference in the average problem-solving skill of students in the experimental class and the control class. Based on the research results, there is one aspect that is not fulfilled, namely the experimental class did not reach the minimum classical completeness of 85%. So it can be concluded that the application of the PBL model is not effective on mathematical problem solving skills in IX grade student of SMPN 16 Mataram in the 2024/2025 school year.

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Determination of Student Interest Groups Using the Fuzzy Inference Method at SMAN 1 Wanasaba, East Lombok Regency for the 2023/2024 Academic Year

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ABSTRACT

This research aims to apply the Tsukamoto fuzzy inference method in determining student interest groups at SMAN 1 Wanasaba, East Lombok Regency, based on subject grades and students' interest in science and technology. This is an applied research involving 359 tenth-grade students for the 2023/2024 academic year, with data sources including first and second-semester grades and interest questionnaires. The steps include fuzzification of variables (science grades, social studies grades, science interest), the formation of a knowledge base (fuzzy IF-THEN rules), inference using the minimum method (α -cut), and defuzzification with the weighted average method. This analysis was conducted with the help of Microsoft Excel, which facilitates the implementation of the method without the need for specialized software. The results of the research showed that 187 students were recommended for the science and technology interest group, while 172 students were recommended

for the social studies interest group. The study suggests that future researchers consider adding or modifying variables to strengthen the decision-making process for determining student interest groups.

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The Effectiveness Of Cabri 3D Learning Media On Understanding The Concept Of Flat-Sided Geometric Shapes For Class VIII Students At SMPN 1 Pringgasela

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This study aims to measure the effectiveness of the Cabri 3D software on students' understanding of concepts in solid geometry, applied to eighth-grade students. Two samples are needed: an experimental class and a control class. The experimental class will use the Cabri 3D software, while the control class will use conventional teaching tools. After the data is collected, it will be analyzed to conclude.

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students' mathematical communication skills in terms of self-confidence in class VIII A students of SMP Negeri 2 Pringgarata for the 2023/2024 academic year

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Written mathematical communication skills are students' ability to process vocabulary, notation and mathematical structures both in the form of reasoning, representation and problem solving in mathematics learning. This research aims to describe the mathematical communication skills of class VIII A students of SMP Negeri 2 Pringgarata in the 2023/2024 academic year with high and low self-confidence. The type of research used is qualitative descriptive research. The research results showed that (1) students with high self-confidence are able to interpret mathematical ideas in writing both in the form of reasoning, representation, and solving mathematical problems using appropriate mathematical terms and are able to fulfill all indicators of mathematical communication, namely presenting symbols, creating mathematical models, and write. (2) Students with low self-confidence are only able to fulfill 1 of the 3 indicators of mathematical communication ability, namely the ability to create mathematical models. Students with low self-confidence are not yet able to interpret mathematical ideas in writing either in the form of reasoning, representation, or solving mathematical problems using appropriate mathematical terms.

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Development of Student Worksheets Based on the Guided Discovery Model for Class 11 Students at SMKN 5 Mataram

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This research aims to develop a student worksheet based on guided discovery that is valid and practical. This is due to the lack of adequate learning media in the learning process. This results in low comprehension skills and student learning outcomes. The type of research used is research and development using 4D models (define, design, develop, and disseminate). The data collection technique uses interview and questionnaire guidelines. The data analysis techniques carried out consist of validity analysis and practicality analysis. The results of data analysis showed that the worksheet product developed obtained an average validity score of 85.75% by 4 material expert validators with very valid criteria and an average validity score of 84.5% by 4 media expert validators with valid criteria. The practicality of the product received a practicality score of 90.72% with very practical criteria based on the results of 25 respondents and obtained a practicality score of 85.71% with very practical criteria based on the results of teacher respondents. So it can be concluded that the development of LKPD based on guided discovery is valid and very practical to be used in the learning process.

