FACULTY OF MATHEMATICS AND NATURAL SCIENCES
UNIVERSITAS NEGERI YOGYAKARTA

PROGRAM BOOK

INTERNATIONAL JOINT SEMINAR
5th ISIMMED and 7th ISSE

International Seminar of Innovation in Mathematics and Mathematics Education and International Seminar of Sciences Education

"TECHNOLOGICAL PEDAGOGICAL CONTENT KNOWLEDGE (TPACK) IN THE CURRENT TREND OF SCIENCE TECHNOLOGY ENGINEERING MATHEMATICS (STEM) EDUCATION"

November 19th - 20th, 2021

UNIVERSITAS NEGERI YOGYAKARTA
YOGYAKARTA
INDONESIA

ABOUT INTERNATIONAL JOINT SEMINAR 5TH ISIMMED – 7TH ISSE 2021

The Technological Pedagogical Content Knowledge (TPACK) is a rapidly growing framework for developing the professionalism of mathematics and science teachers. This framework encourages teachers to be able to integrate knowledge about content, pedagogy, and technology and apply them to teach certain topics appropriately. On the other hand, the development of the industrial revolution that has an impact on the economic, social, and environmental life of the community demands better student competence in overcoming these problems through science and technology. The demands of these competencies have changed the views of students on how to learn, the communication system, and interact with the surrounding environment. One of them is the implementation of STEM (science, technology, engineering, & mathematics). STEM empowers individuals with the skills to succeed and adapt to this changing world, including changes due to natural events. Therefore, the development of TPACK related to STEM-based learning is very necessary for teachers and prospective teachers of mathematics and science. This year Faculty of Mathematics and Natural Sciences Universitas Negeri Yogyakarta held the International joint seminar of 5th international of mathematics and mathematics education (5th ISIMMED) and 7th international seminar on science education (7th ISSE). It provides a platform for international education practitioners, teaching staff, researchers, and other stakeholders to learn the major science and mathematics education trends for achieving quality mathematics and science education. Therefore, the seminar intent to keep abreast of the current development and innovation in the mathematics and science education area as well as provide an engaging platform for the participant to share knowledge and expertise in related disciplines.

List of scopes for 5th ISIMMED:

1. Algebra
2. Geometry
3. Analysis
4. Statistics
5. Applied Mathematics & Computer
6. Innovative Mathematics Teaching and Learning
7. Evaluation and Assessment in Mathematics Education
8. Using Technology in Mathematics Education

List of scopes for 7th ISSE:

1. Science Education
2. Chemistry Education
3. Biology Education
4. Physics Education
5. Pure sciences content areas (all branches including interdisciplinary)
6. Teacher Education in sciences
7. STEM Education

BRIEF CONTENT

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Welcoming Speech

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WELCOMING SPEECH OF THE CHAIRPERSON

Assalamu'alaikum warahmatullahi wabarakatuh

May peace and God's blessing be upon you all.

The honorable presenters and participants on behalf of the Organizing Committee, we would like to extend our hearty welcome to the virtual Joint-Seminar ISIMMED-ISSE 2021.

The 5th international seminar of innovation in mathematics and mathematics education (5th ISIMMED) and 7th International Seminar on Science Education (7th ISSE) conducted by the Faculty of Mathematics and Science, Universitas Negeri Yogyakarta, Indonesia is held today on November, 19–20, 2021. "Technological pedagogical content knowledge (TPACK) in the current trend of science technology engineering mathematics (STEM) Education" -the theme of this seminar- provides a practical solution to a variety of issues that teachers face while introducing technology into their classrooms. The benefits of implementing TPACK in the STEM education are increasing students' learning motivation, helping students associate concepts with students' prior knowledge, helping teachers create a different learning atmosphere which is visual, concrete, fun, and interesting.

Moreover, through this Joint-seminar, I encourage researchers, lecturers, students, and academics to actively discuss and exchange opinions, share experiences about mathematics, mathematics education, and science education. I hope this forum can be a good platform to collaborate among academics, scientists, and practitioners in education. This seminar has accepted 186 papers and 145 participants from Indonesia and Philippines. There are approximately 100 selected papers that will be published by AIP Publisher under the Scopus Index, while the rest of the papers will be published on Regular ISIMMED-ISSE Proceeding.

I would like to extend my gratitude to distinguished guests, ladies and gentlemen from various countries. First of all, please allow me to express my sincere appreciation for keynote speakers:

Prof. Dr. Niwat Srisawasdi from Khon Khaen University, Thailand.

and invited speakers

1. Prof. Dr. Michael Phillips Ph.D from Monash University, Australia
2. Dr. Sun Jin from The Education University of Hong Kong, Hong Kong
3. Prof. Dr. Anna Permanasari, M.Si from Universitas Pendidikan Indonesia, Indonesia
4. Prof. Dr. Sugiman, M.Si from Universitas Negeri Yogyakarta, Indonesia

Lastly, let me express my deepest gratitude and highest appreciation for all seminar organizers, all of the reviewers, as well as the authors, committee members and steering committee who have been working really hard for making the success of this Joint-seminar. Enjoy the seminar. We wish you have insightful discussions, meaningful sharing, and have more academic connections.

May God bless us all. Aamien.

Wassalamualaikum warahmatullahi wabarakatuh

Endah Retnowati, Ph.D.

WELCOMING SPEECH
THE DEAN FACULTY OF MATHEMATICS AND NATURAL SCIENCES

May peace and God's blessings be upon you all.

On behalf of the Committee, first of all, allow me to extend my warmest greeting and welcome to the "5th International Seminar of Innovation in Mathematics and Mathematics Education (5th ISIMMED) and the 7th International Seminar on Science Education (7th ISSE)" 2021, organized Faculty of Mathematics and Natural Sciences (FMIPA) Universitas Negeri Yogyakarta.

The development of ICT (Information, communication, & technology) in the 21st century has ushered in the digital era, which is an era with characteristics, namely: science is developing rapidly, technology and information have an important role in everyday life, and society has become very depending on technological tools. ICT literacy as part of 21st-century skills is needed by society to survive in this century. Along with that, the characteristics of students who are already familiar with technology and in terms of the school's ability to purchase technology equipment lead educators and schools to immediately integrate ICT in learning.

TPACK (Technological Pedagogical Content Knowledge) is the knowledge needed to integrate technology in learning. TPACK's dynamic framework describes the knowledge that educators should have when designing and implementing curriculum and teaching while guiding their students in thinking and learning with digital technologies on a variety of subject topics. According to the TPACK framework, the use of technology tools is not just educators having access to these tools and learning skills how to use them. However, educators must think carefully about the potential of technology in solving pedagogical problems when designing learning. This means that educators make decisions in terms of how to select, adapt, and apply appropriate materials, pedagogies, and technologies that can add meaningful value to learning with technology in the classroom, leading to learner-centered learning.

With the theme "Technological Pedagogical Content Knowledge (TPACK) In The Current Trend of STEM Education", this conference aims to bring together researchers, educators, policy makers, and practitioners to share their critical thinking and research results. Thus, we can understand and study the development of basic principles, knowledge, and technology to integrate technology, pedagogy, and subject matter in learning and prepare a quality generation.

The scope of this conference covers all topics and is grouped into sub-themes that cover the scope of mathematics and science education, including algebra, geometry, analysis, statistics, applied mathematics and computer, innovative mathematics teaching and learning, science education, chemistry education, biology education, physics education, pure science content areas (all branches including interdisciplinary) and teacher education in science, as well.

Distinguished guests, ladies, and gentlemen, this conference will be far from a success and we could not accomplish what we do without the support from various parties. So let me extend my deepest gratitude and highest appreciation to all committee members. I would also like to thank each of the participants for bringing their expertise and experience around the table and engaging in such fruitful, constructive and open exchanges throughout the two days of the conference. While not as effective in terms of lead capture and networking as an in-person event, please accept my sincere apologies for any inconveniences and shortcomings.

We look forward to welcoming you again at the next coming conferences. To conclude, let me wish you a blooming discussion and an impressive virtual conference.

Yogyakarta, 19th November 2021

Dean

Prof. Dr. Ariswan, M.Si

WELCOMING SPEECH
THE RECTOR OF UNIVERSITAS NEGERI YOGYAKARTA

Assalamu'alaikum warahmatulahi wabarakatuh

The honorable; all vice rectors, deans, heads of institutions, board members of Universitas Negeri Yogyakarta, particularly Dean of Faculty of Mathematics and Natural Sciences and the Joint-seminar ISIMMED-ISSE 2021 committees.

Our distinguished guest, the keynote speaker: (1) Prof Dr. Niwat Srisawasdi (Khon Kaen University, Thailad), and the invited speakers: (2) Prof. Michael Philips, Ph.D (Monash University, Australia), (3) Dr. Sun Jin (The Education University of Hongkong), (4) Prof. Dr. Anna Permanasari, M.Si (Universitas Pendidikan Indonesia) and (5) Prof. Dr. Sugiman, M.Si (Universitas Negeri Yogyakarta) and also all presenters and participants, ladies and gentlemen.

I would also like to extend my gratitude to you all for joining this virtual Joint-seminar of 5th International Seminar Mathematic and Mathematic education (ISIMMED) and 7th International Seminar on Science Education (ISSE) 2021.

"Technological pedagogical content knowledge (TPACK) in the current trend of science technology engineering mathematics (STEM) Education" offers a useful solution to various problems that teachers have in integrating technology into their classrooms.

Once again, thank you for participating this seminar. I hope all of you relish this seminar and have admirable experiences.

Thank you

Best Regard,

Rector of Universitas Negeri Yogyakarta

Biography of Keynote & Invited Speakers

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BIOGRAPHY OF

KEYNOTE SPEAKERS

Dr. Niwat is currently an Assistant Professor at Faculty of Education, Khon Kaen University. He is now in charge of Deputy Dean of Research and Creative Educational Innovation at the faculty. He is a Departmental Head of Smart Science Learning Innovation at the Smart Learning Innovation Research Center (SLIRC) at the university. In term of professional community, he is, currently, an Executive Committee represented Thailand in the Asia-Pacific Society on Computers in Education (APSCE), and he is also a Chief of Technology (CTO) and advisory committee for Learning Engineering and Development (LED) Co. Ltd.

Dr. Niwat's research interests focus on digital learning and technology-enhanced learning in STEM disciplines, e.g. computer-interfaced laboratory experiments, interactive computer simulation and visualizations, microcomputer-based laboratory, adaptive web-based learning environment, mobile and ubiquitous learning, digital game-based learning, augmented reality in STEM subjects, and AI-transformed education. In term of teacher professional development and education research, he pays a huge attention on Technological Pedagogical and Content Knowledge (TPACK) in STEM fields. He has published 96 research articles in Scopus database including book chapters, journal articles, and proceedings. He serves as an editorial board member of International Journals of Mobile Learning and Organization (IJMLO) and Computers and Education: Artificial Intelligence (CAEAI). Also, he serves as an associate editor of Frontiers in Psychology, and Frontiers in Education. He was invited to serve as Guest Editor of two special issues in Journal of Computers in Education (JCE) and IJMLO, and serve as a reviewer for several international journals related education. He has invited and conducted more than 70 intensive and training workshops on technology-enabled active learning and STEM education nationwide in the last five years.

He has also been Principal Investigator and Co-Principal Investigator for 16 educational research projects funded by national research agency, such as Ministry of Education (MOE), National Research Council of Thailand (NRCT), Thailand Research Fund (TRF), and Khon Kaen University (KKU), and 2 international project funding from British Council, UK, Ministry of Science and Technology, Taiwan. In addition, owing to the good reputation in academic research and innovative inventions in education, he received 3 national outstanding invention and research awards by NRCT in 2020, TRF-OHEC-Scopus Young Researcher Award (Social Science) by TRF in 2017, Annual Most Outstanding Researcher Award in Social Science by Khon Kaen University in the year of 2019 and 2013, and Outstanding Faculty Researcher by Faculty of Education, Khon kaen University in 2020, 2019, and 2014.

BIOGRAPHY OF

INVITED SPEAKERS 1

Mike Phillips is the Associate Professor of Digital Transformation in the Faculty of Education, Monash University. His work focuses on the knowledge expert teachers develop when integrating educational technologies into their practice. Additionally, Mike researchers the ways in which expert teachers make active decisions about their classroom technology integration. Mike's research regularly involves collaboration with colleagues from Australia, the United States, Europe, Asia and the sub-continent. In 2019, Mike lead an international team from 11 countries exploring teacher decision making in technology rich contexts as part of the UNESCO EDUsummIT.

These projects have resulted in a range of books, book chapters, peer reviewed journal articles and conference presentations including a Highly Commended Paper Award from the Australian Council for Computers in Education (ACCE) and the Best Paper Award at the Society for Information Technology and Teacher Education (SITE) conference in 2016 and again in 2019. Mike has also received the Dean's Award for Excellence in Teaching and Learning (2015), the Vice-Chancellor's Award for Programs that Enhance Learning (2016), the Monash Postgraduate Association Lecturer of the Year Award (2016) and the Dean's Award for Outstanding Research by an Early Career Researcher (2017). Mike is the current Director of Initial Teacher Education programs at Monash University.

Prior to joining Monash University in 2013 Michael was a senior teacher for 15 years in secondary schools. He is also an Associate Editor for the Australasian Journal of Technology in Education and his work enhancing the professional learning of ICT teachers in Victoria was recognised in December 2013 with an Outstanding Professional Service Award from the Council of Professional Teaching Associations of Victoria.

BIOGRAPHY OF

INVITED SPEAKERS 2

Prof. Dr. Anna Permanasari is a Professor of Chemistry Education who currently works at Science Education Program and serves as Vice Director of Academic Affairs, Postgraduate School, Pakuan University. Her research mainly focuses on scientific literacy, STEM education, and low carbon education. In line with her research focus, Prof. Permanasari has actively involved in several projects that intended to develop low carbon education (LCE) learning model and promote science literacy through implementation of STEM approach and enhancing quality of teaching and learning science.

Prof. Permanasari actively writes and has successfully published many scientific articles including journal articles and proceeding papers. The recent published work of Prof. Permanasari sought to encourage students' scientific literacy through science learning with socio scientific issues. Besides being productive in conducting research and writing scientific articles, Prof. Permanasari is also active in sharing his knowledge through guest lectures and workshops and seminars as a keynote speaker. The knowledge shared by Prof. Permanasari through these activities revolves around the theory and implementation of STEM education, socio scientific issues, chemical literacy, science literacy, higher order thinking skills (HOTS), and teacher development programs.

Prof. Permanasari has also participated in the International Training for Doctoral Programs by Research: Academic and Financial Management at the University of Adelaide, Australia and International Training for Sustainability Education Development. Prior to becoming Vice Director of Academic Affairs, Postgraduate School, Pakuan University in 2020 to present, Prof. Permanasari was Head of Science Education Program and Vice Director for Academic and Student Affair, School of Postgraduate Studies, Universitas Pendidikan Indonesia.

BIOGRAPHY OF

INVITED SPEAKERS 3

Prof. Dr. Sugiman is a Professor of Mathematics Education at Yogyakarta State University, Indonesia. Prof. Sugiman currently serves as Coordinator of Master Program of Mathematics Education, Yogyakarta State University. His research interest focuses on methodology of mathematics learning strategy. In accordance with his research interest, Prof. Sugiman has conducted many researches and written scientific articles in the form of journal articles and proceeding papers that intended to explore innovative learning strategies, such as STEM education, cybergogy-based learning, ethnomathematics, and cognitive load theory based learning, to promote problem-solving skills, HOTS, mathematical reasoning, computational thinking, and other mathematical thinking skills. In addition, Prof. Sugiman has also produced mathematics teaching material in the form of book entitled 'Advanced Calculus aided Geogebra' and 'Mathematics Instructional Design to Cultivate Higher Order Thinking Skills (HOTS)'.

Prof. Sugiman holds intellectual property right in the form of copyright for realistic mathematics education based comics and worksheet, STEM-problem-based learning worksheet to promote mathematical reasoning and self-efficacy, and videos on the use of mathematics learning space application. Prof. Sugiman often involves in community service programs through training and workshops as an effort to encourage teacher professional development. Furthermore, Prof. Sugiman also serves as secretary for development of curriculum and learning of IMES (Indonesia Mathematics Educator Society) and secretary of Perhimpunan Pascasarjana Pendidikan Matematika Indonesia (PPPMI) since 2019.

INTERNATIONAL JOINT- SEMINAR
5th ISIMMED and 7th ISSE

International Seminar of Innovation in Mathematics and Mathematics Education
And International Seminar of Sciences Education

November 19th - 20th, 2021

Technical Guidelines

UNIVERSITAS NEGERI YOGYAKARTA
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Information and Registration Visit Our Website:
isimmed-isse.uny.ac.id

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GENERAL TECHNICAL GUIDELINE
5th ISIMMED and 7th ISSE 2021
Universitas Negeri Yogyakarta

Zoom Virtual Meeting

All events in this conference, including the opening ceremony, keynote sessions, parallel sessions, and closing ceremony, will be conducted in the ZOOM virtual meeting. Please find the ZOOM virtual meeting link for the parallel sessions in the app.

ZOOM virtual meeting link for Presenter and Participant:

Date	Session	ZOOM ID, Passcode, and Link
19th – 20th November 2021	Opening Ceremony, Keynote Session, and Closing Ceremony	ID: 971 3350 6676 Passcode: 787779 Link: https://bit.ly/ISIMMED-ISSE

OFFICIAL LANGUAGE

The official language of the 5th International Seminar of Innovation in Mathematics and Mathematics Education and the 7th International Seminar on Science Education is English. All presentations including questions and answers (Q&A) must be delivered in English.

CERTIFICATE

1. The only author who presents the appearance will receive a **"Presenter"** certificate.
2. The only participant who attends all sessions at the conference will receive a **"Participant"** certificate.

PRESENTER TECHNICAL GUIDELINE
5th ISIMMED - 7th ISSE 2021
Universitas Negeri Yogyakarta

A. The Opening and The Main Seminar Session

1. The application used for the international conference is the ZOOM Cloud Meetings. Therefore, please make sure your computer/laptop has the ZOOM Cloud Meetings application installed. If you do have not the application on your device, please click the link below to download: https://zoom.us/download
2. The conference access link will be on the Program Book 5th ISIMMED and 7th ISSE that we sent to the email that you have registered on the 5th ISIMMED and the 7th ISSE 2021.
3. The access login for all presenters will be opened 30 minutes earlier before the opening ceremony starts at 07.30 AM (GMT+7).
4. Rename your account to the format according to these scope codes:
   Room Number_Scope Code_Your Name_Institution
   For EXAMPLE: 1_LWP_Syifana Ayu_UNY

5th International Seminar of Innovation in Mathematic and Mathematic Education ISIMMED 2021		
No	**Scope**	**Code**
1	Algebra	ALG
2	Geometry	GEO
3	Analysis	ANL
4	Statistics	STS
5	Applied Mathematics & Computer	AMC
6	Innovative Mathematics Teaching and Learning	IMT
7	Evaluation and Assessment in Mathematics Education	EAM
8	Using Technology in Mathematics Education	UTM

7th International Seminar on Science Education ISSE 2021		
No	**Scope**	**Code**
1	Science Education	SED
2	Chemistry Education	CED
3	Biology Education	BED
4	Physics Education	PED
5	Pure Science Content areas (all branches including interdisciplinary)	PSC
6	Teacher Education in Science	TES
7	STEM Education	SE

5. Please change your virtual background by downloading the official background from the following link:
   For ISSE: http://isse.uny.ac.id/virtual-conference
   For ISIMMED: http://isimmed.uny.ac.id/virtual-conference
6. When the conference is running, you can ask the keynote speakers by using the Q&A features at the ZOOM chat box with this format: **Name_Institution_Question.**
7. The moderators will choose questions to be given to the keynote speakers.
8. The moderators have the full rights to run the conference.

B. The Parallel Seminar Session

1. Uploading your PowerPoint and video presentation files to your account is mandatory.
2. You have to join your respective rooms according to the scope that has been determined by the committee.
3. The information related to your ZOOM room can be seen on the Program Book 5th ISIMMED and 7th ISSE 2021 that had been uploaded on the website.
4. Rename your account to the format according to these scope codes:
   Room Number_Scope_Your Name
   For Example: 1_LWP_Syifana Ayu

5th International Seminar of Innovation in Mathematic and Mathematic Education		
No	**Scope**	**Code**
1	Algebra	ALG
2	Geometry	GEO
3	Analysis	ANL

5th International Seminar of Innovation in Mathematic and Mathematic Education		
4	Statistics	STS
5	Applied Mathematics & Computer	AMC
6	Innovative Mathematics Teaching and Learning	IMT
7	Evaluation and Assessment in Mathematics Education	EAM
8	Using Technology in Mathematics Education	UTM

7th International Seminar on Science Education ISSE 2021		
No	**Scope**	**Code**
1	Science Education	SED
2	Chemistry Education	CED
3	Biology Education	BED
4	Physics Education	PED
5	Pure Science Content areas (all branches including interdisciplinary)	PSC
6	Teacher Education in Science	TES
7	STEM Education	SE

5. Your video presentation will be played by the committee and the Q&A session is about 5 minutes for each presenter after all the video presentations are played.
6. The presenter must be present in the room parallel. If the presenter is absent and is called still not present until three times so the video will not be played.
7. The moderators have the full rights to run the conference.

PARTICIPANT TECHNICAL GUIDELINES
5th ISIMMED and 7th ISSE 2021
Yogyakarta State University

A. The Opening and The Main Seminar Session

1. The application used for the international conference is the ZOOM Cloud Meetings. Therefore, please make sure your computer/laptop has the ZOOM Cloud Meetings application installed. If you have not the application in your device, please click the link below to download: https://zoom.us/download
2. The conference access link will be on the program Book ISIMMED and ISSE that we sent to the email that you have registered on the 5th ISIMMED and the 7th ISSE 2021.
3. The access login for all participants will be opened 30 minutes before the opening ceremony starts, at 07.30 AM (GMT+7).
4. Rename your account to the format :

   Room Code_Your Name_Institution
   For EXAMPLE: RM1_Syifana Ayu_UNY

Day 1: November 19th 2021	
Room Parallel Session	**Scope**
RM1	Evaluation and Assessment in Mathematics Education
RM2	Evaluation and Assessment in Mathematics Education
RM3	Evaluation and Assessment in Mathematics Education
RM4	Analysis and Using Technology in mathematics education
RM5	Using Technology in mathematics education
RM6	Physics Education
RM7	Physics Education
RM8	Biology Education
RM9	Biology Education
RM10	Biology Education

Day 2: November 20th 2021	
Room Parallel Session	**Scope**
RM11	Algebra, Statistics, & Geometry
RM12	Applied Mathematics & Computer, Pure sciences content area (all branches including interdisciplinary) and Physics Education
RM13	Physics Education and STEM
RM14	Physics Education
RM15	Physics Education
RM16	Physics Education
RM17	Science Education
RM18	Chemistry Education
RM19	Innovative Mathematics Teaching and Learning
RM20	Innovative Mathematics Teaching and Learning
RM21	Innovative Mathematics Teaching and Learning

5. Please change your virtual background by downloading the official background form the following link:
   For ISSE: http://isse.uny.ac.id/virtual-conference
   For ISIMMED: http://isimmed.uny.ac.id/virtual-conference
6. You are requested not to active the microphone feature during the conference.
7. When the conference is running, you can ask the keynote speakers by using the Q&A features at the ZOOM chatbox with this format:
   Name_Institution_Question
8. The moderators will be choosing the questions to be given to the keynote speakers.
9. The moderators have the full rights to run the conference.

B. The Parallel Seminar Session

1. The parallel seminar is divided into two sessions. One session consist of 10-11 room that have a different scope.
2. The participant can choose the room parallel session according to the desired sub theme or scope and fill in the presensions allotted to the parallel room.
   The room of parallel session can viewed on the website by clicking link below:
   For ISSE: http://isse.uny.ac.id/
   For ISIMMED: http://isimmed.uny.ac.id/
3. Rename your account according to this format:
   Room Number_Your Name_Institution
   For EXAMPLE: 1&9_Syifana Ayu_UNY

4. The presenter's video presentation will be played by the committee and the Q&A session is about 5 minutes for each presenter after the video presentation played.
5. You can give the question while the video presentation is played by writing down in the ZOOM chat box with this format:

   Name_Institution_Question

6. The moderators will be choosing the questions to be given to the presenter.
7. The moderators have the full rights to run the conference.

Full Rundown

UNIVERSITAS NEGERI YOGYAKARTA
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Rundown International Joint-Seminar
5th ISIMMED – 7th ISSE
"Technological Pedagogical Content Knowledge (TPACK) in the Current Trend of Science Technology Engineering Mathematics (STEM) Education"
Friday-Saturday, 19th-20th November 2021

DAY 1: Friday, 19th November 2021

Time Schedule (GMT+7)	Agenda	Venue
07.30-08.00	Registration Day 1	Zoom Plenary Session
08.00-08.30	Opening ceremony by Master of Ceremony	
	National Anthem (Indonesia Raya)	
	Welcoming speech by Chairperson **Endah Retnowati, S.Pd., M.Ed., Ph.D**	
	Welcoming speech by Dean and Faculty Mathematics and Natural Science UNY **Prof. Dr. Ariswan, M.Si**	
	Welcoming speech by Rector UNY **Prof. Dr. Sumaryanto, M.Kes, AIFO**	
	Traditional Dance	
08.30-09.15	**Keynote Speaker 1** **Prof. Dr. Niwat Srisawasdi (Khon Kaen University, Thailand)** Moderator: **Wipsar Sunu Brams Dwandaru, S.Si, M.Sc, Ph.D**	
09.15-09.35	Discussion	
09.35-10.20	**Invited Speaker 1** **Prof. Michael Philips, Ph.D (Monash University, Australia)** Moderator: **Dr. Agung Wijaya Subiantoro, S.Pd., M.Pd**	
10.20-10.40	Discussion	
10.20-13.00	Break	
13.00-13.30	Registration of Parallel Session Day 1	Zoom Parallel Session
13.30-13.40	Prepare for parallel session	
13.40-13.45	Directing participants	
13.45-13.50	Opening by moderator	
13.50-15.50	Presentation + Discussion	
15.50-15.55	Closing by moderator	

Rundown International Joint-Seminar
5th ISIMMED – 7th ISSE
"Technological Pedagogical Content Knowledge (TPACK) in the Current Trend of Science Technology Engineering Mathematics (STEM) Education"
Friday-Saturday, 19th-20th November 2021

DAY 2: Saturday, 20th November 2021

Time Schedule (GMT+7)	Agenda	Venue
07.30-08.00	Registration for parallel session Day 2	Zoom Parallel Session
08.00-08.05	Prepare for parallel session	
08.05-08.10	Directing participants	
08.10-08.15	Opening by moderator	
08.15-11.15	Presentation + Discussion	
11.15-11.20	Closing by moderator	
11.00-12.30	**Break**	
12.30 -13.00	Registration Day 1	Zoom Plenary Session
13.00-13.45	**Invited Speaker 2** **Prof. Dr. Anna Permanasari, M.Si (Universitas Pendidikan Indonesia, Indonesia)** Moderator: **Widodo Setiyo Wibowo, S.Pd.Si., M.Pd**	
13.45-14.00	Discussion	
14.00-14.45	**Invited Speaker 3** **Prof. Dr. Sugiman, M.Si (Universitas Negeri Yogyakarta, Indonesia)** Moderator: **Nila Mareta Murdiyani, S.Pd., M.Sc**	
14.45-15.05	Discussion	
15.05-15.25	Closing Ceremony	
	Traditional Dance	
	Closing Speech by Chairperson Announcement for Best Presenter	
15.25-15.30	Closing Ceremony by MC	

The Schedule of the Parallel Session

UNIVERSITAS NEGERI YOGYAKARTA
YOGYAKARTA
INDONESIA

Room 1

Scope : **Evaluation and Assessment in Mathematics Education**
Date : **Friday, November 19th 2021**
Time : **13.00 – 16.00 Yogyakarta Time**
Moderator : **Ezra Putranda Setiawan, S.Si., M.Sc.**
Operator : **Hestiana, S.Pd.**

Link : **https://bit.ly/Room_Parallel01**
ID : **979 6373 2558**
Pass : **parallel**

No	Article Code	Presenters	Title of Paper
1	EAM01	Venie Gupitasari	The Relationship Between Perseverance and Openness Problem Solving in Mathematics Achievement Based on PISA 2012 Indonesia Data
2	EAM02	Riska Nur Rohmah	Attitude Assessment: How to Utilize Assessment Techniques with Journals?
3	EAM03	Syukrul Hamdi	Personality Competence of Pre-service Mathematics Teachers in the Industrial Revolution 4.0 Era
4	EAM04	Amalia Silwana; Cholis Sa'dijah	Undergraduate Students' Analogical Reasoning in Solving HOTS Statistical Methods Problem
5	EAM05	Azriah	Potential Effects of PISA-Type Mathematical Assessment: Literature Review
6	EAM06	Ahmad Heri Purwanto	AKM: The New Assessment for learning in Indonesia
7	EAM07	Nia Afrelia	How is the Problem-Solving Ability and Scientific Attitude of Students in Mathematics Learning Seen from the Teacher's Perspective?
8	EAM08	Lydia Yeckti Henawati	Evaluation of The Implementation of Blended Learning Models in Mathematics Learning (A Literature Review)

Room 2

Scope : **Evaluation and Assessment in Mathematics Education**
Date : **Friday, November 19th 2021**
Time : **13.00 – 16.00 Yogyakarta Time**
Moderator : **Arifta Nurjannah, M.Pd.**
Operator : **Endang Lasminawati, S.Pd.**

Link : **https://bit.ly/Room_Parallel02**
ID : **480 172 2240**
Pass : **parallel**

No	Article Code	Presenters	Title of Paper
1	EAM09	Siti Kholifah	The Guardian's Mathematics Communication in Word Problem Based on Students Reading Skill
2	EAM10	Lilis Arum Ravita	The Relationship of Instrumental Motivation, Self Efficacy, Mathematics Work Ethic, Teacher Morale, and Teacher Grouping Ability to PISA 2012 Mathematics Achievement of Indonesia Students
3.	EAM11	Luqyana Khalda' Aesa	Developing An Assessment Based on Solo Taxonomy for Junior High School
4	EAM12	Shinta Agustina Putri	Study of Literature: Analysis of Assessment Result of Mathematic Problem-Solving Ability for Student
5	EAM13	Fuad Luky Atmaja	Assessment of Higher Order Thinking Skills: Perspective of Mathematics Teacher
6	EAM14	Fifi Khairun Nisa	Literature Review: Analysis of The Development of Assessment Instruments Based on Mathematical Literacy for Junior High School
7	EAM15	Eva Julianingsih	Analysis of Statistics Daily Test Based on Yogyakarta Culture for Grade VIII with Anbuso 8.0
8	EAM16	Khairul Bariyah	How to Analyze Students' Logical-Mathematical Intelligence in Problem Solving based on SOLO Taxonomy

Room 3

Scope : **Evaluation and Assessment in Mathematics Education**
Date : **Friday, November 19th 2021**
Time : **13.00 – 16.00 Yogyakarta Time**
Moderator : **Thesa Adi Saputra Y., M.Sc.**
Operator : **Muqit Virdaus, S.Pd.**

Link : **https://bit.ly/Room_Parallel03**
ID : **967 2027 8039**
Pass : **parallel**

