

Why Should Students Do Research?

Dr. techn. Marzuki

Department of Physics

Universitas Andalas

Seminar on Research-Inspiration, October 21, 2020



DEPARTMENT OF PHYSICS
UNIVERSITAS ANDALAS

My Research Career



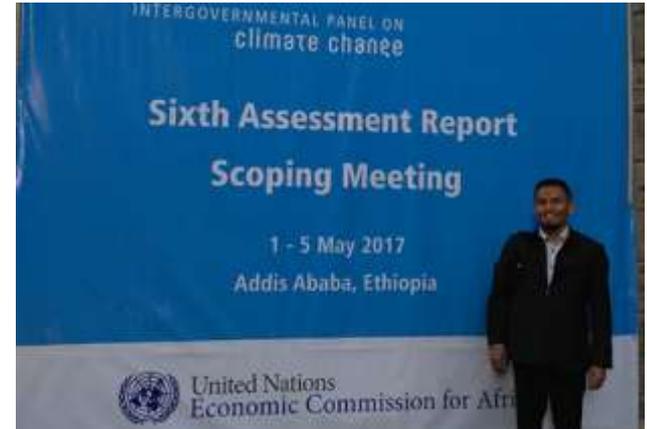
Number of article: 40
H-index : 10



Number of article: 100
H-index : 12



Number of articles: 70
Score : 23.74



Number of article
published in Q1: 11

On Going Research Project

No	Tahun	Judul Penelitian	Pendanaan	
			Sumber	Mitra
1	2020-2021 (2 tahun)	Validation of GPM Precipitation Products by Comparison with Ground-Based Observations over Indonesian Maritime Continent	World Class Research, Kemenristekdikti	LAPAN, BMKG, Leicester University, NASA
2	2020	Perbandingan Profil Arah Vertikal Distribusi Butiran Hujan dari Micro Rain Radar (MRR) dan Global Precipitation Measurement (GPM)	Penelitian Tesis Magister, Kemenristekdikti	Kyoto University, Shimane University
3	2020	Perubahan Karakteristik Profil Vertikal Awan di Indonesia dalam Kaitannya dengan Perubahan Iklim	Penelitian Tesis Magister, Kemenristekdikti	
4	2019-2021 (3 tahun)	Mechanisms of Diurnal Precipitation over Sumatra: Measurement and Climate Model Perspectives	Penelitian Dasar Kemenristekdikti	BMKG, UKM
5	2018-2020 (3 tahun)	Pengembangan Sistem Pemantau Cerdas Kebencanaan Berbasis Teknologi Internet of Things (IoT) (Co-investigator)	Penelitian Pengembangan Unggulan Perguruan Tinggi, Kemenristekdikti	Politeknik Negeri Semarang
6	2018-2020 (3 tahun)	Penerapan dan Pengembangan Metode Laser Speckle Imaging (LSI) untuk Pengukuran Curah Hujan dalam Mitigasi Kebencanaan (Co-investigator)	Penelitian Terapan, Kemenristekdikti	LAPAN
7	2018-2020 (3 tahun)	Improvement of Indonesia weather radar mosaic data and its application for development of satellite rainfall retrievals (Co-invetigator)	Fund for the Promotion of Joint International Research (Fostering Joint International Research (B)), JSPS	Kyoto University, BMKG, ITB, LAPAN

Expected Learning Outcomes (ELO) of UPP

- ELO 1: Able to acquire knowledge of fundamental laws and principles of classical and modern physics (Keywords : Fundamental Knowledge)
- ELO 2: Able to apply laws and principles of physics using experimental methods, mathematical and computational techniques to solve physical problems and related field. (Keywords : Application of Physics Knowledge and Skills)
- ELO 3 : Able to conduct experiments in physics systematically as well as to interpret data and to present result correctly. (Keywords : Experimentation Skills)
- ELO 4 : Able to plan, perform and evaluate scientific studies and research related to physics or broader areas specifically those related to the innovation of science and technology and disaster mitigation. (Keywords: Scientific Study and Research)
- ELO 5 : Able to identify, formulate, analyze and solve problem scientifically (Keywords : Critical Thinking and Problem Solving)
- ELO6: Able to function effectively in multidisciplinary teams. (Keywords: Team-working Skills)
- ELO 7: Have fundamental capability in oral and written communication both in Bahasa and in English. (Keywords : Communication Skills)
- ELO 8: Able to continuously seek and acquire contemporary knowledge, work independently and manage learning time effectively (Keywords : Lifelong Learning and Information Management)
- ELO 9: Able to practice ethical values and integrity in scientific and social interaction (Keywords : Adaptability, ethics and integrity)