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THE APPLICATION OF PROBLEM-BASED LEARNING (PBL) BASED ON LKPD TO IMPROVE CREATIVE THINKING SKILLS AND MATHEMATICS LEARNING OUTCOMES OF CLASS VIII STUDENTS OF SMPN 1 SAKRA IN THE 2024/2025 SCHOOL YEAR

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This study aims to determine the application of Problem Based Learning (PBL) which can improve the creative thinking ability and mathematics learning outcomes of SMPN 1 Sakra students in the 2024/2025 academic year on the material of the system of linear equations of two variables. This research is a quantitative research study with quasi experimental method with the design used is pretest posttest nonequivalent control group design. The subjects in this study were students of class VIII B as an experimental class and students of class VIII D as a control class of 32 students each class. This research data is the pretest and posttest scores of creative thinking skills and student math learning outcomes using the Problem Based Learning model assisted by LKPD and conventional models. After the data is obtained and analyzed, it can be seen that the average posttest value of class VIII B creative thinking ability is 56.21% and student mathematics learning outcomes are 61.90% and the average posttest value of class VIII D creative thinking ability is 47.18% and student mathematics learning outcomes are 48.90%. Based on the research results, data analysis and discussion, it can be concluded that the application of Problem Based Learning (PBL) can improve the creative thinking ability and mathematics learning outcomes of SMPN 1 Sakra students in the 2024/2025 school year.

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The Metric Dimension of The Subdivision Graph of The Windmill Graph K_1+mK_3

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Metric dimension is an important concept in graph theory that measures the ability of a set of vertices to distinguish other vertices through distance. This research focuses on analyzing the metric dimension of the pinwheel subdivision graph $K1+mK3$, a graph consisting of one central vertex $K1$ connected to m copies of a triangular graph $K3$, where each edge of the pinwheel graph is subdivided. Subdivision is adding new vertices that enrich the graph structure and increase the complexity in calculating the metric dimension. The purpose of this study is to determine the smallest cardinality of the pinwheel subdivision graph $K1+mK3$ for $2 \leq m \leq 4$. The type of research used is pure research involving combinatorial analysis of the distance between vertices in the graph. The results show that the metric dimension of the pinwheel subdivision graph $K1+mK3$ has decreased by one unit compared to the pinwheel graph that does not undergo subdivision. This finding can enrich the literature related to metric dimension in pinwheel subdivision graphs and can be applied in various problems related to robot navigation and sensor system design. Thus, this research makes an important contribution to the development of graph theory.

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ANALYSIS OF ERRORS IN SOLVING MATHEMATICS STORY PROBLEMS REVIEWED FROM THE LEARNING ATTITUDES OF CLASS VII STUDENTS OF JUNIOR HIGH SCHOOL 15 MATARAM

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The aim of this research is to analyze student errors in solving word problems in terms of learning attitudes in class VII students at SMPN 15 Mataram in the 2023/2024 academic year using the Newman procedure. This type of research is descriptive qualitative. The sample used was 30 people from class VII-B with the sampling technique used was purposive sampling with data collection techniques carried out by tests, questionnaires and interviews. The results of the research show that the errors made by class VII-B students in solving mathematics story problems on comparative material include all types of errors based on Newman's stages in terms of learning attitudes. Based on the results of the learning attitude questionnaire, 3 categories were obtained, namely: 10% of students with high learning attitudes, 76.66% of students with medium learning attitudes, and 13.33% with low learning attitudes. Based on the analysis of test results, 3 levels of student errors were obtained in solving questions, namely: students with a high error rate of 20%, students with a moderate error rate of 63.33%, students with a low error rate of 16.67%. Based on the results of the interview, it can be concluded that the factors causing errors include, first, weak understanding of the concept. Second, limited ability to read and understand questions. Third, lack of problem solving strategies. Fourth, lack of practice and experience in solving story problems. Fifth, lack of self-confidence.