No	Article Code	Presenters	Title of Paper
1	EAM17	Wiwit Damayanti Lestari	Profile of Prospective Mathematics Teacher's Pedagogic Competency: Understanding in Recognizing the Characteristics of Students in Hybrid Learning
2	EAM18	Phoa Wily	Error Analysis of Vocational School Students in Solving Quadratic Equations Problems with Reflective and Impulsive Cognitive Styles Based on Step of Solving Polya Problems
3	EAM19	Mutiara Annisa Widodo	An Implementation of Mathematics Learning for SMPLB Students Based on Curriculum 2013
4	EAM20	Rian Efendi	Analysis of PISA 2018 results in Indonesia: Perspective of ICT Resources, Books, Grade Repetition, and School Background
5	EAM21	Nindy Fadlila	Students' Statistical Literacy: An Analysis in Solving PISA-Like Problems
6	EAM22	Muqit Virdaus	Analysis of Indicators Which Items are Difficult to Solve in Solving Social Arithmetic Problems in Junior High School?
7	EAM23	Silfia Hayuningrat	Assessment of Mathematics: A Review of Literature Large Scale Assessment and Class Assessment on Its Outcomes and Implementation Issues
8	EAM24	Irfan Hilmi	The Roles of Technology in Assessing Students' Mathematics Learning Outcome
9	EAM25	Khamsone LORXAYPAO	The Ability of Grade X Students at Nampheun Secondary School to Solve the Trigonometry Problem in Indonesian Textbooks

Room 4

Scope : **Analysis and Using Technology in Mathematics Education**
Date : **Friday, November 19th 2021**
Time : **13.00 – 16.00 Yogyakarta Time**
Moderator : **Nur Fitriyana, S.Pd., M.Pd.**
Operator : **Rizki Zakwandi, S.Pd.**

Link : **https://bit.ly/Room_Parallel04**
ID : **919 3867 3457**
Pass : **parallel**

No	Article Code	Presenters	Title of Paper
1	UTM09	Rahman Nul Hakim	Study of a Mathematics Web-Based Learning on the Subject of Mean, Median, and Modus
2	UTM10	Arif Sapta Mandala	Development of Mobile Augmented Reality Application for Geometry in Mathematics Learning
3	ANL01	Hartono	Determining the location of limit cycle on weakly nonlinear van der pol equation
4	ANL02	Mujahidawati	Analysis of Interest in Learning Mathematics of Junior High School Students Using Android-Based Animation Film Media During The Covid-19 Pandemic
5	ANL03	Rira Jun Fineldi	A Case Study Design: Analysis of Students Mathematical Creative Thinking Ability Derived from Their Self-Efficacy
6	ANL04	Ratna Dwi Anisya	Cognitive Level of Word Problems in High School Mathematics Textbooks Class X
7	ANL05	Hapipi	The Profile of Elementary School's Prospective Teachers on Perceiving Mathematical Proof
8	ANL06	Adhenia Fitri	Analysis of Mathematical Reasoning Ability and Self Esteem

Room 5

Scope : **Using Technology in Mathematics Education**
Date : **Friday, November 19th 2021**
Time : **13.00 – 16.00 Yogyakarta Time**
Moderator : **Dina, S.Pd., M.Pd.**
Operator : **Hadi Nur Rahman, S.Pd.**

Link : **https://bit.ly/Room_Parallel05**
ID : **996 6150 5176**
Pass : **parallel**

No	Article Code	Presenters	Title of Paper
1	UTM01	Inayah	Ict-Based Learning Media for Mathematics Learning Achievement and Positive Attitudes of High School Students
2	UTM02	Arifta Nurjanah	Augmented Reality in the Perspective of Cognitive Load Theory
3	UTM03	Nuim Hayat	Students' responds on Website-Based Mathematics Learning Media on Social Arithmetic Materials
4	UTM04	Sukmo Purwo Diharto	Study of the Effect of Mobile Learning for Mathematics Understanding in Middle School
5	UTM05	Rahma Siska Utari; Nike Astiswijaya	Developing of Mathematics Learning Multimedia Based on ICT in Statistics Material
6	UTM06	Eka Rachma Kurniasi	Integration of Computational Thinking in 21st Century Mathematics Learning
7	UTM07	Fitri	Study: Exploratory: Difficulties of Mathematics Teachers in Applying Technology to Online Learning
8	UTM08	Anwaril Hamidy; Fathur Rahman; Ishmatul Maula	Relationship Between Online Learning Readiness and Math Anxiety in Higher Education

Room 6

Scope : **Physics Education and Pure Science Content Area**
Date : **Friday, November 19th 2021**
Time : **13.00 – 16.00 Yogyakarta Time**
Moderator : **Khafidh Nur Aziz, S.Si., M.Sc.**
Operator : **Dian Septi Anifa Chusna, S.Pd.**

Link : **https://bit.ly/Room_Parallel06**
ID : **934 1645 2865**
Pass : **parallel**

No	Article Code	Presenters	Title of Paper
1	PED01	Rohmah Riya Widyasari	The Effectiveness of Phet-Assisted Student Worksheets to Improve Students Conceptual Understanding
2	PED02	Farchan Oktavianto Pribadi	Development Of Cri-Based E-Diagnostic Test to Identify Conceptual Misconceptions in Simple Harmonic Motion
3	PED03	Nur Anisa Arwan	Effectiveness Of Physics E-Book for Improving Students Conceptual Understanding
4	PED04	Racy Religia	Computer-Based Reasoned Multiple-Choice Test Instrument to Identify Critical Thinking Skills on Impulse and Momentum
5	PED05	Margaretha Fionelda Marin	Effect Of E-Pjbl Learning Model Assisted by Student Worksheets to Improve Critical Thinking Ability of Smk Students
6	PED06	Titis Pandan Wangi Reformasi	The Effect of Using Truth or Dare Card Media Assisted by Physics Spinning Wheel on Physics Cognitive Learning Output and Learning Interest
7	PED07	Delsy Desmarlin Raja Lado	Development Of The E-Guided Inquiry Model for Student Worksheets (Lkpd) For Business and Energy Materials Improving the Scientific Attitude of Class X High School Students
8	PED08	Prasetyo Fitriadi	The Development of Physics E-Book Based on Contextual Teaching and Learning to Increase Student Problem-Solving Skill
9	PSC09	Nurul Miftakhul Janah	Simple Vertical Upward Motion Experiment Using Smartphone Based Phyphox App for Physics Learning

Room 7
Scope : Physics Education
Date : Friday, November 19th 2021
Time : 13.00 – 16.00 Yogyakarta Time
Moderator : Metridewi Primastuti, S.Pd., M.Pd.
Operator : Ibnu Rafi, S.Pd.

Link : https://bit.ly/Room_Parallel07
ID : 861 371 0562
Pass : parallel

No	Article Code	Presenters	Title of Paper
1	PED09	Doni Saputra	Implementation Of Peer Teaching in Physics Learning During Covid-19
2	PED10	Ivandra Immanuela Latumakulita	The Development of Physics E-Book Based on Contextual Teaching and Learning to Improve Students Mathematical Representation Skill
3	PED11	Habibah Khusna Baihaqi	Analyzing Students Participation to Carrying Out Scientific Approach Stages Using Diffraction and Polarization E-Book
4	PED12	Susan Yona Matulessy Susan	Application Of Phsyics Crossword Assisted E-Book Media on Learning Interest
5	PED13	Khairunnisa Fahrina Imanzha	Development Of Electronic-Based Physics Worksheets with Sets (Science, Environtment, Technology, And Society) Approach to Improve High School Students' Literacy Skills
6	PED14	Abdul Rahman Musa	The Role of Experimental Method Towards Graph and Table Comprehension of Physics Experiment on Students Sma Negeri 12 Makassar
7	PED15	Anggi Septi Wardani	The Effect of Use of Student Worksheets Based on PjBL to Increase Learning Interest in Class X Students in Vocational High School
8	PED16	Qamariah Qamariah	Development Of Physics Module Based on Problem Solving Skills for Electrical Engineering Students
9	PED17	Anggi Datiatur Rahmat	The Effect of Augmented Reality Technology on Learning Achievement and Attitudes Toward Physics Education

Room 8
Scope : **Biology Education**
Date : **Friday, November 19th 2021**
Time : **13.00 – 16.00 Yogyakarta Time**
Moderator : **Rio Christy Handziko, S.Pd.Si., M.Pd.**
Operator : **Siti Imroatus Sa'adah, S.Pd.**

Link : **https://bit.ly/Room_Parallel08**
ID : **989 1877 0601**
Pass : **parallel**

No	Article Code	Presenters	Title of Paper
1	BED01	Nanik Yuniastuti	Building Critical Thinking Skills and Biology Learning Outcomes Through The E-Lkpd Assisted Science Technology and Society Approach
2	BED02	Mifta Ramandhani Pujiningtyas	Developing An Augmented Reality-Based Immune SySTEM Module to Improve the Eleven Grade Students' Learning Performance
3	BED03	Nur Azizah Tohiroh	Profile Of Critical Thinking Ability in Respiratory Materials in State Senior High School in Tulungagung Regency
4	BED04	Bowo Sugiharto	Challenges And Opportunities for Empowerment of Sps in Distance Biology Learning
5	BED05	Elvi Fuspita Dila	The Profile of Scientific Literacy of Senior High School Student on The Topic of Environmental Pollution
6	BED06	Prendi Niki Halhaji	The Profile of Science Literacy of High School Students Based on Issues of Environmental Change Concept in Bengkulu
7	BED07	Ariska Mifianita	Analysis Of the Implementation SiSTEM Kredit Semester (Sks) With A Scientific Approach of The Biology Learning Process
8	BED08	Oktian Dira Saputri	Analysis Of Students' Learning Independence in Biology Subject Of Sman 1 Jetis As An Impact Of Online Learning During Covid-19 Pandemic Reviewed Based On Students' Gender

Room 9

Scope : **Biology Education and Science Education**
Date : **Friday, November 19th 2021**
Time : **13.00 – 16.00 Yogyakarta Time**
Moderator : **Nur Aeni A., SP., MP., M.Agr., P.hD.**
Operator : **Nopi Tri Utami, S.Pd.**

Link : **https://bit.ly/Room_Parallel09**
ID : **592 867 9994**
Pass : **parallel**

No	Article Code	Presenters	Title of Paper
1	SED12	Novi Handayani	Elementary Schooler'S Misconception on Human Blood Circulation System
2	BED09	Dias Setyawan	Need Analysis of Local Potential-Based Modul of Biodiversity Materials for High School Students
3	BED10	Maulana Malik Irsyad	Teacher'S Perception on Emergency Online Learning: A Survey in High School Biology Classes
4	BED11	Najma Hayatun Nisa	Analysis Of Students' Perceptions of Technological Pedagogical and Content Knowledge (Tpack) Of Animal Physiology Lecturer Iain Syekh Nurjati Cirebon
5	BED12	Diki Muhamad Chaidir	Prospective Biology Teacher in Learning Using Three-Dimensional Software: Interest, 3D Representation and Learning Outcomes
6	BED13	Diqna Nur Annisa	Augmented Reality to Support Students Learning of Socio-Scientific Issues in Biology Class: A Systematic Review of The Literature
7	BED14	Nurrana Fitria Luthfi	Literature Review and Synthesis: Cipo Evaluation Model in The Implementation of The Online Learning Program for Biology Subjects at Madrasah Aliyah Negeri (Man) Yogyakarta City
8	BED15	Tatag Bagus Putra Prakarsa	Diatery Analysis, Colony, And Distribution of Nycteris Javanica (Javan Slit-Faced Bat) In Jonggrangan Karst Area, Indonesia

Room 10
Scope : Biology Education
Date : Friday, November 19th 2021
Time : 13.00 – 16.00 Yogyakarta Time
Moderator : Dr. Anggi Tias Pratama, S.Pd., M.Pd.
Operator : Choirul Amri, S.Pd. Gr. M.Pd.

Link : https://bit.ly/Room_Parallel10
ID : 976 8320 9564
Pass : parallel

No	Article Code	Presenters	Title of Paper
1	BED16	Farah Nadia Karima	The Potential of Flowering Plant Diversity in Local Fruit Thematic Garden of Indrokilo Botanic Garden of Boyolali as A Biology Learning Resource
2	BED17	Riska Fadhilah Hutasuhut	Environmental Literacy Profile of Nature Tourism Parks for Students
3	BED18	Rizqa Devi Anazifa	The Development of Two Levels Inquiry-Based Blended Learning Model on Ecology to Improve Student'S Critical Thinking Skills, Creatives Thinking Skills, And Learning Independence Skills
4	BED19	Rina Rahmawati	Needs Analysis of Web-Based E- Module in Biology Learning
5	BED20	Dwi Ayuningtyas	Needs Analysis of Local Potential-Based Pteridophyta E-Encyclopedia for High School
6	BED21	Ema Aprilisa	Development Of Google Classroom-Based Online Learning Product for Biology in High School
7	BED22	Ishadiyanto Salim	Development Of Dragonfly Identification Field Guide Application in Jatimulyo Tourism Village Integrated with Values of Local Potential: Feasibility and Student Responses
8	BED23	Mualimin	Holistic Higher Order Thinking Skills Ability in Solving Environmental Problems for Biology and Biology Education Undergraduate Students in Indonesia

Room 11

Scope : **Algebra, Statistics, Geometry**
Date : **Saturday, November 20th 2021**
Time : **08.00 – 11.00 Yogyakarta Time**
Moderator : **Ezra Putranda S.Si., M.Sc.**
Operator : **Hestiana, S.Pd.**

Link : **https://bit.ly/Room_Parallel11**
ID : **979 6373 2558**
Pass : **parallel**

No	Article Code	Presenters	Title of Paper
1	STS01	Adi Setiawan	Multilevel Logistics Regression Analysis on Determinants of Adult Stroke Incidence in Indonesia
2	STS02	Dhoriva Urwatul Wutsqa	Mapping of Flood-Susceptibility Areas in Bantul Regency using the Fuzzy Clustering Ensemble Method
3	STS03	Rosita Kusumawati	Normal Mixture Distribution with Expectation Maximization Algorithm for Portfolio Analysis
4	STS04	Katon Agung Ramadhan	The Impact of Student Resilience, Goal Orientation and Digital Learning on Students' Mathematic Achievement: Analysis of PISA 2018 Data
5	GEO01	Hesty Marliana Wati	Challenges for Mathematics Education Students in Teaching and Assessing Geometry Concepts in the Era of Digital
6	ALG01	H P Lestari	Linear Programming Problems with Cube Constraints
7	ALG04	Fakhry Asad Agusfrianto	Sub-Exact Sequence of Quotient Modules
8	ALG02	Karyati	Fuzzy Two-Phase Method for Solving the Generalized Trapezoidal Fuzzy Number Linear Programming Problem
9	ALG03	Yudi Mahatma	A Note on Relative Normal Subgroups

Room 12

Scope : **Applied Mathematics & Computer, Pure Sciences Content Area (all Branches Including Interdisciplinary) and Physics Education**

Date : **Saturday, November 20th 2021**

Time : **08.00 – 11.00 Yogyakarta Time**

Moderator : **Arifta Nurjannah, M.Pd.**

Operator : **Endang Lasminawati, S.Pd.**

Link : **https://bit.ly/Room_Parallel12**

ID : **480 172 2240**

Pass : **parallel**

No	Article Code	Presenters	Title of Paper
1	AMC01	Dhoriva Urwatul Wutsqa	Social Welfare Mapping Using the Fuzzy C-Means Clustering Algorithm in Bantul Regency
3	AMC02	Toto Sukisno	Application of Fuzzy SySTEM to Determine Transformer Losses at Substations of PLN in the Special Region of Yogyakarta
4	AMC03	Primadina Hasanah	Fuzzy Tsukamoto's Application in Determining Flood Insurance Premium (Case Study: Balikpapan City)
5	AMC04	Glagah Eskacakra Setyowisnu	The Derivation of Green's Function on Homogeneous Two-Dimensional Wave Equation Dirichlet Boundary Condition Using Separation of Variable Method
6	AMC05	Sri Andayani	Images Processing for Myopia Detection Using Artificial Neural Networks
7	AMC06	Rasyid Hardi Wirasasmita	Teslet-Model: The Application of Web-Based for Measurement of Student Learning Achievement on Math Subject
8	AMC07	Faida Shofiyatul Azizah	The Topsis Method for Selection of Holticurtura Cultivation
9	AMC08	Emiliana Asumpta	Odd Harmonious Labeling of Some Family of Snake Graphs

Room 13

Scope : **Physics Education and STEM Education**
Date : **Saturday, November 20th 2021**
Time : **08.00 – 11.00 Yogyakarta Time**
Moderator : **Dr. Anggi Tias P., S.Pd., M.Pd.**
Operator : **Muqit Virdaus, S.Pd.**

Link : **https://bit.ly/Room_Parallel13**
ID : **967 2027 8039**
Pass : **parallel**

No	Article Code	Presenters	Title of Paper
1	PED18	Ahmad Risal Patappa	Development Of Physics Worksheet with Discovery Learning-STEM To Improve Student Problem Solving Skills
2	PED19	Dewi Fairuz Zulaikha	STEM-Pbl with Integration of Local Wisdom in Physics Learning: Teachers' Perspective
3	SE04	Velinda Finka Irawan	STEM-Pbl Design to Improve Problem Solving Skill for Public Senior High School
4	SE05	St Afifah	The Influence of Project-Based Learning Integrated Science, Technology, Engineering, Mathematics (STEM) On the Learning Process
5	SE06	Fikri Nathiqrahman Alsa	Physics Guided Discovery Learning E-Module Based on STEM To Enhance Student'S Learning Motivation and Creative Thinking Skill
6	SE07	Afrida Dwi Rahmayanti	Physics Project Based Learning E-Module Based on STEM To Enhance Student'S Creative Thinking Skills and Motivation to Learn
7	SE08	Grace Marchella A. Sagala	Pbl E-Module for Circular Motion Based on STEM To Enhace Student' Creative Thinking and Motivation Learning
8	SE01	Rahmah Evita Putri	Learner Analysis to Inform the Design and Development Of STEM-Based Science Practicum Book for Secondary School
9	SE02	Maratus Sholikah Ikah	Enhancing Students Critical Thinking Skills and Creativity in Pjbl-Based STEM Approach to Biotechnology Online Practicum in Mipa Laboratory Iain Syekh Nurjati Cirebon
10	SE03	Ricka Tesi Muskania	E-Smart Learning Model

Room 14
Scope : Physics Education
Date : Saturday, November 20th 2021
Time : 08.00 – 11.00 Yogyakarta Time
Moderator : Yunita Fera Rahmawati, S.Pd., M.Sc.
Operator : Rizki Zakwandi, S.Pd.

Link : https://bit.ly/Room_Parallel14
ID : 919 3867 3457
Pass : parallel

No	Article Code	Presenters	Title of Paper
1	PED20	Rizki Zakwandi	Exploring The Effect of Problem-Solving Laboratory on Computational Thinking Skills in Physics Class
2	PED21	Veronika Yeni Setyo Tri Nugaheni	The Development Of 2-Dimensional Augmented Reality Integrated Physics E-Book to Improve Problem Solving Skill
3	PED22	Prof. Dr. Edi Istiyono, M.Si.	An Eight-Category Partial Credit Model as Very Appropriate for Four-Tier Diagnostic Test Scoring in Physics Learning
4	PED23	Poppy Sari Dewi	The Development of Augmented Reality 2D Integrated E-Worksheet to Improve Mathematical Representation Ability
5	PED24	Iva Nandya Atika	Enhancing Scientific Literacy and Analytical Thinking Skills Using Problem Based Learning Model in Physics
6	PED25	Reno Nurdiyanto	Development Of Optics Virtual Lab with Discovery Learning Approach Using Unity 3D For Visual Science Literacy and Physics Conceptual Understanding
7	PED26	Yohansen Frando Hadinata Silaban	The Development of Diagnostic Test Instrument to Identify Physics Conceptual Understanding of High School Students
8	PED27	Baiq Armita Lutfia W,	The Impact of Problem-Solving Laboratory in Physics Learning to Improve Students' Science Literacy Ability
9	PED28	Maria Ester Lere	Metal Cu Absorption in Artificial Waste Cu (So4) Using Electrocoagulation Method
10	PED29	Putri Sisa Nurdin	Development Of Pbl Based E-Worksheet Assisted by Virtual Lab To Enhance Critical Thinking Skills And Learning Interest Of High School Student

Room 15
Scope : Physics Education
Date : Saturday, November 20th 2021
Time : 08.00 – 11.00 Yogyakarta Time
Moderator : Nur Aeni A., SP., MP., M.Agr., P.hD.
Operator : Hadi Nur Rahman, S.Pd.

Link : https://bit.ly/Room_Parallel15
ID : 996 6150 5176
Pass : parallel

No	Article Code	Presenters	Title of Paper
1	PED30	Ayu Nanda Mustika	The Development of Science Literacy Test Instruments for High School Material Elasticity of Solids
2	PED31	Sri Rizky	The Development of Scientific Literacy Test Instruments on Newton'S Law Materials for High School Students
3	PED32	Rosalita Anggi Suryanto	The Development of Augmented Reality Integrated E-Worksheet to Improve Problem-Solving Skills
4	PED33	Anggi Datiatur Rahmat	The Effect of Augmented Reality Technology on Learning Achievement and Attitudes Toward Physics Education
5	PED34	Annisaa' Mardiani	Learning Experience in Inquiry-Based Physics E-Book Integrated with Traditional Games: Feasibility and Student Response
6	PED35	Ria Riski Novita	Analyzing Students' Conceptual Understanding as A Learning Effect Through Android Based Learning Media with Kwl Strategy
7	PED36	Fransisca Felbi Helvina Gea	Student Worksheets Assisted by Phet Simulation to Determine Students' Science Process Skills
8	PED37	Pinandita Afriwardani	Development Of Interactive Physics E-Book to Reduce Student Misconception
9	PED38	Nadya Damayanti	Analysis The Impact of Ispring Learning Media Integrated with Kwl Learning Model Towards Students' Self-Direct Learning
10	PED39	Fajar Kurnianto	Developing Physics E-Book Using Ispring to Optimize Conceptual Understanding on Simple Harmonic Vibration

Room 16

Scope : **Physics Education and Teacher Education in Science**
Date : **Saturday, November 20th 2021**
Time : **08.00 – 11.00 Yogyakarta Time**
Moderator : **Khafidh Nur Aziz, S.Si., M.Sc.**
Operator : **Dian Septi Anifa Chusna, S.Pd.**

Link : **https://bit.ly/Room_Parallel16**
ID : **934 1645 2865**
Pass : **parallel**

No	Article Code	Presenters	Title of Paper
1	TES01	Auliyah Shofiyah	Implementation Of Problem Based Learning Through Lesson Study to Improve Students Problem Solving Skills
2	TES02	Amalia Nura	Identification of Students'metacognition in Designing HOTS Questions
3	PED39	Serly Anggraini Listianingrum	A Review of Various Misconceptions in Physics Learning
4	PED40	Toni Rahmanto	Implementation Of Blended Learning Using Discovery Learning Model to Improve the Physics Problem Solving Ability
5	PED41	Yohana Atwina Aspiranti Ndoa	Application Of Physics E-Module Based on Flipped Learning to Increase Conceptual Understanding
6	PED42	Alifia Azis Rahmasari	The Effectiveness of Problem Based Learning Physics E-Books to Improve Physics Learning Motivation for Grade Xi High School Students
7	PED43	Afif Oktavia Putri Sakti	Profile Of Problem-Solving Ability of Islamic Senior High School Students on Momentum and Impuls
8	PED44	Desinta Putri Anastasia	Feasibility Of the Ispring Physics E-Book with A Scientific Approach on Impulse and Momentum Material
9	PED45	Priskila Desmawati Lifire	Development Of The E-Guided Inquiry Model Student Worksheet (Lkpd) On Effort and Energy Materials to Improve Critical Thinking of Class X
10	PED46	Dr. Nana M.Pd	The Effectiveness of The Poe2We Model in Developing Student Character to Face The Challenges Of The 21St Century

Room 17
Scope : Science Education
Date : Saturday, November 20th 2021
Time : 08.00 – 11.00 Yogyakarta Time
Moderator : Dr. Asri Widowati, S.Pd.Si., M.Pd.
Operator : Ibnu Rafi, S.Pd.

Link : https://bit.ly/Room_Parallel17
ID : 861 371 0562
Pass : parallel

No	Article Code	Presenters	Title of Paper
1	SED01	Desy Purwasih	Analysis Of Potential Types of Spice Plants in Banjar Cooking Spices as A Source of Learning Science in Junior High School
2	SED02	Lady Jane Huquire Juanico	Insufficiency Of Science Laboratory Equipment/Apparatus: The Struggles of Science Teachers in The Implementation of Laboratory Works and Activities
3	SED03	Nindiasari Agung Pangesti	Response Of Junior High School Students to Edmodo as An Online Science Learning Media
4	SED04	Rizky Nugraheni Purnamawati	Junior High School Students' Learning Motivation for The Implementation of Liquid Substance Pressure Practicum During the Covid-19 Pandemic
5	SED05	Normalia Sandy Palumpun	Analysis Of Student Creativity on Transfer and Transformation Energy in The Photosynthesis Process Using Padlet-Assisted Learning Videos
7	SED07	Lamby Pratiwi Mayta Sari; Heri Retnawati	Evaluation Of Learning Success by Implementing Curriculum 2013 In Senior High School
8	SED08	Tri Wahyuni	Student'S Response to The Whisper Test Practicum on Vibration, Waves and Sounds
9	SED09	Erna Suhartini	Environmental Literacy Profile of Primary Teacher Candidates in Tropical Rainforests Environment Context
10	SED10	Jody Febriandini	The Potensial of Aquascape
11	SED11	Kinanti Kidung Pangastuti	Scientific Literacy-Based E-Module in Technical Mechanics Subject at Vocational High Schools

Room 18
Scope : Chemistry Education
Date : Saturday, November 20th 2021
Time : 08.00 – 11.00 Yogyakarta Time
Moderator : Dina, S.Pd., M.Pd.
Operator : Siti Imroatus Sa'adah, S.Pd.

Link : https://bit.ly/Room_Parallel18
ID : 989 1877 0601
Pass : parallel

No	Article Code	Presenters	Title of Paper
1	CED01	Asyari Nurul Fitri	Analysis Of Android Media Development Needs in Green Chemistry-Based Chemistry Learning
2	CED02	Munasprianto Ramli	Teaching Chemistry Experiments Using Interactive Video Via Cloud Meeting
3	CED03	Cut Aprinasari	Need Analysis of Web-Based Electronic Module Learning Media Development
4	CED04	Miftahul Jannah	Study Of The Students' Curiosity Relationship, Interest and Motivation In Chemistry Learning: Literature Review
5	CED05	Ade Wulan Ramadhani	Online Learning: A Comparison of Self-Regulation Students High School Based on Gender Differences in The Covid-19 Pandemic Era
6	CED06	Indayana Ratna Sari	Chemical Teachers Perception About Chemical Literacy, Cognitive Learning Strategies, And Self-Efficacy in High School Students
7	CED07	Siti Imroatus Sa'Adah	Development Of Problem-Based Learning E-Worksheet to Improve Students' Learning Independence on Hydrocarbon Subject Materials
8	CED08	Yudha Febriyanto	Development Of Website-Based Learning Media Containing Socioscientific Issues on Buffer Solution Material
9	CED09	Anugrah Anang Respati	Chemistry Learning Innovations: Development of Guided Inquiry-Based Electronic Modules on Chemical Bonding Materials
10	CED10	Erlina Azmi Siregar	Student'S Chemical Representation Ability: A Study on Molecule Shapes
11	CED11	Muhammad Muhibullah	Study On The Difficulties Chemistry'S Learning with Recommendation For Learning Media During Virtual Learning

Room 19

Scope : **Innovative Mathematics Teaching and Learning**
Date : **Saturday, November 20th 2021**
Time : **08.00 – 11.00 Yogyakarta Time**
Moderator : **Nur Fitriyana, S.Pd., M.Pd.**
Operator : **Nopi Tri Utami, S.Pd.**

Link : **https://bit.ly/Room_Parallel19**
ID : **592 867 9994**
Pass : **parallel**

No	Article Code	Presenters	Title of Paper
1	IMT01	I Ketut Darma	The Effectiveness of Schoology-Based Blended Learning Improves Mathematical Problem-Solving Skills for Polytechnic Students during the Covid 19 Pandemic
2	IMT02	Ririn Hutneriana	Implementation Role Playing Model to Optimize Mathematical Ability Connection for Junior High School, Is It Work?
3	IMT03	Endah Nawang Wulan	A Learning Trajectory for Probability: A Case of Traditional Indonesian Children's Game Based-Learning
4	IMT04	Djamilah Bondan Widjajanti	Worksheets to improve the student's mathematical understanding who was studying mathematics online: how should it be?
5	IMT05	Ali Mahmudi	How is the ability of prospective teacher students in solving mathematical proof problems?
6	IMT06	R. Rosnawati	Mathematical Reasoning Activities in the Micro-teaching Simulation
7	IMT07	Irfan Saeful Hidayat	Implementation of Mathematics Learning in The Context of The Joglo Traditional House with The Help of Geogebra at MTs Al-Hikmah 02 Benda
8	IMT08	Zahrotur Rohmah	Can We Improve Transfer Skill through Isomorphisms: The Case of Proportion Topic
10	IMT10	Bambang Heriyanto	Development of Papuan Ethnomathematics-Based Student Worksheets (LKPD) with Problem Solving Learning Models in Junior High School Mathematics Learning

Room 20

Scope : **Innovative Mathematics Teaching and Learning**
Date : **Saturday, November 20th 2021**
Time : **08.00 – 11.00 Yogyakarta Time**
Moderator : **Lusi Harini, S.Si., M.Sc.**
Operator : **Arshi Alfianti, S. Pd.**

Link : **https://bit.ly/Room_Parallel20**
ID : **976 8320 9564**
Pass : **parallel**

No	Article Code	Presenters	Title of Paper
1	IMT11	Eka Dewi	STEM Approach in Middle School Mathematics Learning: What is Teacher's Perception of it?
2	IMT12	Febri Kristiani	Learning Trajectory Surface Area of Triangular Prism Through Realistic Mathematics Education
3	IMT13	Mirna Kusumawati	Development of LAPS-Heuristic-Based Mathematics Learning Tools to Improve Students' Mathematical Problem-Solving Ability in The Application of Blended Learning
4	IMT14	Ninda Karisa	The Effectivity of Contextual Teaching and Learning Based Online Learning in Term of Mathematical Representation and Disposition of Junior High School
5	IMT15	Ika Wahyuni	Identification Mathematics Literacy of Prospective Mathematics Teachers in Solving Pisa Questions
6	IMT16	Bintang Wicaksono	Pedagogıcal Content Knowledge (PCK) Mathematıcs Students of Elementary School Educatıon Teachers
7	IMT17	Dita Aldila Krisma	The Validity of Module Based on the van Hiele Theory Oriented to Reasoning Ability, Problem Solving, and Self-Efficacy
8	IMT18	Dafid Slamet Setiana	Gemstones Ethnomathematics Based Electronic Student Worksheets

Room 21

Scope : **Innovative Mathematics Teaching and Learning**
Date : **Saturday, November 20th 2021**
Time : **08.00 – 11.00 Yogyakarta Time**
Moderator : **Metridewi Primastuti, S.Pd., M.Pd.**
Operator : **Choirul Amri, S.Pd. Gr. M.Pd.**

Link : **https://bit.ly/Room_Parallel21**
ID : **817 492 9103**
Pass : **parallel**

No	Article Code	Presenters	Title of Paper
1	IMT19	Rera Fareralita	The application of inquiry learning for mathematics learning and its impact on students
2	IMT20	Ulfa Annisa Lubis	The Effect of LMS Schoology Assisted Reciprocal Teaching on Students' Self-Efficacy in Learning Mathematics
3	IMT21	Nur Fitriani	Didactical Design of Learning Mathematics in Reducing Students' Learning Obstacles
4	IMT22	Eka Ramadanti	Learning Mathematis with a Contextual Approach on Online Learning
5	IMT23	Choirul Amri	How to Create Isomorphic Problems in Proportion
6	IMT24	Hasratuddin	Adversity Quotient-Based Mathematical Reasoning Ability in Geometry Learning Through Virtual Realistic Approaches at the Mathematics Department, FMIPA, State University of Medan
7	IMT25	Ertin Aini Farhatin	The Effect of Creative Problem-Solving Learning on Students' Creative Thinking Ability and Mathematical Disposition
8	IMT26	Setia Kusumaningrum	Multi-step Word Problem in Quadratic Equations to Facilitate Student's Mathematical Reasoning Ability

Abstract of Keynote Speakers

UNIVERSITAS NEGERI YOGYAKARTA
YOGYAKARTA
INDONESIA

TPACK in Action for STEM Discipline Teachers: A Case of Khon Kaen University Smart Learning Academy Project

Prof.Dr. Niwat Srisawasdi
Division of Mathematics, Science, and Computer Education Faculty of Education
Khon Kaen University, Thailand
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Technology Pedagogical and Content Knowledge (TPACK) framework is formally recognized as essential qualities of knowledge for a highly qualified STEM discipline teacher in today's education. In this talk, several studies of TPACK development, in particular context of Khon Kaen University Smart Learning Academy Project in Thailand, for STEM discipline teachers are presented. Moreover, several issues concerning TPACK-based teacher training approach, including the development of personalized TPACK training system, the design of intensive TPACK workshops, and the investigation of TPACK transformations, are revealed as well.

STEM Pedagogical Opportunities with Educational Technologies

Prof. Michael Phillips, Ph.D
Faculty of Education, Monash University, Australia
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This presentation will examine the growing pervasiveness of educational technologies in a variety of contexts with a focus on recent developments in Indonesia. Both opportunities and challenges when using technologies will be presented and the technological, pedagogical and content knowledge (TPACK) framework will be offered as one way to consider the intricate forms of knowledge required by STEM teachers.

TPACK in Practice: Embedding Technology, Engineering and Mathematics into Science Learning

Prof. Dr. Anna Permanasari, M.Si
Faculty of Mathematics and Science Education
Universitas Pendidikan Indonesia, Indonesia

Applying the TPACK concept in science learning basically requires a relevant approach. An approach that prioritizes student activity, independence, and active interaction is needed so that TPACK can be implemented. STEM is an integrative approach that can be applied in the context of science learning. Teaching science with the STEM approach certainly has its own peculiarities, and the learning design will be different if the STEM approach is applied in learning mathematics or engineering and engineering. The embedded pattern is the most suitable strategy for applying the STEM Approach in learning science or mathematics. Science learning with embedded-STEM learning packaged in a project based learning model has been proven to make a very significant contribution to increasing scientific/STEM literacy, systems thinking skills, critical thinking skills, and creative thinking skills. However, STEM learning in most cases has not contributed much to the choice of a STEM career.

Keywords: STEM learning, Project Based Learning, Integrated learning.

Abstract of Oral Presenters

UNIVERSITAS NEGERI YOGYAKARTA
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[EAM01]
The Relationship between Perseverance and Openness Problem Solving in Mathematics Achievement Based on PISA 2012 Indonesia Data

Venie Gupitasari[1, a)] and Kismiantini[2, b)]

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Abstract. One of the skills that students must have in the 21st century is problem solving skills. Students' strong attitude of perseverance and openness to problem solving can improve mathematics learning achievement. However, only a few studies have examined this topic. This study aims to examine the relationship between persistence and openness to problem solving on mathematics learning achievement in Indonesia. This study uses a stratified model on the 2012 PISA dataset to explore the variables that affect students' mathematics learning achievement. The results obtained using the multilevel model are persistence and openness to problem solving which are statistically significant predictors of mathematics learning achievement. The higher the attitude of perseverance and openness to problem solving, the achievement of students' mathematics learning achievement will also increase.

Scope: Evaluation and Assessment in Mathematics Education

[EAM02]
Attitude Assessment: How to Utilize Assessment Techniques with Journals?

Riska Nur Rohmah[1, a)] Heri Retnawati[1, b)] Elly Arliani[1, c)]

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Abstract. Attitude assessment is defined as an activity carried out by educators both inside and outside the classroom to obtain descriptive information about student behavior. Attitude assessment allows students to perform, understand, and apply mathematical concepts not only in the classroom but also in everyday life. But in reality the assessment of attitudes in mathematics learning in Indonesia there are still several obstacles. Therefore, it is necessary to know what techniques can be used to determine student attitudes towards learning. More broadly, through this knowledge, it is considered as material for making educator evaluation policies in the future. Through a theoretical study, this article tries to describe the use of attitude assessment techniques with journals in mathematics learning. It was found that the use of attitude assessment techniques with journals would be carried out and obtain appropriate results if educators communicated assessments of students and recognized and paid attention to student behavior both inside and outside the classroom.

Scope: Evaluation and Assessment in Mathematics Education

[EAM03]

Personality Competence of Pre-service Mathematics Teachers in the Industrial Revolution 4.0 Era

Syukrul Hamdi, Badrun Kartowagiran, Siswantoyo, Amat Jaedun, I Gede Astra Wesnawa, Endang Susantini, Ahman, Lukman A.R. Laliyo, Sumaryanta

Abstract

In the era of the Industrial Revolution 4.0, the personal competence of prospective teachers must be endeavored to be very high, but unfortunately there is no instrument that can be used to measure that competency validly and reliably. The purpose of this study was to develop an instrument to measure pre-service teacher personality competence in the Industrial Revolution 4.0. The measurement results can be used as recommendations for the curriculum designers and the lecturers of the undergraduate of educational studies level. This research was conducted at Universitas Negeri Yogyakarta, Universitas Negeri Surabaya, Universitas Pendidikan Ganesha, dan Universitas Negeri Gorontalo with 141 student respondents. The draft instrument consists of five factors and has 34 items. The instrument draft was validated for its content validity using the Aiken formula, construct validity using exploratory factor analysis continued with confirmatory factor analysis, while the reliability was estimated using the Cronbach Alpha technique. The result shows that the instrument has 29 items grouped into five factors, namely: (1) act according to the norm, (2) presenting oneself as individuals who can be role models, (3) presenting oneself as individuals who are steady and authoritative, (4) show a high work ethic and responsibility, and (5) uphold the code of ethics of the teaching profession.

Keywords: *Industrial Revolution 4.0, Instrument personality competence, pre-service mathematics teacher*

Scope: Evaluation and Assessment in Mathematics Education

[EAM04]
Undergraduate Students' Analogical Reasoning in Solving HOTS Statistical Methods Problem

Amalia Silwana[1, a)], Cholis Sa'dijah[1, b)], Sukoriyanto[1, c)] And Hendro Permadi[1, d)]

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Abstract. Analogical reasoning is a process of concluding identical relationships or problem-solving structure similarities of the source problem to be applied in solving the target problem. The aim of this research is to describe analogical reasoning of first semester undergraduate students in solving higher order thinking skill (HOTS) statistical methods problem. This research is descriptive qualitative research. The research subjects are six undergraduate students: two high-ability undergraduate students, two medium-ability undergraduate students, and two low-ability undergraduate students. Research data obtained from the result of HOTS analogical statistical methods problem test and interviews. The research results showed that high-ability undergraduate students could pass through the encoding, inferring, and mapping stages well in solving HOTS analogical statistical methods problem. But not all of the high-ability undergraduate students could pass through the applying stage, since some of them make a little error calculation due to lack of accuracy. While medium-ability undergraduate students could only pass through the encoding stage, and low-ability undergraduate students couldn't pass through all of the analogical reasoning stages.

Scope: Evaluation and Assessment in Mathematics Education

[EAM05]
Potential Effects of PISA-Type Mathematical Assessment : Literature Review

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Abstract. Assessment has an important role in the learning process. Assessment is not only used to see the results of students' learning achievements but is also used to improve the learning process. PISA (Program for International Assessment) is a study of international level assessment organized by the OECD (Organization for Economic Cooperation and Development). Indonesia is one of the participating countries in the PISA study. However, the content of the questions within the PISA framework is still relatively small in the available teaching materials. So educators in Indonesia have begun to make adjustments and conduct research on the development of PISA-type assessments. The purpose of this article is to examine the PISA type of mathematical assessment that has been developed. Then, the potential effects of the problems that have been developed will be seen. This study uses the literature review method by reviewing and reviewing articles on PISA-type mathematical assessments. Article collection was carried out on Google Scholar and Research Gate in the period 2015-2021. Based on the results of the research that has been reviewed, it is known that the potential effects of the developed PISA type of mathematical assessment include problem-solving, mathematical literacy, communication skills, and reasoning abilities.

Scope: Evaluation and Assessment in Mathematics Education

[EAM06]
AKM: The New Assessment for learning in Indonesia

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Abstract. The Indonesian government has implemented the latest educational evaluation in the form of a national assessment. One of the abilities measured is the ability of mathematical literacy that is named Asesmen Kompetensi Minimum abbreviated as AKM. Mathematical literacy is very important to develop. This is so that it can help someone or students to recognize the role of mathematics in the real world. AKM presents various problems that are expected to be solved by using students' mathematical literacy skills. A good AKM result shows that students' mathematical literacy skills are also good. Therefore, it is necessary to discuss whetherthe AKM modelis reliable to test mathematics literacy.

Scope: Evaluation and Assessment in Mathematics Education

[EAM07]
How is the Problem Solving Ability and Scientific Attitude of Students in Mathematics Learning Seen from the Teacher's Perspective?

Afrelia Nia[1, a)] Mahmudi Ali[2, b)], Retnawati Heri [3, c)]

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Abstract. One of the main goals of learning mathematics is problem solving ability, which are important for every student to mastered. In addition, there is a domain of attitude that also supports problem-solving abilities, namely the scientific attitude. The important role of teachers is needed in training students' problem solving skills and scientific attitudes especially in learning mathematics. This study aims to describe how students' mathematical problem solving abilities and students' scientific attitudes in the mathematics learning process based on teacher perceptions. This research is a qualitative with the type of phenomenology. Data were collected using online questionnaires and interviews with 10 mathematics teachers in Jambi province. Data analysis was carried out using the Milles & Huberman stage, which divided the steps of data analysis activities into several parts, there are data collection, data reduction, data display, and conclusion or verification. Overall, the results showed that the problem-solving ability and scientific attitude of students in learning mathematics based on the teacher's perspective are not optimal, this happened not only because of factors from the students themselves but also exist big contribution by a teacher.

Scope: Evaluation and Assessment in Mathematics Education

[EAM08]
Evaluation of The Implementation of Blended Learning Models in Mathematics Learning (A Literature Review)

Lydia Yeckti Henawati[1, a)] and Heri Retnawati[1, b)]

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Abstract. Improving the quality of education is important to do even during these pandemic conditions. One way to start improving quality is to improve the quality of learning in schools, especially math learning. In this pandemic, it takes a combination of conventional learning and online learning so that students can understand math learning materials better, this is known as blended learning. This research aims to conduct literature studies related to the evaluation of blended learning implementation on mathematical learning. The SLR (Systematic Literature Review) method was used in this study. The data collection process is carried out by collecting research articles related to the implementation of blended learning on mathematical learning between 2015 and 2021 and also reviewing the articles. The articles reviewed in the study were as many as 10 articles obtained from various journals on the Springer Link, ERIC, Google Scholar, and Researchgate databases with the keywords "blended learning mathematics" and "blended learning mathematics". The evaluation model used is a discrepancy model with stages of Design, Installation, Process, Product, and Analysis. The findings obtained are blended learning effective to do because it successfully provides improved learning outcomes so that it can continue to be implemented.

Scope: Evaluation and Assessment in Mathematics Education

[EAM09]
The Guardian's Mathematics Communication in Word Problem Based on Reading Skill

Siti Kholifah[1, a)], St. Budi Waluya[2, b)], Iqbal Kharisudin[2, c)]

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Abstract. Describing students' mathematic communication skill in solving mathematic word problem is the aim of this research. The type of research is descriptive qualitative. Students with guardian personality become the focus of this research by selecting two samples which are Guardian personality type student with average reading skill, and Guardian personality type student with low reading skill. The data collection technique used in this research is inventory test, reading skill test, mathematic communication test, and interview. The test and interview results are analyzed based on four indicators: (1) the competence to present visual idea, (2) the competence in using mathematic notation, (3) the understanding of mathematic concept, (4) the ability to paraphrase mathematic problem in their words comprehensively. The description results of average reading skill Guardian type students show that they are capable to represent mathematic word problem with exceptional concept as well as representing those problem on their own language and perspective. However, they face difficulty on using mathematic notation in order to solve the mathematic word problem. The low reading skill Guardian type students show that their capability to represent mathematic word problem into graphic is limited, similar to the other task, which are using the mathematic notation on problem solving, and understanding the fundamental of the material taught by the teacher. They also need longer time to fully understand the concept since their ability in reading comprehension is not enough.

Scope: Evaluation and Assessment in Mathematics Education

[EAM10]
The Relationship of Instrumental Motivation, Self Efficacy, Mathematics Work Ethic, Teacher Morale, and Teacher Grouping Ability to PISA 2012 Mathematics Achievement of Indonesia Students

Lilis Arum.R[1, a)] and Kismiantini[2, b)]

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Abstract. Based on datasets in the international scale assessment program. Indonesia's math score PISA in 2012 obtained a math score far below the average when compared to other countries. The low level of mathematics achievement was used as a follow-up study in this study with the aim of investigating the relationship between instrumental motivation, self-efficacy, mathematics work ethic, teacher morale, and the ability of teachers to classify students on mathematics achievement. The datasets in the study were analyzed using a multilevel model based on the characteristics of the data. The results of the analysis showed that the variables of self-efficacy, instrumental motivation, math work ethic, and teacher morale were statistically significant predictors of students' mathematical achievement. Meanwhile, the teacher's ability to group students showed insignificant results. The low accuracy of the results of this analysis of course requires further discussion and discussion of significant variables or vice versa. so the urgency of the research is expected to be able to investigate and determine the relationship between variables that affect mathematical achievement.

Scope: Evaluation and Assessment in Mathematics Education

[EAM11]
DEVELOPING AN ASSESSMENT BASED ON SOLO TAXONOMY FOR JUNIOR HIGH SCHOOL

Luqyana Khalda' Aesa[1, a)] dan Endah Retnowati [2, b)]
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Abstract. Assessment is one of the most important aspects in education, especially in the domain of knowledge and skills. The development of questions for assessment can be developed using the Solo Taxonomy containing four levels, namely the uni structural level, the multi-structural level, the relational level, and the expanded abstract level. This paper discusses how to develop mathematics assessment based of these four levels. Each level provides distinguished level of complexity in the domain. By levelling the mathematics assessments, it might be expected that teacher could get reliable data about student's achievement. It is argued that this model is more suitable when a reasoning skill is particularly assessed. Examples on how to develop the assessment in the topic for junior high school, comparison, is discussed in this paper.

Scope: Evaluation and Assessment in Mathematics Education

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[EAM12]
Study of Literature: Analysis of Assessment Result of Mathematic Problem Solving Ability for Student

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Abstract. The ability to solve mathematical problems is one of the skills needed in mathematics. This study aims to analyze the results of the assessment of mathematical problem solving abilities. This study uses a literature review research method by analyzing articles on the analysis of problem solving abilities, developing problem solving instruments and analyzing the results of problem solving assessments. The results of the research analyzed are that a valid and adequate instrument is able to measure problem solving abilities accurately, and know the results of the problem solving assessment. The results of the analysis of mathematical problem solving ability indicators are in accordance with expert opinion, namely understanding the given problem, planning problem solving, solving problems according to what has been planned and re-examining the results obtained (looking back).

Scope: Evaluation and Assessment in Mathematics Education

[EAM13]
Assessment of Higher Order Thinking Skills : Perspective of Mathematics Teacher

Fuad Luky Atmaja[1, a)] and Kana Hidayati[1, b)]

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Abstract. HOTS assessment is a judgment on matters of non-routine requires solving process with a solution that has never been done before. HOTS characteristic in this assessment aims to process analysis, evaluation, and creation. Literature This review aims to systematically review the literature about the implementation of HOTS assessment in mathematics. A literature search was conducted through the Education Resources Information Center database and Semantic Scholar in the period 2012-2021. The inclusion criteria used were English-language articles that specifically discuss the implementation of the assessment of higher-order thinking skills in mathematics. Based on the extraction of articles chosen six articles that meet the criteria. Results of the review showed the implementation of HOTS assessment in mathematics can improve critical thinking skills and students' motivation is to have an impact on student achievement. It is thus important for teachers to develop the assessment of higher-order thinking skills in mathematics.

Scope: Evaluation and Assessment in Mathematics Education

[EAM14]
Literature Review: Analysis of The Development of Assessment Instruments Based on Mathematical Literacy for Junior High School

Fifi Khairun Nisa[1,a)], Heri Retnawati[2,b)], Elly Arliani[3,c)]
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Abstract. In this era of globalization, learning incereasing. Likewise learning mathematics. Students are more requred to not only be able to count, but be able to apply it to solve problems in everyday life. Improving the quality of Human Resources (HR) socialize Indonesian people must be literate in mathematics of mathematical literacy. The OECD through the PISA program conducts research on students' reading ability, mathematical literacy, and scientific literacy on a regular basis every three years since 2000. The achievement of student mathematics achievement in Indonesia is still low, as can be seen from the results of the PISA study in 2015. Based on the results of research on literacy skills by PISA from 2000 to 2012 Indonesia was in the lowerst 10 country group. The low ability of mathematical literacy can be caused by students not being used to answering mathematical literacy based assesment questions. It takes a problem development that is able to provide space for students to parctice mathematical literacy ability. Based on this, the researchers conducted an analysis of the assesment instrument for the Middle Semeter Examination (UTS) SMP instrument. The UTS instrument was prepared by a junior high school teacher. The purpose of this study was to analyze the development of an assesment instrument based on mathematics literacy for junior high school students. The research method used is a fast review, by summarizing the results of related research and being interpreted. The results of the review determained that: (1) teachers did not understand mathematical literacy and had not prepared assesment instruments based on mathematical literac, (2) the development of UTS instruments prepared by teachers had low levels of mathematical literacy.

Scope: Evaluation and Assessment in Mathematics Education

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[EAM15]
Analysis of Statistics Daily Test Based on Yogyakarta Culture for Grade VIII with Anbuso 8.0

Eva Julianingsih[1, a)], Heri Retnawati[2, b)], Elly Arliani[3, c)]

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Abstract. This study aims to determine the level of difficulty of the questions, the discriminatory power of the questions, the quality of the questions, the validity, and the reliability of the daily assessment questions based on the Yogyakarta culture of statistics material for class VIII. Analysis using Anbuso 8.0 and Excel applications. The results of the study are that the level of difficulty of the questions is in the medium category and has good distinguishing power, which means that the questions are able to distinguish the abilities of each student. Before being tested, the validity of this question was assessed by experts and resulted in the conclusion that this question was valid. The reliability coefficient of multiple choice and essay questions is in the sufficient category where the results of the analysis are 0.761624 and 0.705419.

Scope: Evaluation and Assessment in Mathematics Education

[EAM16]
How to Analyze Students' Logical-Mathematical Intelligence in Problem Solving based on SOLO Taxonomy

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Abstract. The diversity of ways and strategies in solving a problem depends on the level of intelligence a person has, one of Gardner's Eight Types of Intelligence is logical-mathematical intelligence. Analyze students' logical-mathematical intelligence in solving mathematical problems based on the SOLO taxonomy is to decide the logical-mathematical intelligence assessment indicators and indicators of students' response levels. Classify students' development intelligence with the assessment of low interest, consistent growth, and high interest. The pre-structural, unistructural, multi-structural, relational, and extended abstract levels have certain characteristics and indicators that can assess the response level of students' abilities. Domain in this research is geometry with topic perimeter and area of quadrilaterals as one of the TIMSS assessments. Example problems to solve in topic how to find the area and perimeter of quadrilateral at 8th-grade students of Junior High School Teacher mathematics can analyze students' logical-mathematical intelligence base on SOLO taxonomy with the categories.

Scope: Evaluation and Assessment in Mathematics Education

[EAM17]
Profile of Prospective Mathematics Teacher's Pedagogic Competency: Understanding in Recognizing the Characteristics of Students in Hybrid Learning

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Abstract. Pedagogic competence is one of the competencies that must be possessed to become a professional teacher. Recognizing the characteristics of students is one of the sub-competencies in pedagogic competence. Recognizing the characteristics of students, formally, studied in student development courses. In the second year during the COVID-19 pandemic, lectures were held in a hybrid manner, alternating between online and offline. This study aims to determine the profile of the pedagogic competence of prospective mathematics teacher's in recognizing the characteristics of students in hybrid learning. This study is qualitative-descriptive research. The subjects in this study were students of mathematics education at Wiralodra University who contracted student development courses in the even semesters of the 2020/2021 academic year. Data was collected through the provision of tests, interviews, and documentation. The data obtained were analyzed in stages, namely data reduction, data display, and conclusion drawing/verification. The test results show that prospective mathematics teachers, theoretically, already have a very good understanding of recognizing the characteristics of students in hybrid learning. Based on the results of the interviews, it was found that the method of group presentations, case studies, and class discussions carried out during lectures really help they to understand the learning material.

Scope: Evaluation and Assessment in Mathematics Education

[EAM18]
Error Analysis of Vocational School Students in Solving Quadratic Equations Problems with Reflective and Impulsive Cognitive Styles Based on Step of Solving Polya Problems

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Abstract. The purpose of this study is to (1) find out the location of student error according to Polya at Q.E based on reflective and impulsive cognitive style; (2) to know the cause of student-making mistake in solving the problem. This research is a qualitative research. Research subjects taken from students of class X Accounting in Vocational School Ignatius Semarang. All the students given cognitive tests then selected each two students with impulsive and reflective cognitive style. Data collection done by giving the problem of Q.E then analyzed the location of the mistake using Polya problem solving step. Data analysis by data reduction, data presentation, and verification or withdrawal of conclusions. The results showed that (1) the location of student error with reflective and impulsive cognitive style tends to be in the step of implementing the settlement plan and looking back. However, students with reflective cognitive styles are more structured in solving problems than students with impulsive cognitive styles.; (2) the cause of students with reflective cognitive style of making mistakes is less skilled in manipulating algebraic operations while the cause of students with impulsive cognitive style of making mistakes is careless in calculating and not yet understanding the concept well.

Scope: Evaluation and Assessment in Mathematics Education

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[EAM19]

AN IMPLEMENTATION OF MATHEMATICS LEARNING FOR SMPLB STUDENTS BASED ON CURRICULUM 2013

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Abstract

This research aimed to know the implementation process of mathematics learning based on the 2013 Curriculum for the SMPLB (Junior High School for the Disabled) students at State School for the Disabled (SLB Negeri) 1 Bantul. This research belonged to descriptive qualitative research, with mathematics teachers at SMPLB SLB Negeri 1 Bantul from A major (blind), B major (deaf), and D major (quadriplegic) as the subjects of the research. The data collection techniques used involved interviews, observations, and documentation. This research showed that the implementation process of mathematics learning based on the 2013 Curriculum had not been suitable with the Guidelines for the Implementation of the 2013 Curriculum for Special Education. In the mathematics learning implementation, the difference in specificity and the students' ability caused difficulties for the teachers to deliver the materials based on the lesson plan. The time allocation the Ministry of Education and Culture had fixed was also less suitable with the materials to be taught to the students. Furthermore, the low level of the students' focus caused the learning process to become obstructed. The lack of teaching staff for mathematicians also caused a class in B majors filled has students with a number that exceeds predetermined capacity by the Ministry of Education and Culture.

Keywords: *mathematics learning implementation, SMPLB, 2013 Curriculum*

Scope: Evaluation and Assessment in Mathematics Education

[EAM20]
Analysis of PISA 2018 results in Indonesia: Perspective of ICT Resources, Books, Grade Repetition, and School Background

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Abstract. Many researchers believe that the availability of ICT resources, the many books students have, grade repetitions, the school background play an important role in students' mathematics achievement. However, these factors have no influence on students' mathematical theory in some countries. This study analyzes the relationship between the availability of ICT resources, the number of books students have, grade repetition, and school background on mathematics achievement in Indonesia. The data used were 9711 students from 331 schools in Indonesia who participated the 2018 PISA test. Data analysis in this study used multilevel modeling because the data analyzed was nested data with student level as level one and school level as level two. The results of the multilevel analysis found that the factors that influence student mathematics in Indonesia are the number of books owned by students (positive influence), repetition of negative effects, the presence of a computer at home, the influence of the internet network at home. positive), class size in schools (positive influence), and public schools (more influential on private schools). However, the ownership of educational software has no effect on student mathematics in Indonesia.

Scope: Evaluation and Assessment in Mathematics Education

[EAM21]
Students' Statistical Literacy: an Analysis in Solving PISA-Like Problems

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Abstract. The importance of a statistical literacy ability that must be instilled in students is the focus of the problem of this research. This study aims to describe, analyze and draw conclusions from students' statistical literacy skills in solving PISA Like problems. This study uses a qualitative approach with descriptive research with a subject of 30 students from SMPN IT 15 Binjai, North Sumatra. The data collection of this study from the tests and interviews presented. The data analysis technique uses data reduction steps, data exposure, as well as drawing conclusions and verification. The results of the study show that students of SMPN IT 15 Binjai have statistical literacy skills in understanding data in context, writing, interpreting, using algebraic operations in statistical skills, organizing data, but have not yet reached the stage of involving critical thinking in the context presented, using proportional reasoning, express opinions and communicate the results of the interpretation of the data obtained, draw conclusions from the results obtained and evaluate the information critically.

Scope: Evaluation and Assessment in Mathematics Education

[EAM22]
Analysis of Indicators Which Items are Difficult to Solve in Solving Social Arithmetic Problems in Junior High School?

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Abstract. Qualitative descriptive research is the type of this research. This study aims to describe and determine which item indicators are difficult to use in solving social arithmetic problems in junior high school. The subjects in the study were students at State Junior High School 1 Galur, with 91 students in the 2020/2021 school year as the sample. Student test results and documentation were used to collect the required data. The data analysis techniques used by Miles are: (a) the collection of data; (b) the reduction of data; (c) presentation of data; and (d) drawing conclusions. The results of the research and data analysis showed that the indicators of difficult items in solving social arithmetic problems in junior high school were the indicator questions number 2 (predicting the amount of profit), number 4 (counting the amount of loss), number 5 (determining the largest and smallest discount in the table), number 6 (summing up the discount percentage), number 7 (formulating and solving problems related to discounts), number 8 (calculation of the largest tax and smallest tax), number After the analysis, according to the researcher, the students' difficulties did not lie in the indicators and questions given. However, it also comes from the lack of students' ability to read the meaning of the questions and the lack of accuracy in counting. In addition, it is also possible that students are also in a hurry to work on the problem and also guess the answers without counting them.

Scope: Evaluation and Assessment in Mathematics Education

[EAM23]
Assessment of Mathematics: A Review of Literature Large Scale Assessment and Class Assessment on Its Outcomes and Implementation Issues

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Abstract. Assessment in the world of education has a very important role, almost all countries have their own characteristics of assessment in mathematics. Large scale assessment and class assessment that is applied are interrelated although each has its own character, further in this paper will discuss about large scale assessment and class assessment in mathematics starting from its design, tradition, synergy, and implementation in major countries of the world. The method used in this study is a literature review, a collection of articles on large scale assessment and class assessment in mathematics. From the analysis, there are several special characteristics that stand out in large scale assessment and class assessment, especially in design and tradition, between large scale assessment and class assessment in mathematics can also interact in making assessments for the mathematics learning process. Several international trends exist between large scale assessment and class assessment based on the profiles of the 8 major countries in the world. As discussed in all contexts with the exception of Japan and Finland, large scale assessment operates as a public policy instrument that serves as reporting, improving teaching and learning in the education system. Large scale assessment has supported the improvement of assessment in schools globally, focusing on outcomes that can measure teacher practice and student learning so, in this context about teachers and students are users and also subjects of national and state assessments. This draws our attention to consider large scale assessments conducted in the class assessment.

Scope: Evaluation and Assessment in Mathematics Education

[EAM24]
The Roles of Technology in Assessing Students' Mathematics Learning Outcome

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Abstract. The use of technology in assessing student learning outcomes during the COVID-19 pandemic has become a problem. This happens because teachers are not accustomed to using technology in assessing student learning outcomes. The purpose of this research is to explain the technology that can be used to assess student learning achievement. The method used in this study is a literature review. The results of the study indicate that technology has an important role in assessing student learning outcomes. Teachers can use quizizz, kahoot!, google form, that quiz, e-quiz based on HOTS, hot potatoes, e-quiz based on Android, wondershare, quizstar, and also socrative to assess student learning outcomes, especially for online learning or blended learning. By using technology-based assessment tools, both teachers and students will get many benefits including students will be more active in learning, students feel learning is more fun, teachers are very helpful in analyzing quiz results and teachers can control student activities during learning.

Scope: Evaluation and Assessment in Mathematics Education

[EAM25]
The Ability of Students Grade X at Nampheun Secondary School to Solve the Trigonometry Problem in Indonesian Textbooks

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Abstract. Trigonometry is a section of mathematics, it's a section important for the developmental process and it's also an inseparable component of the history of mathematics curriculums. Trigonometry is a useful mathematical that is commonplace in algebra because of its application as a workable solution tool in mathematical problems featuring in science and technology. This study aimed to study the ability of students grade X at Nampheun Secondary School to solve the Indonesian textbook in the section trigonometry using a quantitative research methodology, The population was the students of secondary school in Vientiane Province, Laos. A sample of 42 students of grade X from Nampheun Secondary Schools was established using a purposive sampling sample selection method to determine sample size. The data were collected by using a quiz utilizing test items (reliability was 0.834). The description of the data was analyzed using the mean score, standard deviation, and the percentage of the correct answer. The results show that the ability of students at Nampheun Secondary School is at a medium level with a mean is $\bar{X} = 6{,}42$ and the standard deviation is $S.D = 2{,}63$ of the sample group. In summary, the student's ability at Nampheun Secondary School to solve trigonometry of Indonesia textbook is at a moderate level and In this study the abilities of students were gender-dependent. Most of the students are not yet proficient incorrect the statement on the nature of the problem plaintiff.

Scope: Evaluation and Assessment in Mathematics Education

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[UTM01]
Ict-Based Learning Media for Mathematics Learning Achievement and Positive Attitudes of High School Students

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Abstract. The impact of the COVID-19 pandemic is being felt in the field of education, especially in learning mathematics. Online learning requires teachers and students to master ICT so that learning objectives can be achieved effectively. However, the use of learning media with the use of ICT that can support online learning is still not optimal. So that ICT-assisted mathematics learning media needs to be developed in such a way as to support student achievement and positive attitudes. This study aims to determine whether the use of mathematics learning media can be useful for students to study geometry transformation material. Following the ADDIE model during the development of learning media, 21 grade X students in Cirebon, Indonesia were involved in the Evaluation stage to measure practicality and effectiveness. For the validity aspect, two experts were invited to assess the developed media. The media contains geometry transformation material, example, practice questions and quizzes. The evaluation did show good results, especially the use of animated simulations and guided questions to make it easier for students to understand the material and make students learn fun so that in learning students show a positive attitude and students' learning achievement in mathematics can increase.