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Analysis Of Problem-Solving Ability Of Smpn 16 Mataram Students In Solving Word Problems On Algebraic Expressions In Terms Of Cognitive Style In Grade VII For The Academic Year 2023/2024

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Mathematics is one of the subjects that must be studied at every level of education. This study aims to analyze students' problem-solving abilities in solving algebraic word problems by considering differences in cognitive styles. This study aims to describe students' problem-solving abilities in solving algebra word problems based on field-independent and field-dependent cognitive styles. The type of research used is descriptive qualitative research. The subjects of this study were 6 seventh-grade students from SMPN 16 Mataram in Mataram City, consisting of 3 field-independent students and 3 field-dependent students selected through purposive sampling techniques. Data collection was conducted using the GEFT test instrument, problem-solving test questions, and interview guidelines. Data analysis was carried out in stages, including data reduction, data presentation, and drawing conclusions. In the results of the cognitive style test (GEFT) given to the VIIA grade students, consisting of 32 students from SMPN 16 Mataram, it was found that there were students with both Field Dependent (FD) and Field Independent (FI) cognitive styles. From the GEFT results, there were 11 students with a FD cognitive style and 21 students with a FI cognitive style, indicating that the dominant cognitive style in this class is Field Independent.

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ANALYSIS OF MATHEMATICAL PROBLEM SOLVING ABILITY IN TERMS OF MATHEMATICAL ANXIETY IN CLASS XI STUDENTS OF SMK NEGERI 2 MATARAM ACADEMIC YEAR 2024/2025

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This research aims to find out how students' mathematical problem solving abilities in terms of mathematical anxiety. This study employs a qualitative descriptive research design. The subjects of the study are six students from class XI AKL 2 for the academic year 2024/2025 at SMK Negeri 2 Mataram, categorized by low, medium, and high mathematical anxiety. Data were collected through a mathematical anxiety questionnaire, a mathematical problem-solving ability test, and interviews. The analysis was conducted using data reduction techniques, data presentation, and verification. Results show that students with low mathematical anxiety are able to complete all stages of the indicators. Students with medium mathematical anxiety can only complete three stages of the indicators, which are understanding the problem, devising a plan, and carrying out the plan, but they are unable to complete the looking back stage. Students with high mathematical anxiety are unable to complete any of the stages of the indicators.

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This research examines the effect of the cooperative learning model of Student Team Achievement Division (STAD) on students' mathematical communication skills. The STAD model encourages group collaboration, where students work together to solve mathematical problems and enhance their communication skills. The mathematical communication skills test in this study measures three indicators: writing ideas in their own words, presenting through images/graphics, and creating mathematical models. The objectives of this study include determining the impact of the cooperative

learning model of Student Team Achievement Division (STAD) on the mathematical communication skills of 11th-grade students at SMKN 4 Mataram for the 2023/2024 academic year. This study uses a Quasi-Experimental with a Posttest Only Non-equivalent Control Group Design. The results indicate that the implementation of STAD significantly enhances mathematical communication skills compared to the direct teaching method.

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COMPARISON OF NUMERICAL INTEGRATION BETWEEN SIMPSON'S METHOD AND ROMBERG USING PERL HYPERTEXT PRE-PROCESSOR PROGRAMMING

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COMPARISON OF NUMERICAL INTEGRATION BETWEEN
SIMPSON'S

METHOD AND ROMBERG USING PERL
HYPERTEXT PREPROCESSOR PROGRAMMING

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ABSTRACT

Difficult integral problems that cannot be solved analytically often require numerical approaches. PHP (Perl Hypertext Preprocessor) programming has become one of the tools that can be used to solve numerical problems. This research aims to develop a numerical integration program using the Simpson

method and Romberg method on polynomial, exponential, and trigonometric functions with PHP programming, as well as to compare the efficiency of both methods based on relative error and execution time. Based on the implementation of the algorithms of both methods in PHP programming, the research results show that the average error for the Simpson

method and Romberg method are and , respectively. The comparison of errors between these two methods indicates that the Romberg method is more accurate than the Simpson

method. However, in terms of program execution time, the Simpson

method requires less time compared to the Romberg method. The average execution time for the Simpson

method and Romberg method are seconds and seconds, respectively, and the comparison of execution time between these two methods shows that the Simpson

method is shorter than the Romberg method when using the same number of iterations.