Scope: Using Technology in Mathematics Education

[UTM02]
Augmented Reality in the Perspective of Cognitive Load Theory

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Abstract. Augmented Reality (AR) is a technology that enables the incorporation of three-dimensional virtual objects into a real-world environment and allows users to interact with these objects in real-time on the screen. Because of its various advantages, AR is becoming increasingly popular in education settings. Several studies have proven that AR is effectively used in learning, AR encourages students to be more active, more motivated to learn and supports their spatial abilities. However, on the other hand, other studies have revealed that AR is not significantly better than non-AR-based learning settings. Cognitive load theory provides an explanation of how human information processing systems occur during the learning process and provides a framework on how to design effective learning to deal with limited human processing systems. By reviewing on some previous relevant studies, this paper will discuss AR-based learning from the perspective of cognitive load theory. This paper will contribute to the current knowledge of AR utilization, in particular about when AR is effective for use corresponding to the perspective of cognitive load theory. Accordingly, future researchers or AR developers can design more effective AR for promoting student knowledge acquisition.

Scope: Using Technology in Mathematics Education

[UTM03]
Students' responds on Website-Based Mathematics Learning Media on Social Arithmetic Materials

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Abstract. Online learning media becomes very important in this era since the Covid-19 pandemic. However, web-based mathematics learning should be developed in such a way improve self-independent and motivation. This study aimed to investigate whether using a free-web developer such as WordPress may benefit students in learning social arithmetic. Following the ADDIE model during the web development, a number of 22 year 7th students in Banguntapan, Indonesia involved in the Evaluation phase for measuring the practicality and effectiveness aspects. For the validity aspect, two experts were invited to score the developed media. In particular, the material presented is complete with learning videos that are easily understood by students, equipped with quizzes and assignments that students can do themselves.

Scope: Using Technology in Mathematics Education

[UTM04]
Study of the Effect of Mobile Learning for Mathematics Understanding in Middle School

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Abstract. This article explores studies that investigate the effect of mobile learning for mathematics understanding and showed various applications used for mobile learning in middle school. Mathematics undertanding is the main thinking that can lead students to have other mathematical ability. On the other hand, the vast improvement in mobile phone ownership could be an advantage for the implementation of mobile learning in mathematics classroom. By explorations of the main construct of the study, we collect and analyzed some studies from the last 7 years (2014-2021) whose results reported that mobile learning give impact on mathematics performances. The results from the total of 30 reviewed literature generally indicated that there is improvement in three variables: achievement, mathematics understanding, and critical thinking on mobile learning classroom. In addition, the review of literature in this research provide some alternative application that can be used in the learning mathematics with total 23 applications, such as Geogebra, Google Classroom, Quizizz, Maple, mathematical application developed by the teacher or researcher and so on. However, the implementation also should consider the content and also the learning steps so it can be effective to improve mathematical understanding. This study defined the uses of mobile learning with various applications related to limited mathematical skills as variables: achievement, conceptual understanding, and critival thinking. Therefore, the other variables should more research to show its effect. In addition, this research focused on middle school as subject of research and need more observation for other level.

Scope: Using Technology in Mathematics Education

[UTM05]

DEVELOPING OF MATHEMATICS LEARNING MULTIMEDIA BASED ON ICT IN STATISTICS MATERIAL

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Abstract: This study aimed to develop a valid and practical mathematics learning multimedia in statistics material in junior high school. The mathematics learning multimedia developed in this research were learning videos, virtual classes and learning evaluations. Multimedia learning mathematics was developed using various applications/software, like google classroom, google form, power point presentation slides, faststone capture, kinemaster and the learning video uploaded on youtube. This research was conducted using a design research method and development study type. The stages of this research were the preliminary and formative evaluation stages, which consist of the expert review, one-to-one, small group and field test stages. The subjects of this study were 40 students of class VIII at SMPN 17 Palembang. Data were collected by observation, interviews, questionnaires, tests and walkthrough. The multimedia learning mathematics developed was declared valid and practical. Validity was seen from experts comments at the expert review stage in terms of context, construct and language. Practicality was seen during the one-to-one and small group stages, where the multimedia developed was easy for students to use.

Keywords: design research, development study, ICT, mathematics learning multimedia, statistics

Scope: Using Technology in Mathematics Education

[UTM06]
Integration of Computational Thinking in 21st Century Mathematics Learning

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Abstract. This study aims to examine how computational thinking is applied in mathematics learning. Computational thinking (CT) is a thinking process which includes problem decomposition, algorithmic thinking, pattern recognition, abstraction and generalization. CT in its development is not only interpreted as a computer way of thinking, but more broadly this way of thinking is important to develop in the process of reasoning and solving mathematical problems. Mathematics learning, which according to expert studies and the laws and regulations governing education, aims to develop reasoning and problem-solving abilities. This is a literature review research whose data are taken from studies of scientific journals and the opinions of experts in the field of mathematics education. Data analysis includes qualitative analysis with the stages of literature review, data reduction, and expert confirmation. The results of the study indicate that computational thinking should be integrated in learning mathematics. The reason is because this thinking process supports mathematical reasoning and problem solving. PISA even includes CT as one of the assessments in the field of mathematics in 2021. Keywords: 21st Century; Computational Thinking; Math Learning.

Scope: Using Technology in Mathematics Education

[UTM07]
Study: Exploratory: Difficulties of Mathematics Teachers in Applying Technology to Online Learning

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Abstract. This study aims to obtain information about the difficulties of mathematics teachers in applying technology to online learning due to the covid-19 pandemic. This research uses an exploratory case study method and another approach uses qualitative case study research. This study used three junior high school mathematics teacher respondents in Tarakan City for the confidentiality of respondents coded S1, S2, and S3. This study used semi-structured interviews and a list of questions was developed based on the existing literature. The data analysis technique uses the Bogdan & Biklen model by reducing data, looking for relationships between sub-themes, and making final conclusions. Based on the results of the study, it was shown that mathematics teachers in Tarakan City had difficulties in applying technology to their teachers online lessons during the pandemic include age, lack of experience and training, additional costs and tim e, and being constrained by poor networks. Therefore, there needs to be assistance and training from the school so that teacher difficulties can be handled properly, especially senior teachers and the learning process during the pandemic can run as desired.

Scope: Using Technology in Mathematics Education

[UTM08]
RELATIONSHIP BETWEEN ONLINE LEARNING READINESS AND MATH ANXIETY IN HIGHER EDUCATION

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Abstract: Math anxiety still an important issue in learning mathematics. Changing in learning activities such as online learning may affect this mental issue. Therefore, online learning readiness should predict math anxiety in online learning. This study aimed to examine the relationship between online learning readiness (OLR) and math anxiety (MA) in higher education and investigate the contribution of gender and characteristics of online learning (platform used, frequency, and condition of task) on the relationship. A regression model was used in this quantitative study. Data were taken from 197 students of the Islamic State Institute of Samarinda by using questionnaires. Simple linear regression and moderated regression analysis were used to answer the research questions. Findings reveal that the more OLR increase, the more MA tends to decrease. However, gender, online learning platform, task frequency, and condition did not significantly contribute to the relationship between OLR and MA. It suggest OLR should be considered to reduce MA in higher education. This study also suggests to examine the relationship between OLR, MA, and mathematics achievements in online learning context.

***Keywords**: online learning readiness, math anxiety, higher education*

Scope: Using Technology in Mathematics Education

[UTM09]
Study of a Mathematics Web-Based Learning on the Subject of Mean, Median, and Modus

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Abstract. This study aims to see how students react to web-based mathematics (ganapatih.com) on the Subject of Mean, Median, and Modus. The research approach employed was descriptive quantitative. The data collection use questionnaire has seven positive and one negative item in this web-based maths learning questionnaire. The subjects in this study were 47 students of SMP 4 Samarinda. Overall, student reactions to web-based mathematics were very good, with a score of 81,23%.

Scope: Using Technology in Mathematics Education

[UTM10]
Development of Mobile Augmented Reality Application for Geometry in Mathematics Learning

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Abstract. One of the mathematics subject matter that is close to the student's life is geometry. Geometry is a field of mathematics that studies the points, lines, shapes, sizes, and dimensions of things. To understand geometry, the students need to have a clear visualization because geometry is not easy to learn. It takes the learning media so that learning geometry is easy to teach. The use of AR technology can answer one of the solutions to student difficulties in geometry matter. This study aims to develop a Mobile Augmented Reality application for Geometry in mathematics learning and determine its feasibility. This Research and Development used a model ADDIE. The procedure of this development research is done only until the Development stage. Data collection instruments consist of an expert validation sheet of material and media experts. The study showed that the validation results are to be obtained percentage scoring average of 98.025% with a very valid category. According to the results, the mobile augmented reality application for geometry was very feasible for use in learning of mathematics.

Scope: Using Technology in Mathematics Education

[ANL01]
Determining the Location of Limit Cycle on Weakly Nonlinear van der Pol Equation

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Abstract. The aim of this research is to determine an annulus, which lies on a phase space, as the location of limit cycle of the van der Pol equation. It is assumed that the parameter value of nonlinear term of the van der Pol equation is small enough, that is $\mu \ll 1$, such that the investigated problem is categorized as a weakly nonlinear case.The existence of limit cycle of the van der Pol equation has been proven in many references, but the explicit form of the limit cycle equation is very hard to determine analytically. In this research, the limit cycle solution is approached by use of perturbation method. The method is very powerful for such weakly nonlinear case. Based on the result of the approximation, two circles are made inside and outside the limit cycle as its minimum and maximum boundaries. Both circles form an annulus in the shape of ring which is a place for the limit cycle. The results show that the ring has a thickness of approximately 2μ and both, the inner and outer, circles on the ring are tangent to the limit cycle curve. The inner circle is tangent to the limit cycle on the 2nd and the 4th quadrants, meanwhile the outer circle touching the curve at the 1st and 3rd quadrants.

Scope: Analysis

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[ANL02]
ANALYSIS OF INTEREST IN LEARNING MATHEMATICS OF JUNIOR HIGH SCHOOL STUDENTS USING ANDROID-BASED ANIMATION FILM MEDIA DURING THE COVID-19 PANDEMIC

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Abstract

Education in Indonesia is currently experiencing changes and has challenges in the learning process which is certainly different from the previous period. These changes and challenges are due to the Covid-19 pandemic, where all learning activities are carried out online and offline. Changes in the learning system can cause a lack of interest in student learning, especially in learning mathematics. So the need for technology-based learning media that can increase student interest in learning. This study aims to describe the learning interest of junior high school students towards the use of android-based animated film media during the Covid-19 pandemic. This research is a descriptive qualitative research. The subjects of the study were seventh grade students consisting of 25 junior high school students who were taken randomly. The instruments used in this study were student learning interest questionnaire test sheets and interviews. The data analysis technique used in this research is quantitative descriptive analysis. The results of this study indicate that the overall use of android-based animated film media can be said to support student learning interest during the Covid-19 pandemic, while the overall percentage result is 80% with very high criteria. As for the percentage results based on indicators of overall learning interest, the percentage of students' feelings of pleasure was 83% with very high criteria. The percentage of students' interest and attention indicators is 80% with very high criteria; and the percentage of student involvement indicators is 78% with high criteria. Therefore, it can be concluded that this android-based animated film media is very effectively used as a learning medium to support student interest in learning during the Covid-19 pandemic.

Scope: Analysis

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[ANL03]
A Case Study Design : Analysis of Students Mathematical Creative Thinking Ability Derived from Their Self Efficacy

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Abstract. The Case studies are an in-depth research of individuals or groups in one condition in a certain place and time with the aim of obtaining a complete and deep description. This research aimed at describing how students mathematical creative thinking ability derived from their self-efficacy. The type of research used is qualitative research with the descriptive method through case study design. The subjects in this research were students in one of the schools in Kampar Regency which numbered 20 people. The techniques of collecting the data were data triangulation with the test using mathematical creative thinking ability test question instrument, self-efficacy questionnaire, interview using interview guidelines. Processing the validity of the data was done by using Miles and Huberman technique involving data reduction, data display, and conclusion drawing. Based on the research findings, it was obtained that (1) students' mathematical creative thinking ability at one of schools in Kampar overall was on low category, (2) self-efficacy was in line with creative thinking ability, students on high self-efficacy category had high ability, students on medium self-efficacy category had enough ability, and students on low self-efficacy category had poor ability.

Scope: Analysis

[ANL04]
Cognitive Level of Word Problems in High School Mathematics Textbooks Class X

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Abstract. This study aims to describe the cognitive level of word problems in mathematics textbooks for class X based on the revised Bloom's Taxonomy. This type of research is descriptive qualitative. The object of research is the whole word problems in the mathematics textbook for SMA/MA/SMK/MAK class X Curriculum 2013 in the 4th edition of the 2017 revised edition. The data were collected by the documentation method with the instrument in the form of a checklist used in the process of classifying the cognitive level of word problems based on the revised Bloom's Taxonomy. Question indicators based on the cognitive level of the revised Bloom's Taxonomy were validated by an expert (a lecturer) and their reliability was estimated using inter-rater reliability. The reliability coefficient obtained on the knowledge dimension is 0.73 and the cognitive process dimension is 0.71. The results showed that the cognitive level of mathematics word problems in high school mathematics textbooks includes 11 variations of questions from 24 variations of questions according to the cognitive level of the revised Bloom's Taxonomy. Of the 33 word problems with 57 questions, the dominant cognitive level is analyzing procedural knowledge (45,61%), followed by applying procedural knowledge (19, 30%), understanding conceptual knowledge (10,53%), analyzing conceptual knowledge (7,02%), understanding factual knowledge (3,51%), remembering conceptual knowledge (3,51%), evaluating metacognitive knowledge (3,51%), analyzing factual knowledge (1,75%), analyzing conceptual knowledge (1,75%), understanding procedural knowledge (1,75%), and creating procedural knowledge (1,75%).

Scope: Analysis

[ANL05]
The Profile of Elementary School's Prospective Teachers on Perceiving Mathematical Proof

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Abstract. This article is part of the results of a study that aims to describe how prospective elementary teachers perceive and understand mathematical proofs, as well as what mathematical proof schemes they do. This research is a descriptive study with a total sample of 71 prospective elementary teachers who were taken randomly, tiered and proportionally. In this article, two main points are described, namely: (1) their views on mathematical proofs, where the most of them think that proofs are related to the truth of mathematical formulas; and (2) their level of exposure to learning that involves proof, where most of them believe that they are very familiar with mathematical proofs.

Scope: Analysis

[STS01]
Multilevel Logistics Regression Analysis on Determinants of Adult Stroke Incidence in Indonesia

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Abstract. Stroke is a disease or functional disorder of the brain due to blockage (ischemic stroke) or bleeding (hemorrhagic stroke) which can cause death and disability of the sufferer. According to the World Stroke Organization, 13.7 new cases of stroke patients are diagnosed each year, and approximately 5.5 million people die as result of stroke. The prevalence of stroke in the Indonesian population over the age of 15 years in 2018 was 10.9% or 2,120,362 residents. The prevalence of stroke in Indonesia is still relatively high. As a result, we need a preventive action through early detection by understanding the risk factors that can affect the occurrence of stroke in Indonesian society. This study aims to identify the most important risk factors for stroke patients in Indonesia between the ages of 41 and 60 years. This study drew on secondary data from the Rand Corporation website, specifically the fifth wave of the Indonesian Family Life Survey (IFLS-5) conducted in 2014-2015. Multilevel logistic regression model is used to model one binary response variable with one or more independent variables with data having a hierarchical structure. A multilevel logistic regression analysis is used to explain the relationship between stroke cases (yes/no) and variables of age, sex, activity, hypertension, diabetes, and average age per province. The multilevel logistics regression results revealed that age ($p<0.0001$), light activity ($p=0.0137$), moderate activity ($p=0.0230$), hypertension ($p< 0.0001$), diabetes ($p=0.0116$), and the average age per province ($p=0.0206$) were all statistically significant associated with the incidence of stroke in adults in Indonesia.

Scope: Statistics

[STS02]
Mapping of Flood-Susceptibility Areas in Bantul Regency using the Fuzzy Clustering Ensemble Method

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Abstract. Bantul is one of the regencies in Yogyakarta Special Region which is frequently flooding. This research aims to map the flood-susceptibility areas in Bantul Regency based on the clustering method. The variables used in this research are elevation, slope, land use, and rainfall, type of soil, and districts through which the river passes. The first four variables are numerical data and the remaining variables are categorical data. The fuzzy clustering ensemble method is proposed, it combines Fuzzy C-Means to process the numerical data and Fuzzy C-Modes to process the categorical data. The number of clusters is determined by considering the Xie Beni Index and Partition Coefficient Index cluster validation. The result shows that there are four best clusters with XBI value 0.999 and PCI value 0.786. The very high susceptibility cluster is characterized by regosol soil type and residential area and the high susceptibility cluster is dominated by cambisol soil type residential area. The low and very low susceptibility clusters are characterized by latosol soil type and rice field land use. The difference of low and very low clusters is on the intensity rainfall variable. It is in level 4 for low cluster and level 2 for very low cluster. The variables elevation, slope, and districts through which the river passes indicate the same level for all clusters.

Keywords: Flood, Fuzzy Clustering Ensemble, Partition Coefficient Index, Xie Beni Index.

Scope: Statistics

[STS03]
Normal Mixture Distribution with Expectation Maximization Algorithm for Portfolio Analysis

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Abstract. In addition to providing high profit opportunities (return), stock investment is also carrying a large risk of loss. Stock return distribution analysis can assist investors in measuring the risk of a stock. However, stock return distributions that are not normally distributed are often found, as well as extreme values at the left and right ends or fat tails. The Mixture Normal distribution of stock returns with the expectation maximization algorithm for portfolio analysis will be discussed in this article. An example of applying the method for 2 and 3 components of the normal mixture distribution on 3 stocks, namely PT Indofood Sukses Makmur Tbk (INDF), PT Semen Indonesia Tbk (SMGR), and PT XL Axiata Tbk (EXCL) is given as an illustration.

Scope: Statistics

[STS04]
The Impact of Student Resilience, Goal Orientation and Digital Learning on Students' Mathematic Achievement: Analysis of PISA 2018 Data

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Abstract. PISA is an international assessment that is carried out periodically every 3 years. The PISA test measures the literacy skills of 15-year-old students in reading, mathematic, and science. In addition, PISA measures other non-academic factors of students. Indonesia is one of the countries that took the PISA test and occupied level 1 based on the results of the 2018 PISA mathematic achievement score. Several factors that are influence students' mathematic achievement scores are the of student resilience, student learning goals, and digital learning. This study aims to analyze the effect of three predictor variables on mathematic achievement scores in PISA 2018 data. Data analysis uses a two-level multilevel model. Based on the analysis, the variables that statistically significant were predictors of mathematic achievement scores within schools were student resilience and student learning goals. Furthermore, student resilience and digital learning were statistically significant on students' mathematic achievement scores across the school. However, student learning goals were insignificant to students' mathematic achievement scores across the Indonesia school.

Scope: Statistics

[GEO01]
Challenges for Mathematics Education Students in Teaching and Assessing Geometry Concepts in the Era of Digital

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Abstract. The purpose of this study is to see challenges and readiness based on the point of view of mathematics education teacher candidate in learning and assessing the concept of geometry in the digital era. Sampling in this study was purposive sampling, with the research subjects being undergraduate mathematics education students (semester 5-7) and postgraduates (semester 1-3). Data collection using questionnaries and interviews. The instrument has been validated by four experts. The data analysis used descriptive statistics and the Bogdan & Biklen model. The results showed that students had excellent digital literacy. This is because students are more open in accepting changes and are accustomed to using digital media. This is the main asset for students to conduct learning and assessment in the digital era. Students have difficulty in learning and assessing geometry concepts. This is because students face several challenges in carrying out digital learning and assessment of geometry. Then the difficulty of learning and assessing the concept of geometry can be done by maximizing learning media, improving contextual approaches, modifying lesson plans and maximizing the use of digital technology.

Scope: Geometry

[ALG01]
Linear Programming Problems with Cube Constraints

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Abstract. Linear programming is one of the basic concepts to further study in applied mathematics and optimization. If the constraints of the linear programming problem form a convex region then the problem must have an optimal solution. Cube is convex and, in terms of geometry, cube is very special. Cube has some special properties that all edges are congruent and also the all sides are congruent. Other special properties of the cube are related to orthogonality and parallelism. This paper discuss linear programming problems with cube constraints. Considering the peculiarities of a cube, this linear programming problem must has an optimal solution. The results show the following points: 1) A cube is a convex polyhedron; 2) The steps for solving linear programming with cube constraints are analogous to the steps for solving linear programming in two dimensions using the graphical method, finding all the vertices of the cube and calculating the value of the objective function at all of the vertices, and then determining the vertex point that produces the optimal value; 3) The problem can have a unique solution (vertex) or have infinitely many solutions (the points along the edges or on the side planes of the cube).

Scope: Algebra

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[ALG02]
Fuzzy Two Phase Method for Solving the Generalized Trapezoidal Fuzzy Number Linear Programming Problem

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Abstract. . The aim of this research is to determine the solution of generalized trapezoidal fuzzy number linear programming. In this case, we will use the modified Maleki's ranking function that has been constructed by the author. By developing the fuzzy simplex algorithm, we obtain the new fuzzy simplex method algorithm. The result of this research, i.e. the Fuzzy Two Phase method that has been developed works very well for a general case, i.e. the generalized trapezoidal fuzzy number linear programming problem with just one maximum solution. Cases which has been done in this research are generalized trapezoidal fuzzy number linear programming problems with maximum objective functions. A number Big-M in this research has been found, i.e. a generalized trapezoidal fuzzy number which has bigger than maximum ranking function. Based on this criteria, then we get the optimum solution.

Keywords: *Generalized trapezoidal fuzzy number, modified Maleki's ranking function, fuzzy two phase method*

Scope: Algebra

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[ALG03]
A Note on Relative Normal Subgroups

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Abstract. Let G be a group and α be an automorphism of G. In 2016, Ganjali and Erfanian introduced the notion of a normal subgroup in G which is relative to α, called an α-normal subgroup. Suppose that N is an α-normal subgroup of G. In this research, we investigate the necessary and sufficient condition for the automorphism τ of G so that N can be regarded as τ-normal subgroup of G, as well.

Scope: Algebra

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[ALG04]
Sub-Exact Sequence Of Quotient Modules

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Abstract. Given right module M over ring R. If S is a set of right denominator of M , then Ms is a right quotient module of M over S. Next, given a sequence A→B→C, then we say that the sequence is X-sub-exact if A→X→C exact where X submodules of B. If KS-1 is a submodule of MS-1, then we can construct a sub-exact sequence using KS-1 ,MS-1 and MS-1KS-1. We can construct sub-exact sequence for special case when R is division ring. The aim of this paper is to define a sub-exact sequence specifically for quotient modules based on the definition of the sub-exact sequence.

Scope: Algebra

[AMC01]
Social Welfare Mapping Using The *Fuzzy C-Means* Clustering Algorithm In Bantul Regency

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Abstract. Bantul Regency is one of the regencies in the Special Region of Yogyakarta Province which is divided into 17 districts. Social welfare problems in Bantul Regency indicate that there are people whose rights to their basic needs are not properly fulfilled because they have not received social services from the regional government. The information about the level of welfare is very important to equalize welfare conditions between regions. This study aims to map and to determine the characteristics of the level of welfare in Bantul Regency. The mapping was carried out based on the results of clustering using the fuzzy C-means clustering method. The variables used in this study include the number of residents, the number of poor households, the number of households with female heads of households, the number of people who are not yet in school, the number of individuals with disabilities, the number of unemployed, the number of households that do not have latrines for defecation, the number of health workers, the number of health facilities, and the number of school facilities. The validation process to get the best cluster utilizes the Partition Coefficient Index (PCI), Partition Entropy Index (PEI), and Xie Beni Index (XBI). The results showed that the best number of clusters is 2 with a PCI value of 0.9282, PEI value of 0.1378, and XBI value of 0.02895. Most districts include in cluster 1 with a less prosperous level of welfare. They consist 14 districts, namely Srandakan, Sanden, Kretek, Pundong, Bambanglipuro, Pandak, Pajangan, Bantul, Jetis, Imogiri, Dlingo, Pleret, Piyungan, and Sedayu. Meanwhile, cluster 2 is an area with a moderately prosperous level of welfare consisting of 3 districts, namely Bambanglipuro, Sewon, and Kasihan. The variables that quite differ two clusters are the number of poor households, the number of unemployed, and the number of households that do not have latrines for defecation. Cluster 1 has a higher percentage of welfare indicators than cluster 2 except for the number of unemployed.

Keywords: Welfare mapping, Fuzzy C-Means Clustering, Partition Coefficient Index, Partition Entropy Index, Xie Beni Index

Scope: Applied Mathematics & Computer

[AMC02]
Application of Fuzzy System to Determine Transformer Losses at Substations of PLN in the Special Region of Yogyakarta

Toto Sukisno[1, a)], Nurhayadi[2, b)], Agus Maman Abadi[3,c)], Aulia Kahfi[3,d)]

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Abstract. Transformer losses are one of the factors to be considered in the distribution of electrical energy. In the Special Region of Yogyakarta, there are 12 transformers with a capacity of 60 MVA to meet the electrical energy needs of PLN in Yogyakarta area. This study aims to determine the transformer losses of each substation transformer in the Special Region of Yogyakarta by using the Mamdani and zero order Sugeno fuzzy systems. To construct fuzzy systems, the data are taken from PLN in Special Region of Yogyakarta. The input variables of Mamdani model are current R, current S, current T, and transformer voltage. The output of Mamdani model is transformer loading percentage. Then, output of Mamdani model is used as input of zero order Sugeno model to get the efficiency value of transformer and then, the transformer losses are determined. The results are that loading percentage, efficiency value, and losses of each transformer have been determined. Furthermore, the results show that the model accuracy of transformer losses was 84.1% for training data and 82.74% for testing data. Based on all data, the greatest average of transformer losses occur at transformer I Bantul, while transformer II Wates has the smallest average transformer losses.

Scope: Applied Mathematics & Computer

[AMC03]

Fuzzy Tsukamoto's Application In Determining Flood Insurance Premium (Case Study: Balikpapan City)

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Abstract. Flooding is one of the common natural disasters in Balikpapan. The flood was caused by the topography of Balikpapan and the development of the area that did not pay attention to the optimization of the drainage system. This is based on the facts obtained from data on the incidence of flood cases that occurred in the 2015-2019 range. The data obtained shows that from 2015 there were 33 cases, in 2016 there were 86 cases, in 2017 there were 89 cases, in 2018 there were 10 cases and in 2019 there were 19 cases. In 2018 and 2019 only flood data occurred in residential areas (Balikpapan BPBD data, 2015-2019). Several areas in Balikpapan City have a high level of danger against flooding, including Margo Mulyo Administrative Village and Damai Administrative Village. The location of Margo Mulyo Administrative Village is located near the beach, while Damai Administrative Village has a sunken plain area, which causes frequent flooding. Floods cause losses, both material and non-material. Therefore, based on this explanation, one of the efforts to manage the risk of such damage is to provide insurance protection. This study was conducted to analyze the size of flood insurance premiums based on the people's ability to pay. The determination of the premium is based on several variables, namely the income and expenditure of the community for one month and the height of the flood. The research data was taken from a survey conducted to the people of Margomulyo and Damai Administrative Villages as representatives of the people of Balikpapan. Analysis of the value of insurance premiums using the fuzzy Sukamoto method. The premium value obtained is 283,216 per month.

Scope: Applied Mathematics & Computer

[AMC04]
The Derivation of Green's Function on Homogeneous Two-Dimensional Wave Equation *Dirichlet* Boundary Condition Using Separation of Variable Method

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Abstract. Homogeneous two-dimensional wave equation is an example of partial differential equation (PDE) which contains *Green's* function on its solution, or a function that be affected by the initial value of a differential equation (DE). In this paper, we will derive *Green's* function from homogeneous two-dimensional wave equation on *Dirichlet* boundary condition using separation of variables method. First, two-dimensional wave equation's solution is defined as a product of each independent variable, so that three ordinary differential equations (ODE) by those independent variables obtained. Then, nontrivial solution of ODE can be obtained using *Dirichlet* boundary condition. According to superposition principal, linear combination of every nontrivial solution is the solution of PDE. Meanwhile, the corresponding coefficient of the given initial value can be obtained using the property of base function orthogonality. The corresponding *Green's* function of its initial value is the result of this paper. For the representation, the obtained solution will be analyzed for an initial value.

Scope: Applied Mathematics & Computer

[AMC05]
IMAGES PROCESSING FOR MYOPIA DETECTION USING ARTIFICIAL NEURAL NETWORKS

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Abstract. This study aims to detect myopia using digital image processing technology, which can be detected by pupil size. The methods of artificial neural networks, namely the Backpropagation and Convolution Neural Network (CNN) methods are used to analyze the digital images of eyes. The different preparation of data input to be fit for these two methods has been conducted. The test results using Backpropagation ANN give the highest accuracy 71.66%. The test results of the CNN model produce an accuracy value of 77.14%.

Keywords: Digital image processing, myopia, backpropagation, CNN

Scope: Applied Mathematics & Computer

[AMC06]
TESLET-MODEL: THE APPLICATION OF WEB-BASED FOR MEASUREMENT OF STUDENT LEARNING ACHIEVEMENT ON MATH SUBJECT

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Abstract: The purpose of this study is to find out the application of web-based testlet-model in the measurement of achievement of mathematics students at the junior high school level. This research is a quality descriptive study, data sources in stinging come from teachers and learners from five schools, namely *SMPN 1 Selong, SMPN 2 Selong, SMPN Sakra, MTs Muallimat NW Pancor*, and *SMP Laboratorium NW Pancor*. Data collection techniques are carried out using interview and observation techniques. Data analysis techniques are performed with interactive techniques. Based on the results of data analysis conducted, it is known that most teachers and first-time new students use testlet-model tests let alone web-based ones. In the implementation of the test using the test model testlet web-based is located at the level of the user and has different access. The intended user level is central admin, school admin, teacher, and student. Constraints in the examination of this web-based testlet-model on network problems and students' ability to operate computers. The impact of this application helps teachers to know the level of understanding of students in more depth and can minimize the number of students doing guesses so that they can describe the actual ability of students.

Keyword: Teslet model, web-based, Measurument, Learning Achievement

Scope: Applied Mathematics & Computer

[AMC07]

THE TOPSIS METHOD FOR SELECTION OF HORTICULTURAL CULTIVATION

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Abstract

Horticultura is a plant which usually grown in garden or yard such as vegetables, fruits, ornamental plants and medical plants. This research had aims to determine the selection of horticultural crops to be cultivated in Seyegan District, Sleman Regency. This study used Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method. The research design used an interview as determinant of criteria and alternatives and filled out a questionnaire as the primary instrument of data collection. The research population were groups of farmers in Seyegan District. The results of this study indicated that four villages in Seyegan District had chill priority as the plant selected for cultivation with a preference value in Margoagung Village of 0,98; Margodadi Village of 0,99; Margoluwih Village of 0,99; and Margomulyo Village of 0,99. Meanwhile, Margokaton Village chose melon as a priority with a preference value of 0,75 based on high production, high selling price and disease resistance factor.

Keywords: plant selection, horticultura, TOPSIS

Scope: Applied Mathematics & Computer

[AMC08]
Odd Harmonious Labeling of Some Family of Snake Graphs

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Abstract. Graph labeling is a way of assigning integers to vertices or edges of a graph that satisfy certain conditions. One of graph labeling is odd harmonious labeling. Let G=G(p,q) be a graph that have p vertices and q edges. An odd harmonious labeling of G is an injective function f from the set of vertices of G to the set $\{0, 1, 2,, \ldots, 2q-1\}$ such that the induced function f*, where $f^*: E(G) \rightarrow \{1, 3, 5, \ldots, 2q-1\}$, and $f^*(uv) = f(u) + f(v)$ for every edge $uv \in E(G)$, is bijective. A snake graph k(G) is a graph obtained from a path on k edges by replacing each edge by a graph isomorphic to G. If such labeling exists, then G is said to be odd harmonious. In this paper we show that snake graph k(G) is odd harmonious for some graph G.