Keywords: Method Comparison, Numerical Integration, Simpson

, Romberg,
PHP Programming.

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Development of Guided Inquiry-Based Student Worksheets for Optimizing Mathematical Understanding Skills at SMAN 4 Mataram School Year 2024/2025

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The application of teacher-centered learning at SMAN 4 Mataram resulted in the low mathematical understanding ability of students. This is because teachers only use textbooks as learning tools and rarely use student worksheets. The purpose of this study was to develop valid and effective guided inquiry-based student worksheets. The type of research used is research and development using the 4D model which is carried out to the development stage. Data collection techniques used interview guidelines, learner response questionnaires, and mathematical understanding ability tests. The data analysis technique consisted of validity analysis and effectiveness analysis. The results of data analysis showed that the learner worksheet product developed obtained a score of 4.30 by 1 device expert validator with very valid criteria, then received a score of 4.71 by 1 material expert validator with very valid criteria and obtained a score of 4.44 by 1 learning expert validator with very valid criteria. Furthermore, the guided inquiry-based student worksheet is an effective learning tool because the percentage of classical completeness reached 77.78% and the percentage of student response scores was 83% with very good criteria. So it can be concluded that the development of guided inquiry-based student worksheets is valid and effective for optimizing students' mathematical understanding skills.

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Analysis of Mathematical Literacy Ability Based on Cognitive Style in Social Arithmetic Material for Grade VIII Students at MTs NW Aik Ampat, East Lombok

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This study aims to describe mathematical literacy abilities in relation to the cognitive styles of fast-accurate, reflective, impulsive, and slow-inaccurate. This type of research is a qualitative descriptive. The subjects of the study were 22 students of class VIIIA at MTs NW Aik Ampat, East Lombok, for the 2024/2025 academic year, consisting of 2 students with a fast-accurate, 6 students with a reflective, 11 students with an impulsive, and 3 students with a slow-inaccurate. The subject selection technique used was purposive sampling. The research instruments are MFFT (Matching Familiar Figures Test), a mathematical literacy ability test, and interview guidelines. The data analysis technique employed included reduction, presentation, and conclusion/verification. The analysis was conducted based on aspects of mathematical literacy ability, including formulating situations into mathematical forms; applying mathematical concepts, reasoning, and procedures; and interpreting mathematical solutions. Based on the results of the study, it was obtained that students with fast-accurate and reflective cognitive styles were able to master all three aspects of mathematical literacy, though fast-accurate students were less meticulous in their writing. Meanwhile, students with impulsive and slow-inaccurate cognitive styles were able to meet all three aspects of mathematical literacy but had not yet fully mastered them.

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MATHEMATICAL LITERACY ABILITY OF JUNIOR HIGH SCHOOL STUDENTS IN SOLVING PISA ADAPTATION PROBLEMS BASED ON LEARNING STYLES

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This study aims to describe the mathematical literacy ability of students with visual, auditory, and kinesthetic learning styles in solving PISA adaptation questions in shape and space content. This type of research is descriptive qualitative with nine subjects from 37 students from class VIII A at SMPN 7 Mataram, each with a visual, auditory, or kinesthetic learning style and high, medium, or low mathematical literacy ability. Data collection techniques are filling out learning style questionnaires, written tests of mathematical literacy ability, and interviews. The indicators of mathematical literacy ability are: 1) Formulate the situation mathematically (formulate), 2) Apply mathematical concepts, facts, procedures, and reasoning (employ), and 3) Interpret, apply, and evaluate mathematical results. The results showed that students with visual, auditory, and kinesthetic learning styles with high mathematical literacy could fulfill all three indicators. Students with moderate literacy ability have different results, where visual students fulfill all three indicators, auditory students fulfill two indicators, and kinesthetic students only fulfill indicator 1. While students with low literacy ability, visual and auditory students can only fulfill indicator 1, while kinesthetic students cannot fulfill all three indicators.

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The Effect of Treffinger's Learning Model on Students' Mathematical Creative Thinking Ability

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This study aims to find out whether there is a difference in the average score of mathematical creative thinking ability of students in the experimental class who use the treffinger learning model with the control class that uses conventional learning at SMPN 4 Narmada. In addition, to determine the influence of the treffinger learning model on the mathematical creative thinking ability of grade VIII students of SMPN 4 Narmada. The method used is an experimental method. The samples used in this study are students of class VIII A as an experimental class and students of class VIII B as a control class. The instruments used were in the form of creative thinking skills tests and observation sheets of student and teacher activities. The data analysis used was in the form of a normality test using the Liliefors test, a homogeneity test using the Fisher test and a t-test with an independent sample t-test. The results of data analysis with the t-test showed a value of $t_{hitung} > t_{tabel}$. The result of this study is that there is a significant difference in the average score of creative thinking ability of students in the experimental class who use the treffinger learning model and the control class that uses the conventional learning model. This shows that students' mathematics learning with the treffinger learning model has an influence on students' mathematical creative thinking ability.

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UJI INHIBISI KOROSI EKSTRAK TANAMAN SERAI (*Cymbopogon citratus*) TERHADAP BESI SEBAGAI BAHAN PENGEMBANGAN BUKU SAKU ELEKTRONIK PADA MATERI REAKSI REDOKS

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Korosi merupakan suatu hal yang menyebabkan kerusakan dan penurunan kualitas logam dan memiliki banyak kerugian. Salah satu penghambat korosi yang ramah lingkungan adalah dengan menggunakan inhibitor organik. Serai berpotensi sebagai inhibitor organik pada besi. Terdapat dua metode dalam penelitian ini, pertama metode eksperimen yaitu Weight Loss yang dipadukan dengan pendekatan kimia komputasi untuk mengetahui pengaruh waktu perendaman dan konsentrasi terhadap laju korosi besi, mengetahui efisiensi inhibisi ekstrak serai terhadap besi. Metode kedua yaitu RnD (Research and Development) dengan model 4D untuk menghasilkan bahan ajar berupa buku saku elektronik. Data hasil penelitian dianalisis menggunakan metode grafik untuk menentukan hasil waktu perendaman yang lama dan konsentrasi yang tinggi menyebabkan laju korosi semakin lambat. Laju korosi paling cepat didapatkan pada waktu perendaman 24 jam dengan konsentrasi inhibitor 400 ppm sebesar $2,6 \times 10^{-4}$ gram/cm².jam. Efisiensi inhibisi yang didapatkan berada pada konsentrasi 400 ppm dengan waktu perendaman 16 jam sebesar 70,48%. Senyawa ekstrak serai dengan kemampuan penyerapan elektron dengan nilai absorbansi tertinggi adalah senyawa z-citral yaitu sebesar -135.11629170. Buku saku yang dihasilkan dianalisis dengan statistik Aiken's V dan mendapatkan nilai validasi sebesar 0,81 dengan kategori sangat valid yang berarti sangat layak.

Heading

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ANALYSIS OF STUDENTS' CREATIVE ABILITIES IN COMPLETING QUESTION ABOUT HIGHER ORDER THINKING SKILLS IN CLASS XII STUDENTS AT SMAN 4 PRAYA IN ACADEMIC YEAR 2024/2025 IN TERMS OF STUDENTS' INITIAL MATHEMATICAL ABILITIES

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This research aims to determine student creativity in solving HOTS questions for class XII students at SMAN 4 Praya in the 2024/2025 academic year. This research is qualitative and quantitative research. Using 35 subjects with 6 samples from each ability level. Data collection techniques in this research used initial ability tests, creativity ability tests and interviews. From the results of student analysis, it was found that students with low initial abilities had low creative abilities at level 0 (not creative) or did not meet the indicators as much as 25.7% and level 1 (less creative) met fluency as much as 37.2%. Then students with initial abilities who have moderate creative abilities are also at level 2 (creative) who meet fluency and flexibility or fluency and novelty as much as 25.7%. Furthermore, students with high initial abilities have high creative abilities which are also at level 4 (very creative) fulfilling the third indicator, namely 11.4%. It can be concluded that student creativity is determined by the initial abilities possessed by students.