Scope: Applied Mathematics & Computer

[IMT01]
The Effectiveness of Schoology-Based Blended Learning Improves Mathematical Problem Solving Skills for Polytechnic Students during the Covid 19 Pandemic

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Abstract. The purpose of this study was to determine the effectiveness of the schoology-based blended learning model on increasing the ability to solve mathematical problems of polytechnic education students during the covid 19 pandemic. The study was carried out at the Bali State Polytechnic (BSP), using a mastery-experimental approach, with a pre-test post-test design of non-equivalent control. design groups. The subjects are students in the engineering field of PNB in 2020/2021. Samples were taken purposively as many as 10 classes and divided into experimental and control groups. Data were collected using a mathematical ability test developed by the researcher. The level of validity is between 0.31 and 0.89, the reliability is 0.97, the average difficulty level is 0.41 and the discriminatory power index is between 0.25 to 0.75. Data were analyzed using t test, paired t test and N-Gain score. The results of the analysis show that there is a significant difference between the average mathematical problem solving ability of students who are taught using the blended learning model and those who are taught using the full e-learning model. The schoology-based blended learning model is more effective in improving the ability to solve mathematical problems in vocational education students during the pandemic 19. The implication is that the optimal application of the schoology-based blended learning model in polytechnic education during the covid 19 pandemic, the learning process becomes more effective and succeeds in improving students' mathematical problem solving abilities.

Scope: Innovative Mathematics Teaching and Learning

[IMT02]
Implementation Role Playing Model to Optimize Mathematical Ability Connection for Junior High School, Is It Work?

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Abstract. During pandemic, students learning just by online learning. It is to hard by student to study the lessons. in mathematics a concept has a relationship with other concepts. The relationship between these mathematical concepts is called a mathematical connection. Therefore, an appropriate and effective learning model is needed in improving students' mathematical connection skills. One of these learning models is role playing. Role playing is one of the learning models that can be applied to the current curriculum, because in this model there are many activities that involve students, from students expressing the concept of a material, students observing, students thinking, until students draw conclusions about a material that they can get through role playing. This type of research uses the quasi experimental method and the design is the design of the pretest-posttest group. The population in this study were all eighth grade students of SMP Negeri 1 Sukagumiwang Year 2021/2022. The sample in this study were students of class VIII F as an experimental class. The research instrument used was a written test of mathematical connection ability and a selfconcept questionnaire.

Scope: Innovative Mathematics Teaching and Learning

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[IMT03]
A LEARNING TRAJECTORY FOR PROBABILITY : A CASE OF TRADITIONAL INDONESIAN CHILDREN'S GAME BASED-LEARNING

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Abstract. A teacher must have the ability to be able to see how the students understand, as an effort to develop student learning activities. one of which is that the teacher must be able to see or predict how the students' responses during teaching and learning processes and this is what is called a hypothetical learning trajectory (simon, 1995). there are 3 components in hlt, including learning objectives, learning activities and hypotheses or assumptions from the learning process (simon, 1995). the purpose of this study was to investigate how learning using hlt could make the students easily understand the concept of probability, and it then could produce a learning theory that could be used as a lesson on the topic of probability. in this study, the researchers used the rme (realistic mathematics education) approach with the type of research using the design approach proposed by gravemeijer and cob (2013). this study consisted of 3 stages, namely: preparing the experiment, designing the experiment, Retrospective analysis. The subjects in this study were 9 junior high school students including 3 students as experimental subjects in stage 2 to test the feasibility of HLT, and 6 students for the HLT experiment that had been validated. Each experiment was carried out with low, medium, and high ability levels and was also assisted by one teacher who taught the students to be interviewed. When conducting the attempts and being interviewed the students quite understood of the material provided, and there were no difficulties in conducting the attempts. However, when students answered the LKPD asking about the sample point and sample space, it was found that there were still many students who had errors in determining the sample point and sample space. This could be due to a factor in which the students still did not really understand the concept of probability because it had been taught before. However, that learning process made the students interested in learning the concept of probability because the students were enthusiastic and liked the learning process carried out. The learning trajectory carried out in this study can be used as an alternative way for teachers to improve students' conceptual understanding so that the students easily understand the concept of probability and its relationship to the real world or things that are familiar to the students.

Scope: Innovative Mathematics Teaching and Learning

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[IMT04]

Worksheets to improve the student's mathematical understanding who was studying mathematics online: how should it be?

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Abstract. Learning mathematics online during the COVID-19 pandemic poses several problems for most students experiencing it for the first time. One of the problems that arise is their level of understanding. Theoretically, many factors cause a student to fail to understand mathematical concepts. However, the determining factor for students' success in learning mathematics is the worksheet design used in terms of online learning. This article discusses the creation of worksheets that expects to help students improve their mathematical understanding. Through several studies on worksheets that are effective in enhancing students' mathematical understanding, it can be concluded that these worksheets contain at least: (1) detailed and clear instructions, but not very guiding: (2) questions that can challenge students' curiosity; (3) good place for students to explore; and (4) feedback and conclusions/reinforcement columns from the teacher.

Key words: worksheet, mathematical understanding, online

Scope: Innovative Mathematics Teaching and Learning

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[IMT05]
How is the ability of prospective teacher students in solving mathematical proof problems?

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Abstract. This study is intended to describe and analyze the ability of prospective mathematics teacher students in solving mathematical proof problems. This ability is very important for them to learn mathematics material further and becomes an important material to be taught to students in high school when they become teachers in the future.

Scope: Innovative Mathematics Teaching and Learning

[IMT06]
Mathematical Reasoning Activities in the Micro-teaching Simulation

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Abstract. One of the main objectives of micro-teaching simulation is to develop prospective teachers' basic teaching skills. In particular, one of the important aspects of those basic teaching skills is to design and demonstrate mathematical reasoning activities in mathematics classes. In the case of micro-teaching simulation for prospective teachers, mathematical reasoning activities can be seen in the lesson plan and in the teaching simulation. This study is aimed to study the prospective teachers' skills in designing and performing mathematical reasoning activities. For this purpose, 25 videos of micro-teaching simulation were analyzed by using a qualitative descriptive approach. The analysis focused on identifying three types of questioning – i.e. probing, guiding, and factual – in the tasks and activities designed by the prospective teachers. The analysis revealed that factual guiding is the most frequently observed questioning posed by the prospective teachers.

Scope: Innovative Mathematics Teaching and Learning

[IMT07]
Implementation of Mathematics Learning in The Context of The Joglo Traditional House With The Help of Geogebra at MTs Al-Hikmah 02 Benda

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Abstract. This research is in the form of a description of the results of the implementation of the ethnomathematical learning of artifacts from the Joglo traditional house in class VIII of MTs Al-Hikmah 02 Benda. The purpose of this study is to describe how the ethnomathematical learning process integrates local cultural values in the form of joglo traditional house buildings. This type of research is descriptive quantitative research that aims to be able to describe complete information on the learning carried out, starting from the learning process to student learning outcomes. Collecting data in this study in the form of observations, tests, interviews and documentation for further analysis. The results of the ethnomathematics learning went well and were well received by the students, as seen by the high activity and participation of students in class. Another thing found in the application of ethnomathematics learning is the lack of knowledge of students about the existing local culture, it can be said that cultural knowledge that can be used as content in ethnomathematical learning is still lacking. So it is hoped that with ethnomathematical learning it can reintroduce local cultures that are forgotten by students and at the same time foster students' love for local culture.

Scope: Innovative Mathematics Teaching and Learning

[IMT08]
Can Proportion Topic Isomorphism Problems for Junior High School Improve Transfer Skill?

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Abstract. Transfer skill is the ability to use knowledge from previous learning to solve new problems. The purpose of this article is to explore proportion topic math problems for grade 7 which classified as isomorphism and how they can facilitate the development of transfer skills. The use of isomorphism problems require the ability to think analogously between the problems encountered previously and the new problems. This analogical thinking skill encourages students to bring back the knowledge that has been previously learned because isomorphism problems contain similarities both in context and numerically. By writing down the results of the solution by analogy, students will develop their representational skill. Transfer skill is built from these two thinking skills, namely the ability to think analogy and representational. This paper discusses examples in learning mathematics, especially the topic of proportion, so that it can be understood how the strategy of constructing isomorphism problems that facilitate transfer skill can be understood.

Scope: Innovative Mathematics Teaching and Learning

[IMT10]
Development of Papuan Ethnomathematics-Based Student Worksheets (LKPD) with Problem Solving Learning Models in Junior High School Mathematics Learning

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Abstrak. This research aims to describe the quality of ethnomathematics-based worksheets with Problem Solving learning models developed in class VIII mathematics in terms of: (1) aspects of validity, (2) aspects of practicality, (3) aspects of effectiveness. This research method is research and development (R & D) using a 4D development design model (Define, Design, Developmen and Dissemenation). This research only reached the development stage (Development). The subjects in this study were grade VIII students of SMP Muhammadiyah Aimas Regency. The data collection instrument used a questionnaire sheet, observation sheet, and essay questions. Data analysis used qualitative techniques. From the research, it was found that the average score of assessment by LKPD media experts was 4.4 by Papuan ethnomathematics experts and 4.58 by ethnomathematics-based LKPD material experts so that the average of the three experts was 4.49≥4 thus , the quality of ethnomathematics-based LKPD with problem solving learning models obtained very good criteria and was declared valid. the average score of student response questionnaires is 4.43≥4.2 which indicates a very good category, the average score for the mathematics teacher at SMP Muhammadiyah Aimas, Sorong Regency is 4.91≥4.2 which indicates a very good category, and the implementation of learning reaching 92.69%≥80 is in the very good criteria so that the quality of video-based LKS with the Problem Solving learning model is declared practical. from the acquisition of the average value of the learning outcomes test of 78.71≥70 and the percentage of the number of students who completed 80.69%≥80 LKPD based on ethnomathematics with problem solving learning models and 4D development models developed to obtain effective criteria.

Scope: Innovative Mathematics Teaching and Learning

[IMT11]
STEM Approach in Middle School Mathematics Learning: What is Teacher's Perception of it?

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Abstract. STEM is a learning approach that can equip students with various abilities to face global challenge and support student success in the future. STEM-integrated learning is in line with the demands of the 21st century. The implementation of learning with the STEM approach is strongly influenced by the ability of the teacher, one of which includes the teacher's perception. The purpose of this study was to describe the teacher's perception of the STEM approach in learning Mathematics in Junior High School/MTs in Central Metro, Lampung. This research is qualitative descriptive study involving 38 mathematics teachers from 47 mathematics teachers in State and Private Junior High School/MTs throughout Central Metro, Lampung. The data in this study were collected using an online questionnaire. Data analysis was performed using the percentage technique. The results of research on the perception of mathematics teachers Junior High School/MTs in Central Metro, Lampung on STEM integrated learning shows positive response.

Scope: Innovative Mathematics Teaching and Learning

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[IMT12]
Learning Trajectory Surface Area of Triangular Prism Through Realistic Mathematics Approach

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Abstract. Learning Trajectory (LT) is a student's line of thought resulting from Hypothetical Learning Trajectory (HLT). The purpose of this research is to design an LT regarding the surface area of triangular prism that will be tested on class VIII students who studied the material. This LT is produced from HLT based on realistic mathematics education. The method used in this research is the development of a product, namely LT on the topic of the surface area of triangular prism with the initial form of HLT supported by the presence of iceberg, a series of mathematical activity schemes for students, student activity sheets and student response predictions. This research consists of three stages, namely: pre-experiment, teaching experiment, and retrospective analysis. The designed HLT is presented in an "iceberg" realistic mathematical education in the form of: a situational, model of situational (MoF), a model for mathematics (MfM), and formal mathematics. Data collection techniques used in this study were documentation, interviews and observations, and tests. The data obtained were then analyzed descriptively. Data analysis of the results of documentation, interviews, observations, and tests was carried out qualitatively. The results obtained in this study are a local theory in the form of LT regarding the surface area of triangular prism generated through HLT. Thus, learning using real situations that are bridged with concrete objects in the form of flat-sided shapes can help students understand the concept of the surface area of triangular prism. Learning using RME helps students understand concepts well and can know the relationship of the material being studied with real life.

Scope: Innovative Mathematics Teaching and Learning

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[IMT13]
Development of LAPS-Heuristic-Based Mathematics Learning Tools to Improve Students' Mathematical Problem Solving Ability in The Application of Blended Learning

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Abstact. This research aims to produce a mathematical learning tool based on LAPS-Heuristics to improve students' mathematical problem solving abilities that are valid, practical, and effective in the application of blended learning. The learning tools developed to consist of the Learning Implementation Plan and Student Worksheets. This development research uses the ADDIE model which consists of the analysis, design, development, implementation, and evaluation stages. The subjects of this study were 36 students of class X IPA 2 SMAN 1 Bukittinggi. Product validity was measured using an expert validation sheet instrument. The practicality of the product is measured from the results of teacher and student assessments, as well as learning implementation observation sheets. The effectiveness of the product is measured from the learning outcomes test which includes a test of mathematical problem solving ability on the sine and cosine rules of class X SMA. Then, the data analysis was carried out descriptively.The results showed that the learning tools in the form of lesson plans and worksheets based on LAPS-Heuristics to improve students' mathematical problem solving abilities in the application of blended learning developed were valid, practical, and effective.

Scope: Innovative Mathematics Teaching and Learning

[IMT14]

THE EFFECTIVITY OF CONTEXTUAL TEACHING AND LEARNING BASED ONLINE LEARNING IN TERM OF MATHEMATICAL REPRESENTATION AND DISPOSITION OF JUNIOR HIGH SCHOOL

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Abstract. This research is aims to know (1) the effectiveness of contextual teaching and learning based online learning in term of mathematical disposition of junior high school students, (2) the effectiveness of contextual teaching and learning based online learning in term of mathematical representation of junior high school students. The type of the research is quasy experiment with One- Group Pretest-Posttest Design. This research applies online learning with the help of whatsapp group class application as a media communication between students and teachers. The subjects of this study were 29 students of grade VII in Kroya Junior High School. The instruments that are used on this research are mathematical representation test and mathematical disposition test. Hypotheses trial method uses One Sample Wilcoxon Signed -Rank Test, One Sample Binomial Test, and One Sample t-Test that are helped by software SPSS 25. Base on the result of hypothese trial with a significance level of 5% concluded that : (1) contextual teaching and learning based online learning is effective to the mathematical disposition of junior high school students, (2) contextual teaching and learning based online learning is effective to the mathematical representation of junior high school students.

Keywords: contextual teaching and learning, online learning, mathematical disposition, mathematical representation

Scope: Innovative Mathematics Teaching and Learning

[IMT15]
Identification Mathematics Literacy Of Prospective Mathematics Teachers In Solving Pisa Questions

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Abstract: This study is to describe the mathematical literacy of prospective mathematics teachers in solving PISA questions based on academic ability and mathematical disposition. The research subjects consisted of 6 prospective teachers who were grouped based on their academic ability and mathematical disposition. Prospective teachers are given a mathematical literacy ability test and a mathematical disposition questionnaire, followed by an interview. The results showed that there were differences in mathematical literacy based on academic level and mathematical disposition, although not significant. The mathematical literacy ability of the top group of teacher candidates is good. Prospective upper group teachers with good mathematical dispositions demonstrate skilled behavior, namely being able to understand context, master mathematical content, and perform mathematical processes. Meanwhile, for the top group of teacher candidates with sufficient mathematical dispositions, there are quite a few behaviors in the mathematical process that are not accompanied by explanations. The mathematical literacy ability of the middle group teacher candidates is sufficient. Prospective middle group teachers with good mathematical dispositions showed skilled behavior is only part of the context of the questions being tested. However, for the middle group teacher candidates with sufficient mathematical dispositions in the mathematical process, the prospective teachers did not include arguments and reasoning for the application of mathematical ideas and made some misinterpretations. The mathematical literacy ability of lower group teacher candidates is still lacking. Prospective lower group teachers with good and sufficient mathematical dispositions only show one skillful behavior, namely mastering some mathematical content.

Keywords: *Mathematical literacy, PISA, prospective mathematics teacher*

Scope: Innovative Mathematics Teaching and Learning

[IMT16]
Pedagogıcal Content Knowledge (PCK) Mathematıcs Students Of Elementary School Educatıon Teachers

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Abstract. Teachers and prospective teachers are required to have abilities in pedagogical abilities and understand the content being taught. This is stated in Law No. 14 of 2005 which states that teachers are required to have 4 competencies, namely pedagogic, personality, social, and professional. Therefore, to support this, the Teacher Competency Test is conducted or known as the UKG. UKG is an examination of the mastery of two compulsory teacher competencies, namely pedagogical competence and professional competence in the cognitive field as a basis for determining ongoing professional development activities and part of teacher performance appraisal. The purpose of this study is to analyze Pedagogical Content Knowledge (PCK) in mathematics subjects of PGSD students which is a representation of the teacher's Pedagogic and Professional abilities. This research is a descriptive qualitative research in which data is obtained through questionnaire instruments and documentation as well as interviews. The analytical method used is a triangulation technique, which compares the three data obtained to obtain a valid conclusion. The results of this study were obtained by PCK level PCK level VI 6th semester students in mathematics. 7 out of 11 study subjects were at the Pre PCK level and 4 sis were at the Growing PCK level.

Scope: Innovative Mathematics Teaching and Learning

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[IMT17]
The Validity of Module Based on the van Hiele Theory Oriented to Reasoning Ability, Problem Solving, and Self-Efficacy

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Abstract. This study aims to produce a geometry module based on van Hiele theory oriented to reasoning skills, problem-solving abilities, and self-efficacy on solid geometry for students grade VIII to satisfy valid, practical, and effective criteria. This type of research is R&D (research and development) by adopting the ADDIE (analysis, design, development, implementation, and evaluation) development model. However, this research is limited to the development stage of the module validity test. The instrument used was a validation sheet to measure validity. The validators in this study were three expert lecturers in the mathematics education study program. The results showed that the module developed was included in the very high validity category with an average score of 72 based on the assessment of 3 aspects, namely language, appearance, and content. The score for each aspect is included in the very high validity category, namely the language aspect of 17.67; display aspect of 18.67; and content aspects of 35.67.

Scope: Innovative Mathematics Teaching and Learning

[IMT18]
Gemstones Ethnomathematics Based Electronic Student Worksheets

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Abstract. This study aims to develop gemstones ethnomathematics based electronic student worksheets on mixed arithmetic operations for grade IV elementary schools and determine the level of students' ability to solve story questions. The design of this research is research and development, which refers to the 4D development procedure. The trial was conducted on 14 students collecting data through documentation and tests, while the data analysis technique used descriptive quantitative. The results showed that the e-student worksheet story questions based on gemstone ethnomathematics were valid and feasible to use. Besides that, based on the trial results, it showed that students' ability to solve story questions was in the high category. Based on these results, the e-student worksheet can be used as alternative teaching material during online learning. It can be used to improve students' ability to solve story questions, and at the same time, bring students closer to local culture.

Scope: Innovative Mathematics Teaching and Learning

[IMT19]
The Influence of Inquiry Learning Model on Student's Mathematics Learning Outcomes

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Abstract. This research reviews several article of the influence of the inquiry learning model on student's mathematics learning outcomes. Literature review is research methode, which consists of selection criteria, research procedure, and analysis. The research subjects were junior high school to college student. The application of inquiry learning includes six steps that are orientation, formulate the problem, formulate the hyphothesis, collecting data, testing hyphothesis, and formulate the conclusions. The steps that have the most positive influence an ability are formulating problems and formulating hypothesis. The developed abilities consist of cognitive, affective, and psychomotor aspects. Futhermore, this research can help teachers optimize learning activities so that student's mathematics learning outcomes are satisfactory, because teachers can find out which steps are best developed in an ability.

Scope: Innovative Mathematics Teaching and Learning

[IMT20]
The Effect of LMS Schoology Assisted Reciprocal Teaching on Students' Self-Efficacy in Learning Mathematics

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Abstract. This study aims to determine the effect of the LMS Schoology-assisted Reciprocal Teaching model on students' self-efficacy in learning mathematics. This research is a quasi-experimental study with a population of 276 students of class VIII SMP Negeri 1 Yogyakarta in the academic year 2020/2021. The sample in this study consisted of two randomly selected classes, namely class VIII C as the experiment group and VIII B as the control group. The instrument used in this study was a student self-efficacy questionnaire in learning mathematics. Instrument data were analyzed using the *Independent Sample t-Test* to determine the effect of LMS Schoology-assisted Reciprocal Teaching on students' self-efficacy. The results showed that the Reciprocal Teaching model assisted by LMS Schoology affected students' self-efficacy. The impact is known from the output of hypothesis testing, which shows the value of Sig.(2-tailed) > α, which is 0.042 < 0.05, and the value of $t_{count} > t_{table}$, which is 2.704 > 1.668, where the average score obtained by the experiment group is superior to the control group.

Scope: Innovative Mathematics Teaching and Learning

[IMT21]
Didactical Design of Mathematics Learning in Reducing Learning Obstacle of Studets

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Abstract. Learning barriers are difficulties, obstacles, and everything that can slow down or even fail students in achieving learning goals. In the process of learning mathematics that has been carried out, most students experience learning barriers in learning mathematics in a meaningful way. This article reports on the solution to the learning barriers experienced by students, namely in the form of making a didactic design that is carefully designed and implemented well for learning mathematics. Mathematical didactic design is a mathematical learning design created through three phases considering all the aspects involved. Based on research from several references, it is obtained that there are three phases in designing mathematics learning. The first phase is planning. In this stage, the teacher makes a plan by conducting a Pedagogical Didactic Analysis, taking into account the didactic situation, pedagogical situation, learning barriers, content characteristics, differentiated instruction, and learning trajectories that will be applied. The learning trajectory built must contain abstractions, formulations, and validations for students in learning mathematics. The second phase is to do. In this stage, the teacher applies the plan that has been made and performs a metapedadic analysis. Metapedadic analysis is flexible, coherent, and unified by taking into account the environment created. The third phase is to see. In this last stage, the teacher evaluates and reflects on the plans that have been implemented. In addition, the teacher creates a new design by applying the tacit pedagogical or didactical knowledge obtained in the second phase. Finally, a new didactic design will be formed that will be optimal in achieving learning objectives, by reducing student learning barriers. Therefore, it can be concluded that in the planning phase, the teacher needs to take into account the pedagogical or didactic situations, didactic/epistemological barriers, differentiated instructions, and content characteristics. In the do phase, the teacher must pay attention to the environment formed by conducting a flexible, coherent, and unified analysis. In the third phase, the teacher's tacit pedagogical or didactical knowledge must be applied to obtain a modified learning trajectory containing improvements from the previous hypothetical learning trajectory.

Scope: Innovative Mathematics Teaching and Learning

[IMT22]
Learning Mathematis with a Contextual Approach on Online Learning

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Abstract. Learning with a contextual approach is carried out by paying attention to student abilities, learning support tools, situations and conditions, and paying attention to the learning objectives to be achieved. The contextual approach makes it easier for students to connect the material presented to their knowledge of real problems in everyday life. Students will get used to applying real conditions in learning mathematics. The application of a contextual approach was online learning which is expected to improve understanding of mathematical concepts. In the COVID-19 pandemic situation, learning was carried out online so that teachers and students must be able to determine and choose an approach that is suitable for learning mathematics. The purpose of this study was to see how the process of learning mathematics with a contextual approach on online learning provides an innovation for the phenomena found. The methodology in this study was quantitative descriptive. The subjects of this study were seventh grade students in one of the private junior high schools in Medan, North Sumatra, Indonesia. The results of the study increased students' learning motivation and students' activeness because they looked for mathematical problems and found solutions which are associated with everyday life. The process of learning mathematics with a contextual approach makes it easier for students to understand mathematical concepts. The scores of learning outcomes carried out by providing exercises at the end of each meeting showed an increase. The average value of learning outcomes for each first meeting was 72, 332%, the second meeting 86.16%, and the third meeting 76.16%. There were also obstacles found in the research process as follows: Limited time and place, Internet network, owned private online facilities, and less active students in the process of learning mathematics. A contextual approach during the pandemic-19 provides new innovations for students and teachers. So that it can increase student learning motivation and student activity because they search for mathematical problems and find solutions that associated with everyday life. Students are asked to be very independent to understand the mathematical content that has been delivered.

Scope: Innovative Mathematics Teaching and Learning

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[IMT23]
How to Create Isomorphic Problems in Proportion

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Abstract. The concepts in mathematics will be easily understood through examples of learning especially for students who are still confused when solving problems with different contexts, for example, the concepts between direct proportion and inverse proportion is often inverted. Learning by the isomorphic problem can facilitate students to be able to distinguish concepts correctly because isomorphism produces examples of problems that are interrelated, compound, and build mutual understanding from different contexts. Examples of isomorphic problems are various problems that have the same concept of resolution but different context of the problem. These problems lead to problem-solving so that understanding of concepts is deep, facilitating student's understanding in analyzing, identifying principles, and distinguish relevant information. Isomorphic problems in proportion are created in a context known to students, orientation to understanding mathematical concepts, focusing on the quantity involved and the value of their change. The contexts that can be used are related to the amount of money to the number of goods purchased, speed and travel time or work time, distance on the map and actual distance, the number of items in a container, and other relevance daily life contexts.

Scope: Innovative Mathematics Teaching and Learning

[IMT24]

Adversity Quotient-Based Mathematical Reasoning Ability in Geometry Learning Through Virtual Realistic Approaches at the Mathematics Department, FMIPA, State University of Medan

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Abstract.

This research aims to describe the ability of mathematical reasoning based on students' adversity quotient in geometry learning through a virtual realistic approach in the mathematics department of the Mathematics and Natural Sciences Faculty of the State University of Medan. The implementation of the research is virtual, that is, starting with presenting the learning rules and Semester Learning Plans that contain learning achievements and lecture materials on the SIPDA web account (Online Learning System), which is used. In the learning process through a realistic approach, it begins by providing problems in the form of challenges related to the learning topics to be discussed. Then, with the time allotted, students solve the problems given and at the same time upload them via SIPDA, then the lecturer comments on the student's answers in class discussion. At the 4th meeting, students were given a mathematical reasoning test and a questionnaire about the students' struggle to learn geometry. Through the results of an inferential statistical analysis of the data collected through reasoning tests and adversity quotient questionnaires, it was found that there was no interaction between learning and adversity quotient. So it was concluded that the increase in students' mathematical reasoning abilities was directly proportional to the students' adversity quotient in learning geometry through a virtual realistic approach. So, in improving students' mathematical reasoning skills through a realistic online approach, there is no need to classify students based on their adversity quotient.

Keywords : reasoning, adversity quotient, approach, realistic, geometry, virtual.

Scope: Innovative Mathematics Teaching and Learning

[IMT25]
The Effect of Creative Problem Solving Learning on Students' Creative Thinking Ability and Mathematical Disposition

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Abstract. This study aimed to examined and described the effect of Creative Problem Solving on students' creative thinking and mathematical disposition. This study is a quasi-experiment with non-equivalent pretest-posttest control group design. The population of this study was all eight-grades of SMP Negeri 1 Yogyakarta in the academic year 2020/2021. Based on the population, two classes were selected randomly as a sample. Class VIII E as the experiment class taught using Creative Problem Solving and class VIII D as the control class taught using Scientific approach. The data was collected using tests of creative thinking and questionnaire of mathematical disposition. Data were analyzed descriptively and inferentially ($\alpha = 0.05$). The effect of CPS learning was tested using Manova Hotelling's T^2 test. The result indicates that there was no effect of Creative Problem Solving Learning towards students' creative thinking and mathematical disposition on flat-sided space material at SMP 1 Yogyakarta.

Scope: Innovative Mathematics Teaching and Learning

[IMT26]
Multi-step Word Problem in Quadratic Equations to Facilitate Student's Mathematical Reasoning Ability

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Abstract. In mathematics learning, students' ability to face word problems related to mathematics in quadratic equation is still considered lacking. There are many influencing factors, one of which is the inaccuracy in teaching the students how to evaluate and look for problems in word problems in a good and efficient way. Literature reviews were carried out on "Learning Mathematical Rules with Reasoning" and "An Analysis of Errors and Misconceptions in the Study of Quadratic Equations." Related publications were also analyzed to figure out whether they contain mathematical reasoning abilities and problems in solving word problems. The study shows that reasoning skills are needed to represent the problems given. Strong reasoning abilities are necessary to solve logical and systematic mathematical problems. Therefore, in mathematics learning, especially in solving word problems, it is better to start teaching students to utilize the working forward approach to improve their mathematical reasoning skills in solving word problems and correlating them to real life.

Scope: Innovative Mathematics Teaching and Learning

[PED01]
The Effectiveness of PhET-Assisted Student Worksheets to Improve Students Conceptual Understanding

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Abstract. The ability of students to understand the concept of physics is very important in the process of learning physics. This study is a research and development method with a 4-D model. Based on the results of the study, it shows that the average pretest score in the modeling class is 30.21 and the average posttest score of students is 39.17, and the improved value (N-gain) is 0.13. Then in the implementation class, it was found that the average pretest score of students was 23.16 and the average posttest score was 33.51, and the improved value (N-gain) was 0.14. These results indicate that the understanding of the concepts of students in both classes on simple harmonic motion material has increased but in the low category. The low understanding of students' concepts is caused because most students still experience problems and find difficulties in the process of understanding simple harmonic motion material. Students who are less active during the learning process cause students' difficulties to not be resolved. In addition, most of the students still have difficulty in doing practicum using phet simulation media. Phet simulation media is a new thing for students. In this article, it is presented about the effect of using phet-assisted worksheets on improving students' understanding of concepts in simple harmonic motion material.

Scope: Physics Education

[PED02]
Development of CRI-Based E-Diagnostic Test to Identify Conceptual Misconceptions in Simple Harmonic Motion

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Abstract. This article discusses the development of an e-diagnostic test based on the Certainty of Response Index (CRI) with the help of Google Forms as a media for question sheets and answer sheets. The data described in the form of the validity of the test instrument and the results of the identification of the misconception profile of students on the material of simple harmonic motion. The type of research used is Research and Development (R&D). The research subjects used were 10th grade students of Al Irsyad Al Islamiyyah Integrated Islamic High School Purwokerto. Data collection methods used in the study were observation, interviews, documentation, and tests. The developed E-Diagnostic Test consists of questions with 1 answer choice, 4 distractor choices, and 6 levels of confidence to answer. In detail, the products developed are grids, instructions for working on questions, test questions, answer keys, discussions, scoring guidelines, and data interpretation guidelines. The validity test was carried out by 2 experts and 4 colleagues with the results of the test instrument being developed that was feasible to use. The results of the identification of misconceptions show that an average of 17% of students still experience misconceptions in the simple harmonic motion material.

Scope: Physics Education

[PED03]
Effectiveness of Physics E-Book For Improving Concepts Understanding of Students

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Abstract. The purpose of this study was to see the effectiveness of the development of physics e-books in increasing students' understanding of concepts. The research method used is Research and Development (R&D). The instruments used are pretest and posttest to see students' understanding of concepts. This research was conducted at Senior High School for the academic year 2021/2022 on sound waves. The subjects of this study were students of class XI of Senior High School. This research consisted of two stages, namely treatment by applying the peer tutor model (Implementation) and teaching by using a direct learning model (Modeling). The average pretest score of students' conceptual understanding using descriptive statistical analysis was 55% which was categorized as quite effective, while the posttest average of concept understanding was 75.2% which was categorized as effective. So it can be concluded that there are differences in understanding the concept before and after learning with the given innovation. The results of the research analysis show that this physics e-book can be developed for interactive independent learning.