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THE INFLUENCE OF THE PROBLEM-BASED LEARNING (PBL) MODEL ON STUDENT ACTIVITY AND LEARNING ACHIEVE-

MENT IN STRAIGHT LINE EQUATIONS MATERIAL FOR GRADE VIII AT SMPN 1 AIKMEL IN THE 2022/2023 ACADEMIC YEAR

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This research aims to determine the effect of the problem based learning (PBL) model on student learning activities and achievement. This research was carried out at SMP Negeri 1 Aikmel for the 2022/2023 academic year. This research is a type of quantitative research with a quasi-experimental approach with a posttest only non-equivalent control group design. The population in this study were all students in class VIII of SMP Negeri 1 Aikmel for the 2022/2023 academic year. The research sample consisted of 30 students in class VIII A and 30 students in class VIII C who acted as the experimental and control classes obtained by considering the abilities of the two classes were the same or homogeneous. Collecting data on student activities and learning achievements after treatment using questionnaires and test instruments. Quantitative data analysis was carried out using the multivariate Hotteling's test, a follow-up test using the Bonferroni t test, and continued with the independent sample t-test. The three statistical tests used obtained a significance value of $0.000 < 0.05$, so H_0 was rejected, meaning that there was a significant difference in the average value between the two groups in terms of students' activities and learning achievements both simultaneously and separately. The results of the research show that there are differences in the activities and learning achievements of students who use the PBL model and the direct learning model.

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SUSTAINABLE ENERGY STRATEGIES FOR A GREENER FUTURE

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This infographic presents sustainable energy strategies for a greener future. It defines sustainable energy as renewable sources like wind, solar, geothermal, and hydropower that meet current demands without depleting resources or harming the environment. These sources are naturally replenished and have minimal environmental impact.

Challenges include integrating renewable energy into existing grids and addressing public perception. The infographic emphasizes the need for advanced management solutions and educational campaigns to build public support.

Sustainable energy is crucial for reducing greenhouse gas emissions and mitigating pollution, which improves public health and combats climate change. Renewable energy sources produce significantly fewer emissions compared to fossil fuels.

The infographic also shows the growth in renewable energy capacity from 2019 to 2024. Key strategies for promoting sustainable energy include improving energy efficiency, increasing renewable energy use, raising public awareness, and implementing supportive policies. These efforts are essential for a sustainable energy future.

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Analisis Kemampuan Pemecahan Masalah Matematika Ditinjau dari Kecerdasan Spiritual Siswa Kelas XII Man 2 Mataram Tahun Ajaran 2024/2025

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Penelitian ini bertujuan untuk mendeskripsikan kemampuan pemecahan masalah matematika siswa kelas XII MAN 2 Mataram tahun ajaran 2024/2025 ditinjau dari kecerdasan spiritual (SQ). Subjek dalam penelitian ini kelas XII Saintek MAN 2 Mataram dan sampel penelitian ini kelas XII Saintek 9. Peneliti memberikan angket kecerdasan spiritual dan tes kemampuan pemecahan masalah matematika kepada seluruh sampel penelitian. Kemudian peneliti mengelompokkan siswa yang memiliki kecerdasan spiritual tinggi, sedang dan rendah dan kemampuan pemecahan masalah tinggi, sedang, dan rendah, lalu menganalisis hasil tes kemampuan pemecahan masalah matematika siswa berdasarkan tingkat SQ. Tahap-tahap pemecahan masalah dari Polya. Metode yang digunakan yaitu metode kualitatif. Hasil penelitian menunjukkan: 1) siswa yang memiliki tingkat SQ Tinggi mampu menguasai maksimal seluruh indikator kemampuan pemecahan masalah polya, 2) siswa yang memiliki tingkat SQ sedang mampu menguasai maksimal tiga indikator kemampuan pemecahan masalah polya 3) Tidak ada siswa kelas XII Saintek 9 yang memiliki tingkat SQ Rendah.