Scope: Physics Education

[PED04]
Computer-Based Reasoned Multiple-Choice Test to Identify Critical Thinking Skills in Impulse and Momentum Instrument

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Abstract. The development of critical thinking test instrument research in reasoned multiple-choice questions using google apps as computer-based test, that was aimed to know the eligibility of a test instrument based on the validation results and empirical evidence. The test instrument consists of 15 items with critical thinking indicators. Students from 2 classes of X MIPA were involved as the empirical research subjects, while the instrument was validated by a teacher as the expert and also two peers as the practitioners. The data collected from the empirical test were analyzed using Quest programme to find the reliability, difficulty level, validity, and compatibility of the items model. The results found that all of the items were valid based on the 3 raters with some revision. Based on the empirical test results, all items were found compatible with the model by 0.98±0.27. Furthermore, the mean scores of the instrument was 0.00±0.53 indicating good item difficulty. Meanwhile, for the reliability level, it was poor by having 0.00 reliability index due to 6 out of 15 items which were not fit. Hence, it needs to be revised based on items' material, construction, and language.

Scope: Physics Education

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[PED05]
EFFECT OF e-PjBL LEARNING MODEL ASSISTED BY STUDENT WORKSHEETS TO IMPROVE CRITICAL THINKING ABILITY OF SMK STUDENTS

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Abstract. This study aims to improve the critical thinking skills of students of class X Multimedia at SMK Tamansiswa Jetis Yogyakarta. The method used in this study is the ADDIE development model from Branch (2009). The results showed that the use of the e-PjBL learning model in physics learning could improve students' critical thinking skills. This can be seen from the pre-test and post-test scores which were then analyzed using the Independent-t-test.

Scope: Physics Education

[PED06]
The Effect of Using Truth or Dare Card Media Assisted by Physics Spinning Wheel on Physics Cognitive Learning Output and Learning Interest

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Abstract. The study attempts to: (1) find the effect of using the Truth or Dare card assisted by *Physics Spinning Wheel* on physics learning Output. (2) find the effect of using the Truth or Dare card assisted by *Physics Spinning Wheel* on learning interest. The population in this study all students of class X MIPA MAN 3 Sleman. The samples consisted of 25 students from class X MIPA 1 and 25 students from class X MIPA 4 using cluster random sampling techniques. The research design used quasi experimental design with a nonequivalent control group design. The research instrument has been through the validation by expert judgement, Physics Education lecturer in FMIPA UNY and the practicioner validator, a physics teacher from MAN 3 Sleman. Physics learning Output are measured by pretest and posttest in the form of multiple choice question. This research result indicates that: (1) Found an effect of using Truth or Dare card assisted by Physics Spinning Wheel on physics learning Output the score of 0,58 with gain in medium category (2) Found an effect of using Truth or Dare card assisted by Physics Spinning Wheel on learnin of interest the score of 0,15 with gain in medium category.

Scope: Physics Education

[PED07]
Development of the E-Guided Inquiry Model for Student Worksheets (LKPD) for Business and Energy Materials Improving the Scientific Attitude of Class X High School Students

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Abstract. The research carried out is a research that implements student worksheets (LKPD) with the e-guided inquiry model on the business and energy materials of class X students. This research aims to determine whether the use of the LKPD class X SMA based on the e-guided inquiry model can improve students' scientific attitude. The subjects of this study were students of class X MIA 2 for the implementation class and students of class X MIA 3 for the modeling class. Based on the results of observations and research, it shows that learning with LKPD developed by students can improve students' scientific attitudes.

Scope: Physics Education

[PED08]
The Development of Physics E-Book Based on Contextual Teaching and Learning to Increase Student Problem-Solving Skill

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Abstract. This article reports the results of research on the development of a physics e-book based on contextual teaching and learning to improve problem solving skills of high school students. The subjects in this study were 17 students of class X science class and 26 students of class X social class at one of senior highschool in Yogyakarta as the implementation class and modeling class. This research is a development research with a quantitative approach. The results of this study indicate that the development of a physics e-book based on contextual teaching and learning on simple harmonic vibration material is feasible in terms of expert validation results where the average total validation score is 3.75 with a very high category. The use of e-book Physics learning media based on contextual teaching and learning in the learning process is able to have a significant influence on improving the problem-solving abilities of students both in the modeling class and the implementation class, which is indicated by the value of sig. (2-tailed) of 0.00 both for modeling and implementation classes which are smaller than the alpha value of 0.05.

Scope: Physics Education

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[PED09]
Implementation of Peer Teaching in Physics Learning During Covid-19

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Abstract. Covid-19 has spread widely throughout Indonesia and has affected all aspects of life, especially in the field of education. These conditions require everyone involved in the realm of education to be able to adapt and innovate so that learning can take place. This study aims to determine the application of the ebook-assisted peer teaching method in improving students' understanding of concepts in sound wave physics learning during the covid-19 period. This type of research is pre-experimental research by applying a qualitative approach. The research data was obtained from the results of observations and tests with the research subjects of class XI Science Program in Senior High School, West Sumatra. The results showed that students' understanding of concepts increased by using the ebook-assisted peer teaching method during the covid-19 period. This can be seen in the test results of students who reached an average of 57.57, much higher than the test results of students who only reached an average of 28.78. With details, there are 32 students who have post test scores higher than pre test scores, and only one student who has the same pretest and post test scores. It can be said that the application of ebook-assisted peer teaching methods in physics learning during the COVID-19 pandemic can improve students' understanding of concepts.

Scope: Physics Education

[PED10]
The Development of Physics E-Book Based on Contextual Teaching and Learning to Improve Students Mathematical Representation Skill

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Abstract. This research aims to produce an integrated physics e-book based on contextual teaching and learning models that are feasible to be developed in physics learning on simple harmonic vibration material and to improve students mathematical representation skill. This research is research and development with 4D model (define, design, develop and desiminate). The design of this research used pre-experimental with one group pretest-posttest. The samples of this research were students of class X Natural Sciences as a limited test class and students of class X Social Sciences with Interest in Physics as a broad test class at one of the Senior High School in Special Region of Yogyakarta. The result of this research is the development of an integrated physics electronic book with contextual teaching and learning models on simple harmonic vibration topic suitable for use in physics learning with an average value of 3.75 in the very good category. In addition, the use of electronic book media can improve students mathematical representation skill with a normalized gain value in the limited test class of 0.46 (medium category) and in the broad test class of 0.72 (high category). This research can be used as an alternative in implementing online and offline learning in schools.

Scope: Physics Education

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[PED11]
Analyzing Students Participation to Carrying Out Scientific Approach Stages Using Diffraction and Polarization E-Book

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Abstract. Practical media is needed during The Covid-19 pandemic. This learning media should be used to maintain the students learning process. This study aims to analyze the level of student participation in the stages of a scientific approach through an android-based E-book. Following the 4D model during media development, a total of 3 experts were involved in validating the diffraction and polarization E-book. The E-book contains videos and animations to observe, questions links to accommodate the stages of asking questions, student worksheets to accommodate the stages of trying and reasoning, PhET Simulation, communicating links to accommodate the stages of communicating, simple evaluation, and quiz. The participation rate was obtained from a total of 27 students at 11th grade in Mojokerto, East Java, Indonesia. The results show that the diffraction and polarization E-Book are feasible to use and are in the very good category. All students complete the stages of observing, asking, and trying. Students can reason well through the experiments that have been carried out. Unfortunately, the level of student participation in the communicating stage is not good. They felt has been communicated what they understand through writing down in the worksheet, so they didn't fill the communicating link.

Scope: Physics Education

[PED12]
APPLICATION OF PHSYICS CROSSWORD ASSISTED E-BOOK MEDIA ON LEARNING INTEREST

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ABSTRACT: In the use of media in learning physics to help students understand the concept of physics. One of the media that can be used is physics crossword. This research is to find out the effectiveness of the use of interest in learning. The indicators used to measure interest in learning are interest in learning, attention in learning, motivation to learn and knowledge. Based on the analysis, the results obtained that interest in learning has a significant influence on learning outcomes. Thus it can be concluded that student learning outcomes can be improved through increasing student interest in learning. This means that the better students' interest in learning will have an impact on student learning outcomes that are getting better.

Scope: Physics Education

[PED13]
Development of Electronic-Based Physics Worksheets with SETS (Science, Environtment, Technology, And Society) Approach to Improve High School Students' Literacy Skills

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Abstract. This study aims to determine the effect of using electronic-based worksheets with the SETS approach to improve the scientific literacy of high school students on sound wave material during the COVID-19 pandemic. This type of research is a one group pretest-posttest design. The research population was 34 high school students in class XI. The indicators of scientific literacy ability measured are 1) describing scientific phenomena and utilizing the value of science, 2) studying, designing, and evaluating problems with scientific investigations, and 3) interpreting data and evidence scientifically to make decisions. Assessment of scientific literacy ability is obtained by giving questions. description. Based on the research results, the average pretest score is 22.4. Meanwhile, the posttest average value is 72.23 and it is known that the N gain value is 0.63, which is in the category quite effective for improving scientific literacy skills.

Scope: Physics Education

[PED14]
The Role of Experimental Method Towards Graph and Table Comprehension of Physics Experiment on Students SMA Negeri 12 Makassar

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Abstract. This study is a pre-experiment aimed to determine the skill to understand the graph and table physics experiments as well as to determine whether the understanding graphs and tables of students after being taught by using the experimental method can reach 75% of the ideal score. The design used is The One-Shut Case Study. The independent variables in this study are an experimental method, while the dependent variable is the understanding graph and table physics experiments. Data were obtained by providing post-test were analyzed by descriptive and hypothesis testing. Based on the results of descriptive analysis obtained an average skill to translate the graph in enough categories and tables in the category of very high skill to interpret the graph in lower categories and tables in the low category, as well as the skill clicking extrapolation chart at very high category and tables on the very high category. The results of the analysis of hypothesis testing showed that on average the graphs and tables comprehension of experimental physics on students do not achieve at least 75% of the ideal score on a real level of $\alpha = 0.05$.

Scope: Physics Education

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[PED15]
The Effect of Use of Student Worksheets Based on PjBL to Increase Learning Interest in Class X Students in Vocational High School

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Abstract. This study aims to determine student interest in learning after using student worksheet on AC power material for class X Multimedia At a school in Yogyakarta. The method used in this research is the true experiment method. The analysis was carried out using descriptive analysis to see the differences in students' interest in learning in the control class and the implementation class. The results of the data analysis were normally distributed data. This can be seen from the significance value in the experimental class 0.06 and the control class 0.20 which has a value greater than 0.05 then Ho is rejected so that the data is normally distributed. Then calculate the results of the student learning interest questionnaire using the Independent-T Test, data obtained that there is no significant difference to the interest questionnaire, this is indicated by the significance value in the sig. (2-tailed) column which is greater than 0.05, namely 0.808. so that both the control and experimental classes were given the same treatment, there was no difference in students' interest in learning, which means that both the control class and the implementation class increased their learning interest after being given student worksheet in learning.

Scope: Physics Education

[PED16]

[PED17]
The Effect of Augmented Reality Technology on Learning Achievement and Attitudes Toward Physics Education

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Abstract. Augmented Reality (AR) is one of the developed new technologies which has been popular in recent years due to its contributions to the field of education. The Augmented Reality Technology was designed physics course and it was aimed to determine the impact of augmented reality (AR) technology on learning achievement and attitude towards physics education. This study employs quasi-experimental design which intact classrooms at two different 10th grade high school students were randomly assigned to either the experimental or control group. The experimental group completed the "Keppler's Law" module in physics course using AR technology, while the control group completed the same module using textbooks. Among others, it is concluded that students in the experimental group have higher levels of learning achievements and more positive attitudes towards the course than those in the control group.

Scope: Physics Education

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[PED18]
Development of Physics Worksheet with Discovery Learning-STEM to Improve Student Problem Solving Skills

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Abstract. This paper aims to develop a student worksheet with discovery learning-STEM model on dynamic electric material to build on the problem-solving skills of students in YAPPI Wonosari Vocational High school. The method used is R&D with a 4-D model (Define, Design, Develop, and Disseminate). The instruments used include validation sheets and tests. Data in the form of feasibility of physics worksheet to improve students' problem-solving skills. Data collection methods used inside this study contains expert validation, observation, pre-test, and post-test. The data analysis using the sign test. The results showed that, 1) the development of student worksheets with discovery learning-STEM on dynamic electric material was feasible in terms of the validation results. This can be seen from the results of validation that show the feasibility of physics worksheets for improving problem-solving skills is in the very good category and 2) the effectiveness of using physics worksheets with discovery learning-STEM based on data obtained from the pretest and posttest results can improve problem solving skills as a problem in the implementation class. Thus, student worksheet developed with discovery learning STEM is suitable for improving problem solving skills.

Scope: Physics Education

[PED19]
STEM-PBL with Integration of Local Wisdom in Physics Learning: Teachers' Perspective

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Abstract. This study aimed to describe teachers' perceptions of physics learning based on STEM-PBL integrated with local wisdom. Participants involved in this study were 63 physics teachers consisting of 43 women and 20 men. This was a survey study. Participants were selected by purposive sampling technique. Teachers were selected based on the criteria of educational background, gender, and the duration of teaching. The research instrument used was a questionnaire consisting of 17 questions on a Likert scale with a scale of 0–4 representing strongly disagree to strongly agree and two descriptive questions. The data analysis showed that physics teachers had positive perception on the application of STEM-PBL with integration of local wisdom in physics learning in the classroom. The main constraints that the teachers has to encounter was related to the difficulty of connecting local wisdom with physics material. There is a need for appropriate teaching materials and the fact that most students do not know local wisdom in the local area. The teacher's suggestions related to the implementation of STEM-PBL with the integration of local wisdom include: appropriate teaching materials were needed, the teacher was more in-depth about local wisdom, the introduction of local wisdom that needed to be given to students and the need to integrate the material with problems in everyday life.

Scope: Physics Education

[PED20]
Exploring the Effect of Problem-Solving Laboratory on Computational Thinking Skills in Physics Class

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Abstract. Computational thinking ability is a new framework of thinking that belongs to the hybrid modes of thinking. This study aims to examine the effect of the problem-solving laboratory learning model and gender in training computational thinking skills. The completeness of learning is attempted by designing an experimental model using smartphone sensors as a solution for implementing independent experimental activities during the COVID 19 pandemic. This study was conducted in two XI IPA classes at SMA N 1 Sikur with a post-test-only control group design. Data were collected using google form which consisted of 12 mixed essays and multiple-choice questions representing 7 indicators of computational thinking ability. Data on the results of students' abilities were analyzed using ANOVA to identify the influence of the learning model and gender. The results of the study show that there is a significant difference between the experimental class using the problem-solving laboratory model and the control class using the regular model. The results of the statistical test showed a significance of 0.00 ($p < 0.05$) with a large effect size of 0.237. On the other hand, the results of the study show that there is no interference from the gender on computational thinking skills with a significant value of 0.077 ($p > 0.05$) and an effect size of 0.025. The results of this study are expected to be a reference in training computational thinking skills, especially in learning physics. The results of the study are also expected to be able to encourage teachers to be able to plan smartphone-assisted experimental activities as an alternative to independent experiments during the pandemic.

Scope: Physics Education

[PED21]
The Development of Augmented Reality 2-Dimensional Integrated Physics E-Book to Improve Problem Solving Ability

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Abstract. This study aims to determine the problem solving abilities of students after learning using an integrated e-book of augmented reality optical instrument material in the classroom. Data collection techniques consist of tests, questionnaires, observations, and documentation using instruments that support these techniques. Data were analyzed quantitative based on the results of the validation and analysis of the pretest and posttest items. The results showed: (1) E-book integrated augmented reality is feasible based on the results of the validation using Aiken *V* conducted by the validator with a very high category. The validation value obtained is 0.92. (2) The lesson plan instrument prepared is suitable for use based on the results of the validation using Aiken *V* carried out by the lesson plan validator with a very high category. The validation value obtained for the lesson plan is 0.95. (3) The developed problem-solving ability test is feasible based on the results of expert validation with the very high Aiken *V* category. The validation value obtained for the pretest is 0.89 and the validation value obtained for the posttest is 0.91. (4) Improved problem solving abilities were analyzed using N-gain. The increase in problem-solving abilities obtained a value of 0.8 in the high category.

Scope: Physics Education

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[PED22]
[PED14]AN EIGHT-CATEGORY PARTIAL CREDIT MODEL AS VERY APPROPRIATE FOR FOUR-TIER DIAGNOSTIC TEST SCORING IN PHYSICS LEARNING

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Abstract. There have been many two or three tier diagnostic tests with classical test theory, in this study a four tier diagnostic test was developed which was analyzed using item response theory. This study aims (i) to find the instrument construct of the Four Tier Diagnostic Test (FTDT), (ii) to design the FTDT scoring model, (iii) Identify the characteristics of the instrument. This FTDT development model uses a 4D model. The instrument used is a four-tier diagnostic test, totaling 80 items with 5 anchor items which are divided into several questions packages. The test subjects used were 300 first grade high school students in Yogyakarta Province. The FTDT content validity test involved 7 validators and analyzed using Aiken's V. The validity is proven by the FTDT items fit with the Partial Credit Model (PCM). The analysis used is descriptive analysis and item characteristics with the PCM approach to obtain reliability estimates, difficulty level's item estimates (b_i) and participants' ability estimates (θ) to determine the test information function value. Then, comparing the results of the weighting of 8 categories with 16 categories. The results show that (i) The FTDT construction consists of 4 tiers consisting of: questions, level of confidence in answering questions, reasons and level of confidence in choosing reasons totaling 25 questions with 5 anchor items based on 4 aspects and 5 sub-aspects, contains senior high school of physics topics for first class 2nd Semester which is used to measure students' conceptual understanding of physics (ii) the Four Tier Diagnostic Test (FTDT) scoring system is categorized into 8 categories more suitable than 16 categories, (iii) The overall FTDT items fit the PCM model and the items has a difficulty level in the range between -2, 0 to 2.0, indicating that the scoring system between 0 and 7 accurately distributes normal symmetrical difficulty level ranging from low to high difficulty. This FTDT is actually able to explore and diagnose the weaknesses and misconceptions of students more deeply and can be used as a reference to determine the causes of misconceptions, as well as a reference for determining learning in learning to reduce students' misconceptions. In addition, these results are expected to contribute to the scoring of four-tier format test instruments in the field of physics.

Scope: Physics Education

[PED23]
The Development of Augmented Reality 2D Integrated Physics E-Worksheet to Improve Mathematical Representation Ability

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Abstract. This research aimed to produce an integrated 2D augmented reality physics e-worksheet that is feasible to be developed in physics learning on momentum and impulse material and to improve student's mathematical representation ability. This is a research and development (R&D) with a 4D model (define, design, develop, and disseminate) method. Sampling in this study were students of class X MIPA 5 (as a limited test class) and X MIPA 3 (as broad test class) at SMAN 1 Sedayu. The conclusion of this research is that learning physics using the integrated Augmented Reality 2D physics e-worksheet media is feasible to be developed based on the results of the validation carried out with a value of 4.3 in the very good category and can improve student's mathematical representation ability by the normalized gain value in the limited test class of 0.62 (medium category) and in the broad test class of 0.71 (high category). This finding is an alternative learning media that is feasible to use in distance learning conditions and can also be used in face-to-face learning.

Scope: Physics Education

[PED24]
Enhancing Scientific Literacy and Analytical Thinking Skills Using Problem Based Learning Model in Physics

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Abstract. Learning Physics is a process to develop scientific literacy and analytical thinking skills according to the demands of the 21st century. Various physics learning methods can be applied, such as problem-based learning (PBL) and cooperative learning (CL). This research determined the differences in student's scientific literacy and analytical thinking skills in physics learning between students who learn with PBL and CL models and find out which learning models are better for improving student's scientific literacy and analytical thinking skills in physics learning. This research was experimental research. The sampling technique used in this study was cluster random sampling to determine the experimental and the control classes. The design in this research was a pretest-posttest. The data collected were scientific literacy and analytical thinking skills. The results were analyzed using multivariate statistical analysis MANOVA with a significance level of 0.05. The study showed significant differences (sig. (2 tailed) <0.05) in the student's scientific literacy and analytical thinking skills in physics learning between students who used the PBL model and those who used the CL. This study also shows that PBL model with gain score 0.30 was better than the CL with gain score 0.11 to improve students' scientific literacy. In analytical thinking skills, the PBL model with gain score 0.40 was also better than the CL model with gain score 0.31 to improve students' scientific literacy.

[PED25]
Development of Optics Virtual Lab With Discovery Learning Approach Using Unity 3D for Visual Science Literacy and Physics Conceptual Understanding

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Abstract. This study goals to: (1) Produce interactive learning media based on virtual lab applications that is worth for use in class XI learning on the subject of optics, (2) find out how much increase of visual science literacy of grade XI students in Class on the subject of optics by using virtual lab application with a discovery learning approach, and (3) find out how much increase of conceptual understanding of grade XI student in class on the subject of optics by using virtual lab application with a discovery learning. This research is a development research with a 4D model design consisting of define, design, develop and disseminate. The subject of this study was students of grade XI MIPA on second semester SMA N 1 Godean in Academic Year 2020/2021. Define step to perform needs analysis such as analyzing the condition of the school environment, students, curriculum, and learning objectives. The design step of the researchers made a product design of virtual learning media lab optical tools and research instruments. The development step is carried out validation of research products and instruments until conducting limited trials. Desiminate step, researchers disseminate products that have been made through the website. The results obtained indicate that: 1) learning media in the form of virtual optical lab tools with a discovery learning approach using 3D Unity are feasible, 2) virtual lab optical tools media can improve the scientific literacy of high school students in class XI with moderate categories, and 3) virtual optical instrument practicum media can improve students' conceptual understanding on optical instrument material, sub-materials of reflection and refraction with high categories.

Scope: Physics Education

[PED26]
The Development of Diagnostic Test Instrument to Identify Physics Conceptual Understanding of High School Students

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Abstract. Learning quality can be observed from the quality of the assessment. One type of the assessment that educators can use is diagnostic test. This study aims to develop a diagnostic test instrument that could be used to identify the conceptual understanding of high school students in physics subjects with the topic of Doppler Effect and Sound Intensity Level. This is a research and development (R&D) type with a 4D model (define, design, develop, disseminate). The research subjects were high school students in class XI MIPA in SMAN 3 Solok who had received lessons on sound waves. The data collection technique used is an ordinary multiple choice test instrument. The test results were analyzed quantitatively and qualitatively using Item Response Theory (IRT). According to the content validity using Aiken's V equation, this instrument was declared to be valid with very good criteria. All items in the instrument were valid based on the Rasch, INFIT MNSQ, and INFIT *t* models. The diagnostic test instrument has also been relied upon based on the reliability of the estimated items, so that it can be used to diagnose and determine the profile of students' conceptual understanding. Thus, the instrument has fulfilled the test characteristics that are feasible of its content, empirical evidence, validity, and reliability. In addition, the results of this conceptual understanding profile are expected to be one of the information for teachers in order to overcome students' difficulties and arrange appropriate learning strategies during the learning process.

Scope: Physics Education

[PED27]
The Impact of Problem Solving Laboratory in Physics Learning to Improve Students' Science Literacy Ability

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Abstract. The limitations of practical learning during the covid-19 pandemic make students unable to carry out experimental activities. This study aims to determine the effectiveness of physics learning activities based on the Problem Solving Laboratory (PSL) practicum on the concept of sound intensity level on students' scientific literacy skills. The implementation of learning is carried out by referring to the syntax of the PBL model using the help of Worksheet based on the Problem Solving Laboratory. The data in this study were collected using observation sheets, pretest, and post-test. Observation sheet data is used as an indicator of learning implementation, which is analyzed using an assessment rubric. The pretest and post-test data were analyzed using the gain test (N-gain) and statistical tests, which were used as indicators of increasing students' scientific literacy. The results showed an increase in learning implementation in the excellent category with an N-gain value of 0.29 and an effect size value of 1.69 with a high interpretation. Thus, the implementation of Problem Solving Laboratory-based physics learning is able to make a high contribution to increasing students' scientific literacy skills.

Scope: Physics Education

[PED28]
Metal Cu Absorption in Artificial Waste Cu (SO4) Using Electrocoagulation Method

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Abstract. This paper reports the efforts made to reduce copper levels in artificial waste using the electrocoagulation method as an alternative to copper waste management in liquid substances. The electrodes we use are made of two zinc plates with a size of 5cm x 20cm with a distance of 8cm between electrodes installed at a voltage of 12 volts. The sample used was artificial (CuSO4) waste with different solution concentrations, namely 0.2 M and 0.4 M with variations in reduction time. Analysis of copper (Cu) content using AAS (*Atomic Absorption Spectroscopy*). The results showed that the greatest absorption occurred at 60 minutes where the concentration of 0.2 M occurred by a reduction of copper metal by 36.83% and at a concentration of 0.4 M there was a reduction of copper metal by 33.10%. The results showed that the use of electrocoagulation method for copper metal absorption in wastewater was quite effective.

Scope: Physics Education

[PED29]

DEVELOPMENT OF PBL BASED E-WORKSHEET ASSISTED BY VIRTUAL LAB TO ENHANCE\ CRITICAL THINKING SKILLS AND LEARNING INTEREST OF HIGH SCHOOL STUDENT

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Abstract. This study aims to: (1) develop an electronic student worksheet based on problem based learning assisted by virtual lab to improve critical thinking ability and learning interest of highschool student in projectile motion, (2) find out differences in the improvement of critical thinking skills and student interest in learning between experiment classes with electronic student worksheet and control classes with presentation, (3) effectiveness of electronic student worksheet based on problem based learning assisted by virtual lab to improve critical thinking ability and learning interest in projectile motion high school. It employed a Research and Development design with 4D model. The steps are *define, design, develop, disseminate*. The population in this study were students of class X from SMA N 1 Banyumas. Sampling in this study using simple random sampling and obtained by the students of grade X IPA 1 as experimental class and the grade X IPA 4 as contol class. The data collection instruments used were in the form of pretest-posttest questions and before-after interest questionnaires to determine the improvement of students' critical thinking ability and interest in learning. The analysis technique to test the effectiveness of the product is the Generalized Linear Mcdel (GLM) at the significance level of 5%. The results of this research are as follows: (1) the developed electronic student worksheet based on problem based learning assisted by virtual lab was suitable to be used in physics learning and obtained very good category based on the assessment of experts and physics teachers, (2) electronic student worksheet based on problem based learning assisted by virtual lab can improve students' critical thinking ability and interest in learning based on the Mean Difference (MD) for each tested variable. (3) electronic student worksheet based on problem based learning assisted by virtual lab were effective in improving critical thinking ability in the high category and learning interest in the medium category for students based on the effect size value.

[PED30]

THE DEVELOPMENT OF SCIENCE LITERACY TEST INSTRUMENT FOR HIGH SCHOOL MATERIAL ELASTICITY OF SOLIDS

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ABSTRACT: The availability of scientific literacy test instruments is still minimal and generally applicable, so a scientific literacy test instrument is needed with the type of test that applies to a small scope. The general objective of the research is to produce a scientific literacy test instrument, while the specific objective is to describe the test instrument, validity, reliability, discriminatory power and level of difficulty of the items. This study uses the Research and Development (R & D) adaptation method, which is analyzed based on the validity, reliability, discriminating power and level of difficulty of the items using the Aiken validity, classical theory test and the Rasch model. Based on the Aiken validity analysis and the classical theory test results, 22 of the 40 items were declared valid and reliable with the different power of the questions accepted and having a difficulty level of 95.45% easy and 4.45% moderate. The final results of the research with the subject of 196 students, namely (1) On the validity of the test instrument there are 18 items declared valid; (2) The reliability of the test instrument is categorized as very good; (3) The distinguishing power of the test instrument has four items with poor discriminating power; and (4) the level of difficulty of the test instrument is stated, 9.90% very difficult items, 40.90% difficult items, 45.45% easy items and 4.45% very easy items. This research concludes that the scientific literacy test instrument that has been prepared has a fairly good quality and can be used.

[PED31]

[PED32]
The Development of Augmented Reality Integrated Physics E-Worksheet to Improve Problem-Solving Skills

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Abstract. The STEM approach through the use of augmented reality is able to provide visualization to students through online learning. The purpose of this research are (1) to provide innovation in learning media using 2D Augmented Reality E-Worksheet, and (2) to improve the problem-solving skills of high school students on Momentum and Impulse material. The type of research used is research and development (R&D) with a 4D models. This study involved class X MIPA 3 as a modeling class and class X MIPA 4 as an implementation class at SMA Negeri 1 Sedayu. Indicators of problem-solving skills measured in this study include: (1) understanding the problem, (2) making plans, (3) implementing plans, and (4) reviewing solutions. The results of this study are: (1) 2D Augmented Reality E-Worksheet is feasible and reliable to be used in the physical learning process of Momentum and Impulse material based on the results of validation analysis using the ideal standard deviation of scale 5 with a score of 4.33. (2) The results of the paired t-test analysis showed the value of Sig. 000, so that it is known that there is an effect of using augmented reality e-worksheet on increasing problem-solving skills of high school students.

Scope: Physics Education

[PED33]
The Effect of Augmented Reality Technology on Learning Achievement and Attitudes Toward Physics Education

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Abstract. Augmented Reality (AR) is one of the developed new technologies which has been popular in recent years due to its contributions to the field of education. The Augmented Reality Technology was designed physics course and it was aimed to determine the impact of augmented reality (AR) technology on learning achievement and attitude towards physics education. This study employs quasi-experimental design which intact classrooms at two different 10th grade high school students were randomly assigned to either the experimental or control group. The experimental group completed the "Keppler's Law" module in physics course using AR technology, while the control group completed the same module using textbooks. Among others, it is concluded that students in the experimental group have higher levels of learning achievements and more positive attitudes towards the course than those in the control group.

Scope: Physics Education

[PED34]
Learning Experience in Inquiry-based Physics E-book Integrated with Traditional Games: Feasibility and Student Response

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Abstract. Physics as a fundamental subject in preparing the needs of the 21st century is often considered as an abstract, conceptually difficult, and uninteresting subject by most of the student. That cases increasingly challenging with the Covid-19 pandemic which requires students thinking skills and creativity of teachers in preparing online learning tools. Students' thinking skills can be obtained through learning activities that guide students' thinking processes, such as Inquiry. Meanwhile, Indonesia has a variety of cultures and traditional games, but currently started to be abandoned. Therefore, it is necessary to have technology-based teaching materials that are integrated with traditional games and presented in an E-book application format that can be used on an Android smartphone. This study aimed to know whether the Inquiry-based Physics E-book integrated with traditional games is feasible to be implemented in learning and explore how students' response in it. Following the Research and Development with the 4D stage during the E-book development, a number of 60 student, 10th grade in Malang, Indonesia involved in the evaluation phase for measuring the practically and readability aspects. Product feasibility assessment by three experts showed that the E-book contains Inquiry process helped student to engage in learning and understand the Momentum and Impulse concept. Besides, the presence of video helped them connected to the real world. So that the Inquiry-based Physics E-book integrated Traditional Games is feasible to be used for high school students

Scope: Physics Education

[PED35]
Analyzing Students' Conceptual Understanding as a Learning Effect Thorough Android Based Learning Media with KWL Strategy

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Abstract. Learning media is needed to provide an overview of a concept to students and the KWL strategy can help evaluate students' learning. This study aims to develop an android-based learning media with the KWL strategy to improve students' conceptual understanding and to determine the effectiveness of using learning media. The research method used is Research and Development (R&D) with a 4D model, namely define, design, develop, and disseminate. The data of students' conceptual understanding was collected using an instrument test of conceptual understanding and an eligibility test for media. The subject of this research is students of 10th grade one public senior high school in Warureja. The data were analyzed using the Wilcoxon test to know the difference score in the understanding of the concepts of each group, and the N-Gain test to test the effectiveness of using learning media. The results of the study explain that an android-based learning media with the KWL strategy is very feasible to use. The N-Gain test shows that the use of learning media developed in learning was categorized as quite effective in increasing students' conceptual understanding of momentum and impulse.

Scope: Physics Education

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[PED36]
Student Worksheets Assisted by PhET Simulation to Determine Students' Science Process Skills

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Abstract. Simple Harmonic Motion is a physics material that can be learned through practicum methods. This method can train students' science process skills. However, during the Covid-19 pandemic, practicum implementation is rarely carried out. This happens due to the limited facilities owned by students. Physics simulation applications can be used so that practicum can be done online. Therefore, this study aimed to develop Student Worksheets (SW) assisted by PhET Simulations and determine students' science process skills. SW developed on Simple Harmonic Motion. This 4D model development research involved 37 students of class X Science Islamic Senior High School as subjects and four experts to validate the product developed. Data was collected by SW validation sheets, student response sheets, and student science process skills observation sheets. The SW developed contained a guide to do practicums. SW comes with tutorials on using PhET Simulations and links to learning videos. The result showed that the SW developed feasible to be used with the result of the assessment in the very good category. The response of students to the SW is in a good category. Students' science process skills are still in the sufficient category.

Scope: Physics Education

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[PED37]
Development of Interactive Physics E-Book to Reduce Student Misconception

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Abstract. Learning activities in schools require innovation. This is useful for adjusting existing conditions. This research was conducted to provide innovation in learning physics in schools by developing interactive physics e-books. The aims of this study are (1) to determine the feasibility of the physics e-book on simple harmonic motion material and (2) to determine the reduction of students' misconceptions after carrying out learning using e-books. This study uses the research and development (R&D) method with the research subjects being students of class X. Based on the learning innovations that have been carried out, it is concluded that (1) learning media in the form of e-books have been developed to reduce students' misconceptions. The e-book has been validated by 3 experts and obtained very good results and is suitable for use in learning; (2) there is a reduction in students' misconceptions in the modeling and implementation classes. The biggest reduction occurred in the implementation class, which was 11.00% compared to the modeling class which was only 9.00%. The e-book used succeeded in increasing students' understanding by 18.00% in class modeling and 48.00% in implementation class. The effectiveness of e-books in reducing students' misconceptions belongs to the low criteria in all classes.

Scope: Physics Education

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[PED38]
Analysis the Impact of iSpring Learning Media Integrated with KWL Learning Model towards Students' Self-Direct Learning

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Abstract. Transformation in learning style due to pandemic era demanded the students to change their learning style into self-directed learning. However, the lack of students initiation led them into sub-optimality in learning, especially for some material such momentum and impulse that categorized as difficult concept in physics. One of the solutions to increase students' self-directed learning was by implementing iSpring learning media that integrated with KWL strategy. This study was aimed to analyze the impact of iSpring learning media integrated with KWL learning model towards students' self-directed learning. The subject of this research was 31 students that divided into control group and experiment group that chose with purposive sampling. Post-test only research design was used to analyze the difference of students' learning independency between control and experiment group. The result showed that students in experiment class have better learning independence compared to control group that are not implementing the iSpring that integrated with KWL strategy.

Scope: Physics Education

[PED39]
Developing Physics E-book Using iSpring to Optimize Conceptual Understanding on Simple Harmonic Vibration

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Abstract. This learning was strongly correlated with the cognitive domain. Many learners cannot understand the physics concept. This study aims to (1) produce a physics E-Book Assisted by iSpring suite 9 for harmonic vibration to optimize conceptual understanding in online learning of Public Senior High School Neomuti and (2) to examine the reliability of the product in online learning of the school. The study adopted the 4D stages, started from the defining, designing, developing, and disseminating. The validation and the judgment involved the material and media experts. The results showed that (1) the product, Physics E-Book assisted by iSpring suite 9 for harmonic vibration material based on conceptual understanding took form into an .apk file format, and (2) the developed e-book had an average score of 6.394, categorized excellent. The finding showed that the e-book for physics was suitable for online physics learning during this COVID-19 pandemic.

Scope: Physics Education

[PED40]
Implementation of Blended Learning Using Discovery Learning Model to Improve The Physics Problem Solving Ability

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Abstract. One of the efforts to maintain the quality of physics learning during the Covid-19 pandemic is to apply blended learning using the discovery learning model. Learning physics at vocational high school needs to be carried out with learning innovations that refer to 21st century learning, namely developing problem solving abilities. This study has the objectives to (1) describe physics learning activities on blended learning using discovery learning models on dynamic electrical materials, (2) find out the effect of applying discovery learning models to problem solving abilities on dynamic electrical materials. This type of research is a quasi-experiment research using a non-equivalent control group design. The research method used is descriptive quantitative method. The research subjects were students of vocational high school class X motorcycle engineering competence. The number of students involved in the study was 34 students who were divided into 2 classes. The results of statistical test analysis and N-Gain show that blended learning using the discovery learning model has a positive effect on improving the problem-solving abilities of students in dynamic electrical. There is a significant difference in the improvement of problem solving's ability between the experiment class and the control class. N-gain analysis shows that 83% of experiment class students are in the moderate improvement category. meanwhile, in the control class, all students experienced an increase in the medium category.

Scope: Physics Education

[PED41]
Application of Physics E-Module Based on Flipped Learning to Increase Conceptual Understanding

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Abstract. Face-to-face learning in schools is carried out on a limited basis by the provisions and permission of parents. Teachers can apply flipped learning models in current teaching. Flipped learning is backing by a physics e-module. This study aims to investigate whether flipped learning-based physics e-modules may benefit students in studying quantities and measurements. The type of this research is pre-experimental with one group pretest-posttest design. Students of class X Mathematics and Natural Sciences in Wolowae Indonesia are involved in applied physics learning with physics e-module. Data were collected using a conceptual understanding test, namely pretest and posttest. The pretest and posttest data were analyzed using statistical tests and N-Gain tests. The results showed that the implementation of learning with flipped learning-based physics e-module showed kind results. Learning with physics e-module can increase the conceptual understanding of class X students, especially in quantity and measurement.

Scope: Physics Education

[PED42]
The Effectiveness of Problem Based Learning Physics E-Books to Improve Physics Learning Motivation for Grade XI High School Students

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Abstract. This study aimed to determine the effectiveness of problem-based learning physics' e-book to increase the learning motivation of high school students in grade XI. The research method used was a quasi-experimental design with a pretest-posttest control group design. The research sample was taken using a random sampling technique. The research sample consisted of 68 students in grade XI of State Senior High School in Randudongkal. They were divided into two classes, namely 34 students in the experimental class (XI Mathematics and Natural Sciences 4) and 34 students in the control class (XI Mathematics and Natural Sciences 5). The students' motivation to learn physics was measured through a motivational questionnaire instrument based on the ARCS aspect through the google form. The results of the paired t-test analysis of motivation to learn physics in the experimental class showed a significant value. This showed that the use of e-books was effective in increasing students' motivation to learn physics in the experimental class.

Scope: Physics Education

[PED43]
Profile of Problem Solving Ability of Islamic Senior High School Students on Momentum and Impuls

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Abstract. The purpose of the study was to describe the profile of the problem-solving ability of islamic senior high school on the material of momentum and impulse. The research subjects were students of class X Science 1 and X Science 2 at MA Assalafiyyah Mlangi, Sleman, DI Yogyakarta with 42 students. The research method used descriptive qualitative method. The research instrument used was the momentum and impulse problem-solving ability test. The problem-solving ability test was carried out after the students took part in the momentum and impulse physics learning conducted by the teacher, using the learning model that teachers usually do in class. Based on the results of data analysis, it is known that the indicator of problem solving ability with the highest indicator is understanding the problem of 81.75% with a very high category and the lowest indicator of planning problem solving is 48.41% with a sufficient category. The average percentage of mastery of problem solving skills is 66.27% in the high category. Even though the average percentage of problem-solving abilities is in the high category, there are still indicators that are in the sufficient category, planning problem solving, this can make ideas for future researchers to know the influencing factors. For teachers, it can be used as an evaluation for the implementation of learning, because problem solving is an important part so that it is directed in problem solving.

Scope: Physics Education

[PED44]
Feasibility of the iSpring Physics E-Book with a Scientific Approach on Impulse and Momentum Material

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Abstract.Online learning is a learning solution to the increasing problem of the Covid-19 outbreak. An alternative that can be used when online learning takes place is the use of an android-based e-book. This study uses a research design and development of the 4-D Thiagarajan model, namely define, design, develop, and disseminate. scientific approach. The data of this study were obtained from questionnaires of educators and learners' responses, questionnaire validation of material experts and media experts. The type of data produced is qualitative data which is analyzed by guidance criteria of assessment category to determine product quality. The result of this study is based on the assessment of the average material the media expert's assessment of the average percentage of 86.96% of the category is very reasonable and the assessment of teachers of SMA assessment of the average percentage of 85.77% category is very feasible, while the respondents' responses schools average percentage value of 82.77% very feasible category. Based on the assessment by material experts, media experts, educators and students' response, it can be concluded that the ispring ebook with a scientific approach on impulse and momentum material feasible use as a medium of learning.

Scope: Physics Education

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[PED45]
Development of the E-Guided Inquiry Model Student Worksheet (LKPD) on Effort and Energy Materials to Improve Critical Thinking of Class X

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Abstract. This study implements student worksheets (LKPD) with an e-guided inquiry model for class X students with the material on work and energy. Aims to describe (1) the characteristics of guided inquiry student worksheets (LKPD); (2) knowing the improvement of critical thinking skills by using the developed LKPD. Using 2 classes for modeling and implementation with a simple descriptive research design with data collection techniques in the form of observations and questionnaires, each of which consists of 25 statements. The method used in this study is qualitative and quantitative methods, qualitative methods from the results of observations and filling out questionnaires it can be concluded that learning using the e-guided inquiry LKPD model in online learning is still relatively new for students and also still makes it difficult for students to carry out practice. And with quantitative methods such as giving tests to students in knowing their critical thinking skills. The implementation developed by providing learning using LKPD through the links shared by each group can help students in doing practicum. The results of the development and research show that (1) the characteristics of the LKPD that use e-guided inquiry include the stages of presenting data, conducting investigations, namely carrying out experiments according to procedures, taking practicum results, analyzing the results obtained by filling in the available columns, making conclusions; and in the comments column students can provide comments or suggestions during practicum. (2) the results of the student's critical thinking ability test obtained a total average score of 0.433**.**

Scope: Physics Education

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[PED46]

[SED01]
Plants in Banjar Cooking Spices as a Source of Learning Science in Junior High School

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Abstract. In general, learning is a process of behavior change due to individual interaction with the environment. Science learning does not only use textbooks, but is carried out with a contextual approach. A contextual approach based on local potential can be carried out on plant diversity learning materials by identifying the types of spices in Banjar cooking spices. The research method used is direct observation and interviews at three traditional markets in the city of Banjarmasin . Local potential analysis emphasizes on natural sciences material for grades VII, VIII, and IX junior high schools. The data are described descriptively and the frequency is calculated. The results of observations showed 30 types of spice plants used in 25 Banjar dishes. Identification of potential learning resources for SMP shows variations in the number of potential learning resources.

Scope: Science Education

[SED02]
Insufficiency of Science Laboratory Equipment/Apparatus: The Struggles of Science Teachers in the Implementation of Laboratory Works and Activities

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Abstract. This phenomenological study focuses on illuminating science teachers' experiences in implementing laboratory works and activities with insufficient laboratory equipment/apparatus. Studies revealed that the insufficiency of science laboratory materials brought adverse effects to science teachers. Hence, to gather more experiences and insights about the phenomena, the researchers conducted a qualitative study using in-depth interviews with the twelve (12) science teachers that were purposely selected. Thematic analysis was employed to analyze and generate major themes from the transcript of the in-depth interview. On the experiences of the participants, five essential themes were generated, to wit: enjoyable and challenging as teachers experienced excitement and difficulties in teaching science; pressure because of students' expectations; guilt and disappointment as activities were not realized due to scarcity of materials; insufficiency hampers the completion of the lesson; and on the positive note, these difficulties unveil teacher's creativity. Nevertheless, the participants dealt with the problem through the preparation of well-tailored lessons, improvisation of equipment/apparatus, utilization of localized and indigenized materials, personal acquisition of materials, integration of technology, borrowing of resources from other teachers, and giving group assignments. Thus, resourcefulness and creativity, consultation and collaboration with colleagues, learning and exploring unceasingly, patience and dedication, and allocation of budget for equipment are valuable insights from the science teachers.

Scope: Science Education

[SED03]

RESPONSE OF JUNIOR HIGH SCHOOL STUDENTS TO EDMODO AS AN ONLINE SCIENCE LEARNING MEDIA

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Abstract. Science learning is generally carried out in the classroom, but because this is an emergency period for the spread of COVID-19, learning is carried out remotely or online. Technology that has developed rapidly makes it easier for educators and students to interact virtually. One of the technologies in education that are widely used around the world is Edmodo. This study aims to determine student responses to Edmodo as an online science learning media. The subjects in this study were 8th-grade junior high school students in Daerah Istimewa Yogyakarta. Student's response data were obtained from a questionnaire containing a statement of agreeing/disagree accompanied by the reasons for the answer. The results of the questionnaire are then described in the results and discussion section. Based on the research that has been carried out, it can be concluded that the student's response to Edmodo as an online learning media as a whole is a positive response. Students get new experiences in the learning process that have never been obtained before. One of the obstacles experienced by students when using Edmodo as an online learning media is the limited knowledge of the language. Some features use English, for students who have poor English skills, this can be an obstacle during the learning process.

Scope: Science Education

[SED04]

Junior High School Students' Learning Motivation for the Implementation of Liquid Substance Pressure Practicum during the Covid-19 Pandemic

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Abstract. This study aims to determine the learning motivation of junior high school students towards the implementation of an independent experiment on the topic of liquid pressure. The type of research used is descriptive qualitative research. The instrument used was a student learning motivation questionnaire distributed to class VIII junior high school students in Kalasan District. From the results of the analysis calculation, it is found that the learning motivation of students on the attention indicator is 81.25% in the good category, relevance is 80% in the good category, self-confidence is 79% in the good category, and satisfaction is 80% in the good category. Based on the results, it can be concluded that the learning motivation of junior high school students in this regard is attention, relevance, confidence, and satisfaction in the implementation of independent experiments on the topic of liquid pressure in the good category.

Scope: Science Education

[SED05]
Analysis of Student Creativity on Transfer and Transformation Energy in the Photosynthesis Process Using Padlet-Assisted Learning Videos

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Abstract. Student creativity is one of the skills that are needed in the 21st century. The selection of the right learning media can develop students' creativity, especially in the context of science learning. Integrated science learning is also very much needed so that students do not only study one field of science but also connect one field of science with other fields of science. This study aims to analyze the creativity level of students in the transfer and transformation of energy in the photosynthesis process by utilizing Padlet-assisted learning videos. This type of research is qualitative which was carried out on 19 students from grade 7 from St. Don Bosco Junior High School Sorong. The data obtained came from interviews, observations, and also the work of students. The results showed that the level of creativity of the 7th graders from St. Don Bosco Junior High School Sorong is in the medium category, with an average score of 80.65, with 5 students categorized as very high (26%), 4 students categorized as high (21%), 2 students being categorized as moderate (11%), 5 students were categorized as low (26%) and 3 students were categorized as very low (16%).

Scope: Science Education

[SED07]

Evaluation of Learning Success by Implementing Curriculum 2013 in Senior High School

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Abstract. Indonesia has implemented 2013 Curriculum for eight years since its validity period. This study aims to describe the results of the evaluation of learning success by implementing the 2013 Curriculum, synthesize from relevant research results using CIPP/CIPPO, LOGIC and Discrepancy Provus evaluation models and then, the result of synthesize can categorized in high, moderate dan low in term evaluation model used in the research. From the results of the categorized analysis, the researchers may conclude and decide whether the 2013 curriculum can continue, revised or discontinue. The writing method used is a systematic literature review by summarizing the results of related evaluation research, then interpreting and identifying the success of the learning. The researcher synthesized ten articles based on the following criteria: (1) research articles containing empirical evidence related to the evaluation of learning success by implementing the 2013 Curriculum, (2) articles from journals published in the 2017-2020 period. Results of the study and discussion show that (a). Evaluation of the implementation of the 2013 Curriculum with the CIPP/CIPPO model shows that the implementation of the 2013 Curriculum in general can be categorized as “high”; (b). Evaluation of the implementation of the 2013 Curriculum with the LOGIC model shows that the implementation of the 2013 Curriculum in general can be categorized as “low”; (c). Evaluation of the implementation of the 2013 Curriculum with the Discrepancy Provus model shows that the implementation of the 2013 Curriculum in general can be categorized as “moderate”. Based on results and discussions it may be concluded that the success of learning with the 2013 curriculum can continue to be performed but is still required for improvement or revision.

Scope: Science Education

[SED08]

Student's Response to the Whisper Test Practicum on Vibration, Waves and Sounds

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Abstract. Science learning has special characteristics to obtain special knowledge obtained by observing, experimenting, making inferences so as to be able to formulate theories and link one way to another. Practicum activities are important in the science learning process. However, currently practice activities are hampered by the enactment of long distance learning regulations. The use of video practical instructions and modification of the whisper test are innovations from practicum designs for distance learning, especially science subjects. This study used descriptive qualitative method. The purpose of this study was to describe the student's response to the whisper test modification practicum and to describe the simple practicum that can be done in distance learning. The results of this study indicate that this practice makes students interested in learning and finding out about vibration, wave and sound material. The practicum is also considered to be simpler and does not require sophisticated equipment.

Scope: Science Education

[SED09]

Environmental literacy profile of Primary Teacher Candidates in Tropical Rainforests Environment Context

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Abstract. Tropical rainforests in East Kalimantan are a threatened asset. Its utilization is often not comparable to its rehabilitation and reclamation efforts. Environmental damage from deforestation rates is inevitable, even during pandemics. Through education, it is expected that teachers are able to produce a new generation that has knowledge, awareness and a role in improving the environment. So it is important to know the level of environmental literacy of elementary school teacher candidates. The method used in this research is survey method. The research participants were 102 students from primary teacher training department of Mulawarman University. An environmental literacy test was developed adopting the NAAEE framework for assessing environmental literacy. Data collection was carried out by means of a questionnaire (google form). Environmental literacy is measured by giving questions in the form of multiple choices, essays and questionnaires. The results indicated that the environmental literacy of the students was classified as the moderate category. The knowledge and competence components have significant differences with disposition and behavior. The knowledge and competency components scored 39.73 and 42.70, while the disposition and behavior components scored 75.25 and 71.05. These findings indicate the need for innovation in lectures. Educators can bridge the gap between technology and environmental education. The use of interactive media as part of technology is able to encourage student engagement in activities that support the appreciation of the environment and natural resources promote an understanding of environmental issues.

Scope: Science Education

[SED10]
Potential Utilization of Aquascape as a Science Learning Media for Junior High Schools

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Abstract. Aquascape media is one of the biotic media which has recently been favored by ornamental fish enthusiasts. Aquascape is an aquarium art that arranges aquatic plants and rocks so that they become a place for fish and aquatic plants to live and develop. The use of Aquascape as a learning medium is rarely carried out and researched, therefore this study was conducted to determine the potential of aquascape as a learning medium for Junior High Schools. This research is a qualitative descriptive study, the data obtained based on the results of a survey of needs questionnaires given to students in two schools, namely SMP Negeri 2 Depok and SMP Negeri 12 Yogyakarta with a total sample of 135 students of class VIII. Based on the results of the questionnaire conducted, it can be concluded that the use of Aquascape media for junior high school science learning has the potential to be applied.

Scope: Science Education

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[SED11]

Scientific Literacy-Based E-Module in Technical Mechanics Subject at Vocational High Schools

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Abstract. This study aims to develop a scientific literacy-based e-module as teaching materials in Technical Mechanics subject at Vocational High School which can improve the vocational student's scientific literacy skills, especially in the Construction and Property Engineering Expertise Program. The method used is research and development (R&D) with Branch's (2009) ADDIE development model. The data was collected by distributing checklist as instruments for assessing product feasibility through validation from experts, each consisting 3 material experts and 3 media experts. The result of product validation is analyzed using Likert Scale. Based on the product feasibility assessment, the percentage of assessment from material experts is 84,14% and the percentage of assessment from media experts is 90,79%, so that product is categorized as "very feasible" and can be used in Technical Mechanics subjects for vocational student with the Construction and Property Engineering Expertise Program.

Scope: Science Education

[BED01]
Improving Critical Thinking Ability and Biology Learning Outcomes in Senior High School with the Science Technology and Society Approach with the Assistance of E-LKPD

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ABSTRACT. To format your abstract, use the Microsoft Word template style: Abstract or Use Times New Roman Font: 9 pt, Indent: left 0.2", Right: 0.2", Justified. Each paper must include an abstract. Start the abstract with the word "Abstract" followed by a period in bold, and then continue with the normal 9 dots.

Scope: Biology Education

[BED02]
Developing an Augmented Reality-Based Immune System Module to Improve the Eleven Grade Students' Learning Performance

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ABSTRACT. This study is aimed to (1) develop an augmented reality-based immune system module for the eleven grade students of high school to be a proper learning media for them; (2) Identify the impact of using the augmented reality-based immune system module on the eleven grade students' learning performance. This study is classified as Research and Development study using ADDIE (*Analysis, Design, Development, Implementation, Evaluation*) model but limited only until development stage. The subject of this study were two materials experts, two media experts, two biology teachers, and the students of XI MIPA SMA N 1 Mejobo Kudus. The data were collected using assessment instruments of materials experts, media experts, biology teacher, and students and also pre-test and post-test question sheets. The results of the assessments were analyzed qualitatively and quantitatively using SPPS. The results show that (1) the augmented reality-based immune system module is stated as a proper media to be used in the teaching and learning process. It was based on the assessments from the materials experts with the average value of 48,5 categorized as good, the media experts with the average value of 43,5 categorized as good, and from the biology teachers with the average value of 46 categorized as good; (2) the Augmented reality-based immune system module has an impact on improving the students' learning performance on the topic of immune system.

Scope: Biology Education

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[BED03]

Profile Of Critical Thinking Ability In Respiratory Materials In State Senior High School In Tulungagung Regency

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Abstract. The profile of the critical thinking ability of State Senior Hight School (SMA) students on the material of respiration in class XI. State senior high school (SMA), as many as six schools divided based on superior, medium, and low categories seen from the UN scores and the list of school graduates. The subjects in the study were 80 students who were selected by random sampling in the science class at each school. The research instrument used ware description questions to measure five indicators: interpretation, analysis, inference, evaluation, and explanation. Meanwhile, the questionnaire was used to measure one indicator, namely the self-regulation indicator. Critical thinking indicators used include how to interpret, how to analyze, how to inference, how to evaluate, how to explain, and how to organize themselves. Data analysis used was a descriptive analysis technique based on the percentage of students' critical thinking skills. The research has shown that students' critical thinking skills of SMA N in Tulungagung Regency were 53.12%. Meanwhile, critical thinking skills based on school categories show that state senior high schools in the superior school category get a percentage school with a low category of 53.15%, and high school with a medium category of 52.70%. Furthermore, critical thinking skills based on the completeness of critical thinking indicators show self-regulation indicators 53.39%. The explanation indicator is 51.72%, the interpretation indicator is 48.07%, the inference indicator is 42.40%, the analysis indicator is 36.82%, and the evaluation indicator is 36.04%. Students' critical thinking ability is still reasonably sufficient, so there must be learning innovations as an effort to improve it.

Scope: Biology Education

[BED04]
Challenges and Opportunities for Empowerment of SPS in Distance Biology Learning

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Abstract. Science process skills (SPS) are one aspect of biology learning that must be empowered even in online learning. Online learning platforms are very influential with the opportunity to empower SPS. Thus, the feasibility of various distance learning platforms to empower SPS should be analyzed. This study aims to explore the conditions of SPS empowerment in biology learning in the pandemic era. In addition, it also aims to find out what obstacles are faced by educators in empowering SPSs in the pandemic era. This study surveyed biology teachers around Surakarta and surrounding areas. The survey was conducted online to 28 respondents. The questionnaire contains various questions about how to apply SPS during online learning. The data were analyzed qualitatively. The results showed that existing learning has not facilitated optimal SPS empowerment, so it was necessary to develop an online learning platform that can empower students' SPS.

Scope: Biology Education

[BED05]
The Profile of Scientific Literacy of Senior High School Student on the Topic of Environmental Pollution

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Abstract. This study aims at determining the profile of scientific literacy of senior high school student on the topic of environmental pollution. This research was a quantitative descriptive design with a survey method. The population was all students grades X in Senior High School 2 Mukomuko. The sample consists of 90 senior high school students grades X of science, taken by using purposive sampling technique. The data analysis technique used a descriptive-quantitative statistics. The instrument for students consists of three aspects of scientific literacy competence with six indicators. The results showed that: (1) the three aspects of scientific literacy competence were in the low category, 50.21% explain phenomena scientifically, 43.89% evaluating and designing scientific inquiry, and 44.86% interpret evidence and data scientifically; (2) the lowest indicator of scientific literacy competence is analyzing the data from the investigation and how to relate to the findings to draw conclusions. Based on the results of research, it can be concluded that the scientific literacy of the students was relatively low.

Scope: Biology Education

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[BED06]
The Profile of Science Literacy of High School Students Based on Issues of Environmental Change Concept in Bengkulu

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Abstract. One of the important abilities that must be possessed by students in the 21st century is scientific literacy skills. The purpose of this study was to determine the profile of scientific literacy skills based on the competence of environmental change issues of 1st-grade science of High School students of number 2 in South Bengkulu. The results of this study are expected to provide information about the initial ability of scientific literacy regarding the concept of environmental change for the 1st-grade science of High School students of Number 2 in South Bengkulu. The study was conducted at High School students of Number 2 in South Bengkulu with 1st-grade science class students as the subjects. The sampling technique used is the purposive sampling technique, with a total sample of 34 students of 1st-grade science of High School of Number 2 in South Bengkulu. The research instrument used in this study is a scientific literacy test based on indicators on aspects of scientific literacy competence according to the Organization for Economic Co-operation and Development (OECD). The scientific literacy test instrument uses several issues of environmental change that occur in Bengkulu. The data analysis technique used is a descriptive statistical analysis. The result of this study shows that students have scientific literacy skills at moderate criteria as much as 55.88% or 19 students. Scientific literacy competency aspect that categorized into the moderate category, such as, 1) designing and evaluating scientific investigations, 2) Interpreting scientific data and evidence. The aspect of explaining scientific phenomena is categorized into the low category. The highest percentage score on the scientific literacy indicator is 1) analyze the data from the investigation and its impact on the findings or conclusions, 2) interpret data and conclude appropriately. The environmental issue that has the highest percentage score is "Impact of oil palm plantations (*Elaeis guineensis*) in Bengkulu".

Scope: Biology Education

[BED07]

Analysis of the Implementation Sistem Kredit Semester (SKS) with a Scientific Approach of the Biology Learning Process

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Abstract. The Sistem Kredit Semester (SKS) is a new program and not many schools have implemented it. The main purpose of SKS is to provide opportunities for students who have more abilities to graduate faster (2 years) and because the SKS is new, it is necessary to examine its strengths and weaknesses so that it can be implemented properly. Therefore, this study has the objectives to determine the implementation of the program of SKS. This is a descriptive research with a qualitative approach. The primary object used is the result of depth-interviews and secondary objects are documents which are natural objects and not manipulated by the researcher. While the subjects used in this study were students of the SKS and students of the package system. The key informant of this research are school principals, vice principals of the curriculum section, biology teachers, SKS students and students of the package system. The research instruments used were guidelines / interview sheets and documentation. The Researchers as human instruments and the data collection method used depth interviews. The data validity test used credibility test, reliability test, and conformability. Data analysis carried out included analysis during data collection, data reduction, data presentation and verification. This research produces data on implementation of the SKS program at SMAN 1 Bantul. At the implementation stage, the Sistem Kredit Semester program (SKS) has not been able to guarantee that students can graduate in less than 3 years.

Scope: Biology Education

[BED08]

Analysis of Students' Learning Independence in Biology subject of SMAN 1 Jetis as an Impact of Online Learning during Covid-19 Pandemic Reviewed based on Students' Gender

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Abstract. This research is a preliminary study conducted to find out the Learning independence of biology subject of the Students in SMAN 1 Jetis as an impact of online learning and to know students' Learning independence difference in Biology subject from their gender. Data collection techniques and instruments: closed questionnaires. The questionnaire was then analyzed with SPSS to find out the validity that can be proven using correlation-coefficients. In this study, correlation was calculated with Pearson correlation because the data is assumed to be normal distribution. The validity of each indicator was determined by its correlation significance by the addition score (Item-total correlation). Reliability test: Alpha Cronbach formula. Furthermore, data processing used descriptive statistical analysis for likert-scale data processing. The results of the study show that all three indicators demonstrated enough categories with the percentage of the emotional independence of 65%, behavioral independence of 67% and value independence of 72%. Reviewing it from gender, there is no difference in learning independence on indicators of emotional independence, but there are differences in learning independence on indicators independence of behavior and independence of the value. It shows that students' learning independence must continue to be improved.

Scope: Biology Education

[BED09]
Need Analysis of Local Potential-based Modul of Biodiversity Materials for High School Students

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Abstract. Modules are one of the references for students in taking part in classroom learning. The aim of this research is to know the need for local potential-based modules to be used in the learning process at SMAN 1 Tembilahan on biological learning. This research is a type of quantitative descriptive research. Data collection was carried out by spreading questionnaires to students and teachers of biology subjects. The results showed that students in the learning process only use textbooks, LKS, modules and sources from the internet. Teaching materials in the form of textbooks are often used in the implementation of learning. Examples given by teachers are also still common, not specific about plants and animals in the Riau area. Learning methods in terms of practice need to be improved, either in field practice or in laboratories. So, it is necessary to develop teaching materials in the form of biodiversity modules based on local potential.

Scope: Biology Education

[BED10]
Teacher's Perception on Emergency Online Learning
A Survey in High School Biology Classes

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ABSTRACT

Emergency learning in midst of COVID-19 pandemic is a teaching practice that was done by teachers in the world. In Indonesia, some teachers are unprepared by the sudden change of teaching practice in class. This study aims to know the teacher's perception on the impact of emergency online learning in high school biology classes. This study is a survey, focused on 9 teachers as the respondents sampled by convenience sampling. Data collection was done through a closed questionnaire and open questionnaire. The study result showed that biology teachers have a positive perception about the emergency online learning that was done in COVID-19 pandemic. The teachers believe that emergency online learning is effective to reach cognitive objective in learning process, it also can improve teacher's knowledge about technology in education. However, there are difficulties in doing emergency online learning such as the lack of internet services, difficult in managing class, and inequality of school's resources. Online learning can be used as an alternative to teach in emergency time, but it still have problems that need to be anticipated. To solve the problem, there should be support from all education stakeholders, and the teacher also should increase their competences in teaching with technology.

Scope: Biology Education

[BED11]
Analysis of Students' Perceptions of Technological Pedagogical and Content Knowledge (TPACK) of Animal Physiology Lecturer IAIN Syekh Nurjati Cirebon

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Abstract. TPACK ability is knowledge that needs to be mastered by teachers in the application of technology elements to teach certain subject matter to students into one complete package. TPACK knowledge can also affect the ability of educators to develop learning roles. If educators can integrate technology into the learning tools they compose, then they can use technology well in learning activities. This research is a descriptive study to describe the ability of TPACK lecturer of Animal Physiology IAIN Syekh Nurjati Cirebon. The subjects of this research are students who have taken Animal Physiology courses. The type of research used is descriptive research with survey method. In this type of research, the data obtained will be described objectively and as it is according to the results of students' perceptions of the lecturer's TPACK ability in the learning process. Based on some of these results, it can also be seen that the lecturer's TCK ability element has the largest percentage of responses, while the smallest percentage of responses is the TPACK element which is a unit of the whole. The results of this research are expected to be useful and can be continued for better research.

Scope: Biology Education

[BED12]
Prospective Biology Teacher in Learning Using Three-Dimensional Software: Interest, 3D Representation and Learning Outcomes

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Abstract. The aims of this study are to describe how the interest of biology teacher students towards the use of three-dimensional software in the study of plant anatomy courses and see how the relationship between 3D representation using software and learning outcomes that have been done in the process of learning plant anatomy courses. This research uses quantitative methods with an associative and descriptive approach. Associative data analysis is conducted between 3D representation using blender software with the learning results of prospective biology teachers, to descriptively by analyzing the results of students' interest in biology teachers on learning using three-dimensional software. Sampling was done by purposive sampling by looking at the completeness of instrument data obtained by 63 students of prospective biology teachers. The instruments used are 3D representation scores, learning score and interest questionnaires. The results showed a strong relationship between 3D representation of learning outcomes, with a correlation coefficient value of 0.737, the relationship obtained was also significant. For the highest interest in student learning, it is about student activities, because students feel that they make their own 3D representations, often ask questions, and always follow the learning well.

Scope: Biology Education

[BED13]

Augmented Reality to Support Students Learning of Socio-scientific Issues in Biology Class: A Systematic Review of The Literature

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Abstract. This article presents a literature review on the potential of augmented reality to facilitate socio-scientific issues-based learning in biology class. This study was conducted using the Systematic Literature Review method through five main stages: formulating the research problem; searching the literature; selecting the literature; analyzing and synthesizing; and reporting the findings. Articles that meet the criteria were selected to be analyzed further. Based on selected articles, we analyzed on what kind of augmented reality technology that can be used and how can augmented reality support socio-scientific issues-based learning in biology class. The findings reveal that augmented reality can be an alternative media for biology teachers to facilitate socio-scientific issues-based learning in the form of mobile application. The integration of augmented reality in biology learning based on socio-scientific issues is able to facilitate context visualization, increase students participation, develop conceptual knowledge, affective, socio-scientific reasoning, and many other skills.

Scope: Biology Education

[BED14]
Literature Review and Synthesis: CIPO Evaluation Model in The Implementation of the Online Learning Program for Biology Subjects at Madrasah Aliyah Negeri (MAN) Yogyakarta City

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Abstract. This article presents an overview of the evaluation of the CIPO model (context, inputs, processes and outcomes) which can be broadly divided. model evaluation in education can contribute to the development and improvement of the quality of schools which, as the implementation of o line learning programs, can determine the extent to which program objectives have been achieved based on the time span. This evaluation model has been developed from Jaap Scheerene, so that it has substantive dependent correlations are context, input, process and outcomes. Dimensions context assesses environmental needs, problems and opportunities as a basis for determining goals and priorities and the significance of outcomes. Input assesses alternative approaches to meet and determines needs as a means of program planning. Process analyzing the implementation of activities to achieve online learning goals and dimensions outcomes the early aspects of program planning and seeks to link resources or activities to the desired outcomes in a program that can be implemented, often divided over times short-ter, long-term.

Scope: Biology Education

[BED15]
Diatery analysis, colony, and distribution of *Nycteris javanica* (javan slit-faced bat) in Jonggrangan karst area, Indonesia

Tatag Bagus Putra Prakarsa[1, a)], Failasuf Aulia Nugroho[1], Suhandoyo[1], Sudarsono[1] Isma Dwi Kurniawan[2], Rizka Apriani Putri [1], and Yuanita Fera Rahmawati[1]

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Abstract. The aims of this research were to determine colony, distribution, the natural prey of *Nycteris javanica*. This research was a ecological study using the Natural Snapshot Experimental data collection method. Purposive sampling was applied based on the population of the species, habitat quality, and its conservation status. Data on natural bat prey was obtained by dissecting the abdomen and removing the ventriculus, then dissecting the ventriculus and collecting segments of insect body parts. To assure biomass of its natural prey was done into two steps. The first step was made when N. javanica left the cave at nightfall. The second step was made when bats returned to the cave. Prey biomass was obtained by combining body weight after hunting and before hunting. The data of this study were analyzed using quantitative descriptive statistics. In this study, we found N. javanica only in 2 caves in Jonggrangan karst area. The natural prey consisted of 7 order from Arthropoda (Araneae, Hemiptera, Orthoptera, Coleoptera, Lepidoptera, Blattaria, and Homoptera). Lepidoptera is the dominant prey of *N. javanica*. Prey biomass from *N. Javanica* reached 48% of its body weight. Thus, the decline in *N.javanica* population will have a direct impact on the insect population.

Scope: Biology Education

[BED16]
The Potential of Flowering Plant Diversity in Local Fruit Thematic Garden of Indrokilo Botanic Garden of Boyolali as a Biology Learning Resource

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Abstract. This research was a preliminary study to determine the diversity of angiosperms in the local fruit thematic garden of Indrokilo Botanical Garden of Boyolali and its potential to be used as a biology learning resource. The research was carried out in two stages. In the first stage, an initial survey was conducted to observe the location condition, determine the observation location, and do inventories and classifications. In the second stage, an analysis of the utilization potential of local fruit trees that have been grouped according to the division of angiosperms by literature study as a biology learning resource. The data collection technique was an observation. The research instrument was in the form of an observation sheet. The data obtained were analyzed using the Miles and Huberman model that consist of the data reduction, data display, and conclusion/verification. The study results indicated a diversity of 19 families with 17 species of flowering plants (angiosperms) in the local fruit thematic garden of Indrokilo Botanical Garden, so it had the potential to be a biology learning resource. Its potential can be integrated into biodiversity material for high school students and students majoring in biology education and biology major, particularly in the plant diversity course and courses that deeply observe morphological, physiological, genetic, and systematic characters. This biology learning resource can be developed into various learning media according to the needs of the students.

Scope: Biology Education

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[BED17]
Environmental Literacy Profile of Nature Tourism Parks for Students

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Abstract. The purpose of this study was to determine the environmental literacy of class X MAN 1 Medan students. The data collection technique was carried out using a survey method, by distributing online questionnaires to 40 students. Students already have an understanding of nature tourism park conservation, 60% of students are in the high category, 32.5% are in the medium category, and 7.5% are in the low category. The results of this environmental literacy survey are grouped into four, namely knowledge, behavior, attitudes and skills of students. The average Astudent's ecological knowledge is 73, in the medium category. Meanwhile, environmental literacy behavior is 71.3%. Furthermore, environmental literacy attitudes; verbal attitude, sensitivity attitude, and plan to investigate issues were 69%, 73.1% and 88.6%, respectively. Then ting¬With global issues skills, students are able to analyze environmental issues, and make plans for what will be done to address these environmental issues. The results obtained indicate that it is necessary to inculcate environmental knowledge and environmental literacy in learning and¬ teaching materials at school.

Scope: Biology Education

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[BED18]

[BED19]
NEEDS ANALYSIS OF WEB-BASED E- MODULE IN BIOLOGY LEARNING

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Abstract. This study aims to analyze the need for developing web-based e-module teaching material in biology learning. This research is an early stage of development research. The research method used is descriptive quantitative analysis. Data collection techniques with interviews, observations, and surveys. The research subjects were 4 teachers and 59 students from 2 schools located in West Bangka Regency, Bangka Belitung Islands Province. Research data was obtained from questionnaires and interviews. The results showed that 100% of teachers and 79.7% of students needed web-based e-module development. From the results of this analysis, it can be concluded that there is a need to develop web-based e-modules in biology learning for senior high school.

Scope: Biology Education

[BED20]

Needs Analysis of Local Potential-Based Pteridophyta E-Encyclopedia for High School

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Abstract. The rapid development of science and technology in 21st century education encourages educators to use it as an effort to make learning more fun and optimize the learning process. The development of existing technology makes it easier for students to get sources of information. But in fact, the learning resources that they use still emphasize the cognitive side. This research is a needs analysis that reveals how the biology learning process and student needs are related to the development of the pteridophyte e-encyclopedia as a learning resource. The research method used is quantitative descriptive analysis. Data collection using online questionnaires. The research subjects were 176 students of class XI and XII from three senior high school in Blitar. The results of this study indicate that 89.8% of students who experience pteridophyte learning difficulties require additional learning resources and 86.9% of students agree that the use of an integrated pteridophyte e-encyclopedia of local potential provides benefits in the learning process.

Scope: Biology Education

[BED21]

Development of Google Classroom-based Online Learning Product for Biology in High School

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Abstract. This research is aimed at developing online learning materials using Google Classroom (GC) to increase teaching effectiveness and to improve student's achievement in biology. This research used Research and Development (R & D) design, using the ADDIE model with four steps: Analysis, design, development, implementation, dan evaluation. First, we (researchers, teachers, and students) develop learning materials using Google Classroom. The materials, including texts, links, and videos, were reviewed by experts to get content validity. A questionnaire with Likert's Scale was used to measure the content validity. The valid learning materials were tried out in a school to know the usability of the GC. A questionnaire with Likert's Scale was used to measure the usability of the Google Classroom. Then, the Google Classroom were implemented in six classes from six high schools with a pretest-posttest control group design. Tests were administered to measure students' achievement on the learning materials. The results indicated that (1) the learning materials were valid based on the expert judgment, (2) the Google Classroom was considered easy to use according to the teachers and the students, specifically to organize the materials, to do video conference using google meet, and to do online assessment, and (3) the Google Classroom was effective to improve the students' achievement in biology. Therefore, it is concluded that the Google Classroom learning materials is feasible to perform online learning in biology.

Scope: Biology Education

[BED22]
Development of Dragonfly Identification Field Guide Application in Jatimulyo Tourism Village Integrated with Values of Local Potential: Feasibility and Student Responses

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Abstract. This study aims to determine the feasibility and student responses of dragonfly identification guide mobile application for tenth grade students in field study activities of biodiversity in Indonesia. This research is a research and development with a 4D model (define, design, develop, and disseminate) and a pretest posttest control group design. Assessment of the feasibility of dragonfly identification guide mobile application is carried out by material experts, media experts for product feasibility, biology teachers as assessors of practicality, and student responses to know the readability of the product. The data collected were analysed using descriptive analysis. The results show that the dragonfly identification guide application compiled in Jatimulyo Tourism Village has very good quality in aspects of material, presentation, software engineering, usage, and display and has good quality in the language aspect. Readability tests by students get a percentage of 85% with a positive response. Therefore, the dragonfly identification guide mobile application integrated with values of Local Potential in Jatimulyo Tourism Village is feasible to be used for senior high school students.

Scope: Biology Education

[BED23]

Holistic Higher Order Thinking Skills Ability in Solving Environmental Problems for Biology and Biology Education Undergraduate Students in Indonesia

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Abstract. This study aims to determine the ability of holistic higher order thinking skills (HOTS) in solving environmental problems in undergraduate students of biology and biology education programs in Indonesia. The research used survey method. The sample was taken using a purposive sampling technique, namely only undergraduate students from the biology and biology education program who had graduated from environmental theme lectures. The research instrument in the form of a holistic HOTS ability test in solving environmental problems is 10 numbers that have been validated by material and construction experts given to respondents online. Data in the form of holistic HOTS ability values in solving environmental problems were analyzed descriptively quantitatively. The results showed that the ability of holistic HOTS in solving environmental problems in undergraduate students of the biology study program obtained an average score = 24.81, biology education study program = 27.48, and a combination of biology and biology education = 26.23. The conclusion of this study is that the ability of holistic HOTS in solving environmental problems in undergraduate students of biology and biology education programs is in a very low category so that efforts need to be made to improve.

Scope: Biology Education

[TES01]

Implementation of Problem Based Learning Through Lesson Study to Improve Students Problem Solving Skills

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Abstract. Many skills are needed to face global challenges because the longer life necessities will be more complex than in the previous era. One of them is problem solving skills that play a role in problem solving. This study aims to determine student problem solving skills through Lesson Study (LS) by applying the Problem Based Learning (PBL) model. This type of research is Classroom Action Research (CAR) with a qualitative descriptive approach. The research was conducted on 22 students of the State University of Malang who took the 21st Century Biology Learning course in the 7th semester of the 2019/2020 academic year. The research was conducted in two cycles with a total of 4 meetings. The measurement instrument used was a problem solving skill sheet. The indicators of problem solving skills that are measured are problem identification, solution identification, and maintaining the chosen solution. The results showed that LS-based PBL learning could improve students' problem solving skills. In cycle 1 students' problem solving skills were 54.4 and in cycle 2 increased to 78.4. Based on these results, learning by applying PBL-based LS can improve students' problem solving skills.

Scope: Teacher Education in sciences

[TES02]
Student's Metacogninitive Awareness Towards Designing Skills of Hots Questions

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Abstract. Students with awareness and able to control their cognition can show better perfomance than students who are not metacognition. Metacognition include metacognitive knowledge dan metacognitive regulation. This paper desribes student's metacognitive awareness in terms of knowledge and regulation metacognition when designing HOTS questions based on the Bloom's taxonomy revised (C4,C5,C6). Data were colleted from 56 Biology education students who contracted Biology learning evaluation courses at one of Aceh's university through the Metacognitive Awareness Inventory (MAI), the task of designing HOTS questions to describe students'metacognitive awareness during work, and conducted semistructed interviews to collect rich qualitative data from them who get low and high grade. We found that 95% students get grades <50 and 5% students get grades >50 and for the percentage of metacognitive awareness obtained 70,10% for metacognitive knowledge and 71,91% for metacognitive regulation. Students who get grades >50 know more what to do to design HOTS questions regardless of the rubric that given by the instructor and pay more attention to the most important part in designing questions, while students who get grades <50 spend more time on understanding the material so as to override the most important things in designing HOTS questions. such as determining indicators, stimulus complexity based on cognitive level, and content and context in the questions. These results show that many students still lack metacognition and have limited knowledge of metacognitive regulation or limited ability to implement them, which can impact their achievement.

Scope: Biology Education

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[CED01]
Analysis of Android Media Development Needs in Green Chemistry-Based Chemistry Learning

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Abstract. This study aimed to collect initial information in designing android media drafts in green chemistry-based chemistry learning. The method used in this research is a survey method. Data collection was carried out by distributing questionnaires in a google form adapted from journals relevant to the research. The participants of this study were 19 chemistry teachers from schools in Tasikmalaya. The results of the study were analysed descriptively and the data obtained that the most widely used media was student worksheets with a percentage of 32%, while android media was still rarely used. The obstacles were lack of understanding, knowledge, and development information, no supporting facilities, and limited, there was a suggestion to provide tutorials on the development and use of media, multiply references, and complete supporting facilities. Based on the analysis of aspects of green chemistry-based learning, 68% did not know about green chemistry-based learning and 95% were interested in knowing and integrating the principles of green chemistry in learning.

Scope: Chemistry Education

[CED02]
Teaching chemistry experiments using interactive video via cloud meeting

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Abstract. The COVID-19 pandemic has changed various ways of life, including the field of education. The learning process that has been taking place face to face in the classroom has turned into online learning. This study aims to explore undergraduate students' perception on learning chemistry experiment using interactive video via zoom meeting. Descriptive qualitative method employed in this study. After carrying out online laboratory, an open-ended questionnaire was sent to 78 students It followed by in-depth interviews with 9 students. The findings indicate that learning laboratory using interactive video via cloud meeting provides new experience for students. Compare to watching experimental video, interactive video motivates students to engage in learning. Moreover, there are few obstacles in this activity mostly caused by the unstable internet connection. There are also room for improvement for the near future, such as ensuring the stable internet connection for this activity and equipped video with slow motion scene and photos the experiments process and results.

Scope: Chemistry Education

[CED03]
Need Analysis of Web-Based Electronic Module Learning Media Development

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Abstract. This study aimed to collect initial information on designing web-based electronic module media in chemistry learning. The method used in this research was a survey method. Data collection was carried out by distributing questionnaires in the google forms which were adapted from journals relevant to the research. The participants of this research were 6 chemistry teachers in Semarang district. The results of the study were analysed descriptively and obtained data that the most widely used media were textbooks with a percentage of 55% while electronic modules were rarely used. The obstacles are unsupported facilities, lack of understanding of the media, and lack of time. Based on the analysis, 31% of teachers want a media module and 38% of teachers want video as a learning medium, all of which can be summarized in a web-based electronic module.

Scope: Chemistry Education

[CED04]
Study of the students' curiosity relationship, interest and motivation in chemistry learning: Literature Review

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Abstract. This study aimed to review the relationship between curiosity, interest in learning and important motivation as three factors supporting the successful learning in education through a literature review from previous research and its role in chemistry learning. The assessment included the relationship between each of the three factors including how; 1) The relationship between motivation and interest in learning; 2) The relationship between learning motivation and student curiosity; 3) Relationship between Interest in Learning and Curiosity. The literature review steps consisted of three main stages, namely identification and collection of articles, selection of articles based on criteria, and selection of main articles. A total of 20 articles were examined as the main sources that met the criteria and several others as supporters in this study.

Scope: Chemistry Education

[CED05]
Online Learning: A Comparison of Self-Regulation Students High School Based on Gender Differences in the Covid-19 Pandemic Era

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Abstract. Corona Virus diagnosed 19 (COVID-19) has many impacts on the educational setting, one of which is the online learning process. The implementation of online learning is a challenge for educators and students in maintaining effective learning activities. The purpose of this study was to determine whether there are differences in self-regulation in the online learning environment of high school students against gender differences during the Covid-19 pandemic. The research method is a survey by distributing questionnaires in the form of an Online Self-Learning Questionnaire (OSLQ) which is used to determine student self-regulation through 6 aspects, namely; goal setting, environmental structuring, task strategy, time management, help-seeking, and self-evaluation. A total of 784 students were surveyed and asked to fill out questions by assessing the form of a Likert scale from strongly disagree to strongly agree. Participants consisted of 71% women and 29% men, with a mean age of 15-18 years. The data were analyzed using IBM SPSS version 26 software. The item reliability was found to be higher, namely 0.839 which supports the reliability of the questionnaire that can be used. Based on the results of the Mann-Whitney test analysis, the main finding is that there are significant differences in the self-regulation of students in online learning towards gender differences. The average score obtained shows that female students can manage themselves better than male students in online learning.

Scope: Chemistry Education

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[CED06]
Chemical Teachers Perception About Chemical Literacy, Cognitive Learning Strategies, and Self-Efficacy in High School Students

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Abstract: The purpose of this study was to find out how teachers perceive chemical literacy, cognitive learning strategies, and students' self-efficacy in senior high schools in East Lombok. Data was collected by interviews open (open-ended) to the chemistry teacher at the three public senior high schools of three sub-districts in East Lombok. The research sample was five chemistry teachers (four female, one male). Sampling was done by purposive sampling. Interviews were conducted face to face (one-on-one), and the teacher was given 15 questions. Data was collected in the form of video and sound recordings. Results of the study found that the terms chemical literacy and self-efficacy are still foreign to some teachers. The teachers revealed that the chemical literacy ability of students was still relatively low; the average chemical literacy ability of students was still in the domain of content and context. The teaching and cognitive learning strategies most often applied by teachers and students in the classroom are rehearsal and discussions. More of the teachers reported that rehearsal is the most influential cognitive learning strategy to improve students' chemical literacy. The results of the study also revealed that mastery experience (achievement), vicarious experience, and verbal persuasion were the most influential sources of efficacy to increase students' self-efficacy in learning chemistry. In addition, chemical literacy, cognitive learning strategies, and self-efficacy have a relationship and influence each other where cognitive learning strategies can improve students' self-efficacy and chemical literacy.

Scope: Chemistry Education

[CED07]
Development of Problem-Based Learning E-Worksheet to Improve Students' Learning Independence on Hydrocarbon Subject Materials

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Abstract. This research aims to determine the effect of Problem Based Learning (PBL) *e-worksheet* on the hydrocarbon subject material in the experimental class in class XI of Science of Senior High School 1 Siak. This research was a quasi-experimental research with *one group pre-test post-test* research design. The population in this research were all students of class XI of Senior High School 1 SIak. The research sample consisted of 38 students of class XI of Science 1 of Senior High School 1 Siak. The instrument used was an assessment of the quality of media and materials as well as an independent learning questionnaire. Data analysis was conducted by using percentage technique, n-gain, and paired t-test. The results showed that the application of Problem Based Learning (PBL) *e-worksheet* on hydrocarbon subject material had a significant effect on students' learning independence.

Scope: Chemistry Education

[CED08]
Development of Website-based Learning Media containing Socioscientific Issues on Buffer Solution Material

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Abstract. This research is a research and development of website learning media. This study aims to produce a product in the form of a website-based learning media containing valid and practical Socio-scientific Issues on the Buffer Solution Material. The development stage refers to the 4D model by Thiagarjan et al., (1974) which consists of 4 stages. The subjects in this study consisted of 3 expert lecturers as validators, 5 teachers and 60 students of class XI. The data analysis technique used is descriptive data analysis technique by describing the validity, practicality and legibility of the Website containing Socio-scientific Issues. The results obtained from this development research are as follows: (1) The website containing Socio-scientific Issues has been valid based on the validation of expert lecturers; (2) Websites containing Socio-scientific Issues are very practical to use, this is based on a practicality test score of 85% or very practical; (3) Websites containing Socio-scientific Issues are very easy for students to understand, this is based on a readability test score of 80% or very good.

Scope: Chemistry Education

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[CED09]
Chemistry Learning Innovations: Development of Guided Inquiry-Based Electronic Modules on Chemical Bonding Materials

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Abstract. The goal of this research is to create and test the feasibility of an electronic module using guided inquiry into chemical bonding materials. The 4D development paradigm is used in this research and development (R&D). The study's instrument is a questionnaire that collects product input data as well as a quantitative score that represents the module's viability. An electronic module based on guided inquiry on chemical bonding material is the product of this research. The findings of the electronic module assessment by the chemistry teacher are 91%, 90% from peer reviewers, and 80% from students. The entire module feasibility evaluation received a score of 90%, placing it in the excellent category. As a result, this guided inquiry-based electronic module on chemical bonding materials is acceptable for high school students to utilize as a learning media.

Scope: Chemistry Education

[CED10]
Students' Chemical Representation Ability:A Study On Molecule Shapes

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Abstract. The aim of the study was to analyze the chemical representation ability of high school students on mplecule shapes topic. The one-shot case study design was conducted. This design is one of single-group design in experimental research design. The posttest was given after did the treatment in learning process. Test of analytical thinking based on multiple representations (TAT-MR)that captures of four levels in chemical representation (macroscopic, microscopic, symbolic and mathematics) was used to assess the students' ability. There were 13 items test that had good reliability. The TAT-MR was administered to 50 high school students drawn from senior high school in Pekanbaru , Indonesia. The result showed that students had a good ability on chemical representation by persentase 21,5 %. However, the students still had difficulty to show the microscopic representation and representation mathematic. Hence, the ability of high school students' in chemical representation needs to be improved. This study suggests that multiple representations approach should be used in chemistry learning at high school.

Scope: Chemistry Education

[CED11]
STUDY ON THE DIFFICULTIES CHEMISTRY'S LEARNING WITH RECOMMENDATION FOR LEARNING MEDIA DURING VIRTUAL LEARNING

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Abstract

This study aims to find information related to the difficulties experienced by students in participating in virtual chemistry learning and also to find information on learning media that students need to understand chemistry during the virtual learning process. This type of research is descriptive research to dig up information about certain phenomena. Data were obtained by using an online questionnaire containing open and closed questions. The respondents involved were high school students in grades X, XI, and XII who had done virtual chemistry lessons. The results were obtained from 52 students, as many as 60% had difficulty participating in chemistry learning, as for the other 40%. The aspects of the difficulties encountered by students are chemical formulas, chemical reactions, and also stoichiometry. A total of 34.6% strongly agree, 30.9% agree to choose smartphone-based learning media that can be accessed without reducing smartphone storage capacity.

Scope: Chemistry Education

[PSC09]
Simple Vertical Upward Motion Experiment using Smartphone based Phyphox App for Physics Learning

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Abstract. A simple experiment of vertical upward motion had been carried out using the smartphone-based Phyphox application (Phyphox app) and a ping-pong ball. A special feature of the Phyphox app utilized in this experiment was the acoustic stopwatch. This feature can measure the time duration between two sound signals using the sensor in the smartphone. This simple experiment coould be used for physics learning or practicum at the high school level. Because of its simplicity, this experiment could be conducted in long distance learning, especially in this pandemic situation. The objectives in this study were i) conducting an experiment of vertical upward motion using the Phyphox app, ii) producing a graph of the height vs time (h vs t) for the vertical upward motion of the ping-pong ball, iii) determining the acceleration of gravity (g) from the h vs t graph, and iv) determining the initial speed (v_o) of the ping-pong ball from the h vs t graph. The experiment was done by flicking the ping-pong ball from a height of h until it hit the surface of a book. The Phyphox app then measured the time of the ping-pong from being flicked until it hit the book. In this case, h was varied and the time duration of the ping-pong ball was determined. The results showed that g was obtained with a value of 10.1 m/s^2 and the v_o of the ping-pong ball was 4.2 m/s.

Scope: Pure sciences content area (all branches including interdisciplinary)

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[SE02]
ENHANCING STUDENTS CRITICAL THINKING SKILLS AND CREATIVITY IN PJBL-BASED STEM APPROACH TO BIOTECHNOLOGY ONLINE PRACTICUM IN MIPA LABORATORY IAIN SYEKH NURJATI CIREBON

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Abstract. The aim of this research is to enhance students' creativity and critical thinking skills after using a STEM approach with an online project-based practicum model on conventional Biotechnology courses. The research method uses quasi experimentation with the design of the pretest-posttest control group. The samples were randomly taken by 50 students, which was divided into experimental groups and control groups. Data collection techniques use critical thinking skills tests, questionnaires, implementation observations, performance observations and documentation.Data analysis techniques use descriptive analysis and average different tests. The conclusions of the study are: (1) The results showed a significant average difference in critical thinking skills between experimental classes and control classes after the implementation of STEM approach based on the PjBL model with classes that did not use the STEM approach based on the PjBL model in biotechnology courses in tadris Biology Department Semester 6 IAIN student Sheikh Nurjati Cirebon as evidenced by a probability value (p) of 0.015 < 0.05. (2) Creativity of students in the experimental class of the highest indicators on flexibility and original, while the lowest indicators are on the smoothness indicator

Scope: STEM Education

[SE03]
E-SMART Learning Model

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Abstract. STEM education is of global concern in preparing students to become a generation with 21st century skills. The country of Indonesia is currently focusing on implementing STEM education with various approaches, models and strategies. This study aims to describe the latest learning model with a STEM approach and project-based learning that can be applied to students, especially elementary schools. This research method is descriptive qualitative with the type of literature study from various books and journal articles. The results showed that the E-SMART Learning model is a science learning model that can be applied to elementary schools.

Scope: STEM Education

[SE04]
STEM-PBL Design to Improve Problem Solving Skill for Public Senior High School

Velinda Finka Irawan[1,a)], Warsono[2,b)], and Afif Oktavia Putri Sakti[1,c)]

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Abstract. The study attempts to: (1) find the effect of using STEM-PBL design for momentum and impuls teory (2) find the effect of using STEM-PBL design to improve problem solving skill. The sample used in this research are classes X as experiment class. The learning process is carried out using zoom meeting. The data were collected using Pre-Test and Post-Test designs. Before the learning process begins, students are given a pre-test. After the learning process is complete, student are given a post-test. The Learning Process Plan used in the learning process have been validated. The result of validated is 4.62, with very good criteria. The result of the effect using STEM-PBL design to improve problem solving skill is obtained from standard gain. Standard gain is obtained 0.3, with very low criteria. This indicates that the problem solving skill of student is increase.

Scope: STEM Education

[SE05]
THE INFLUENCE OF PROJECT-BASED LEARNING INTEGRATED SCIENCE, TECHNOLOGY, ENGINEERING, MATHEMATICS (STEM) ON THE LEARNING PROCESS

St Afifah[1,a)], Insih Wilujeng[2,b)], Vinta Angela Tiarani[3,c)], Nurfina Aznam[4,d)]

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Abstract. The integration of the Project-Based Learning (PJBL) learning model with Science, Technology, Engineering, Mathematics (STEM) is expected to improve the quality of education. This study aims to learn how to use the STEM integrated PJBL model and how the role of the integrated project-based learning (PJBL) model of Science, Technology, Engineering, Mathematics (STEM) in the learning process. The method used is a literature review by reviewing several secondary sources in the form of journals. The results of these data can be seen that the PJBL-STEM learning model applied in learning can affect students' interest in learning, understanding concepts, creative attitudes, science process skills, students' critical thinking, scientific work, learning outcomes of cognitive aspects, and psychomotor aspects, and student creativity. so it can be concluded that the PJBL-STEM learning model has a positive impact on the learning process so that it can affect success in the world of education.

Scope: STEM Education

[SE06]
Physics Guided Discovery Learning E-Module Based on STEM to Enhance Student's Learning Motivation and Creative Thinking Skill

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Abstract. The low motivation to learn and students' creative thinking skills are why this research is carried out. This study aims to produce a STEM-based particle dynamics e-module for guided discovery learning that is feasible to improve students' creative thinking skills and learning motivation. The research was conducted using the 4D Model Research and Development (R&D) method. However, this study is only limited to the development stage, which is to assess the feasibility of the e-module through a questionnaire filled out by educational experts and practitioners. This is because the research objective is limited to producing a STEM-based GDL e-module that is suitable to increase students' learning motivation and creative thinking abilities. The analysis results that have been carried out show very high criteria for all aspects of the assessment. It shows that this e-module is feasible to improve students' creative thinking skills and learning motivation.

Scope: STEM Education

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[SE07]
Physics Project Based Learning E-Module Based on STEM to Enhance Student's Creative Thinking Skills and Motivation to Learn

Irvany Nurita Pebriana [1, a)], Afrida Dwi Rahmayanti[1, b)], Narita Relly Millen [1, c)], Supahar[1, d)], and Nurulhuda binti Abd Rahman[2, e)]

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Abstract. This research aims to find out the feasibility of physics e-modules that integrate project-based learning with STEM in linear motion material. The study used a 4D method that was limited to the developing stage, which measures the feasibility of e-modules based on the results of expert and practitioner assessments. Based on the results of the data analysis obtained a score of > 3 on each aspect of assessment with a very high category both by experts and practitioners so that the e-module can be said to be feasible and suitable for use.

Scope: STEM Education

[SE08]
PBL E-Modul for Circular Motion Based on STEM to Enhance Students' Creative Thinking and Motivation Learning

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Abstract. the 21st-century skills, especially in the field of education, require greater mastery of technology. Education with a STEM approach is a learning process that integrates Science, Technology, Engineering, and Mathematics. The purpose of this study was to determine the level of validity of the STEM-based E-Module developed with the PBL learning model to improve students' creative thinking skills and learning motivation. The method used in this study was Research and Development with a 4D model which was limited to the Development stage in the assessment step. The research data was used to determine whether the e-module can be continued to the pilot stage based on the assessment of educational experts and practitioners. The results of the validity show that this e-module can be tested on students.

Scope: STEM Education