10 Most Important Job Skills (2020)

1. Data Literacy
2. Critical Thinking
3. Tech Savviness
4. Adaptability and Flexibility
5. Creativity
6. Emotional Intelligence (EQ)
7. Cultural Intelligence and Diversity
8. Leadership Skills
9. Judgment and Complex Decision Making
10. Collaboration

Source: Forbes

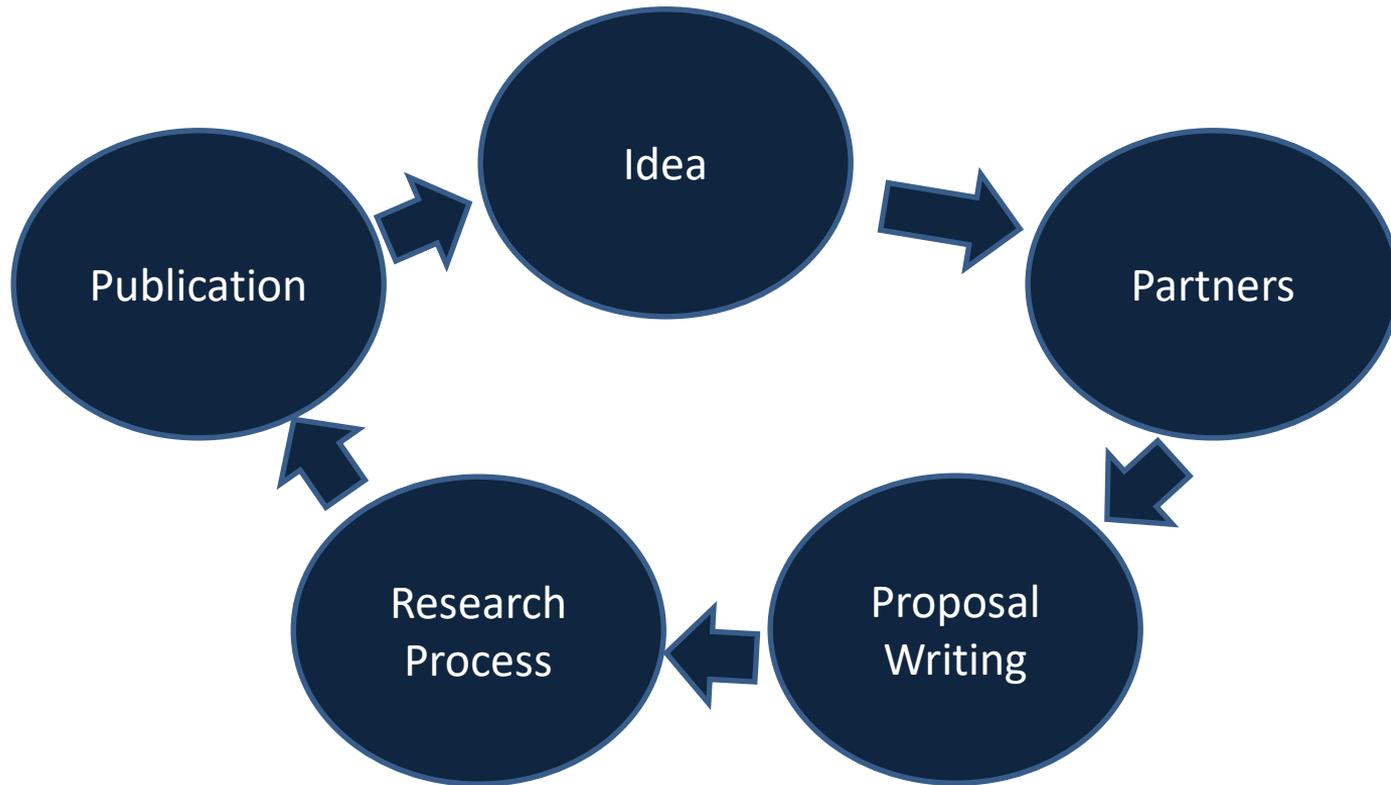
Research Benefit for Student

- Greater problem solving skills
- Better understanding of research methods
- Deeper understanding of the discipline
- Greater confidence and independence
- Better understanding of career and education path

Student who participate in research

- Are more satisfied with their college experience
- Are retained and persist at a higher rate, both at university and within their major
- Are more likely to be accepted to graduate and professional school and graduate.
- Are more competitive when searching for jobs

Research Life Cycle



Generating Research Idea

- One of the most difficult aspects of research is generating an idea
- Research idea need to be interesting and workable
- Researchers must understand what work has been done on a given area

Re + Search

You Need To Be

- Curious
- Courageous
- Creative

Two Ways of Thinking

A range of techniques can be used to find and select a topic. More frequently used techniques are:

1. Rational thinking

- Examining your own strengths and interests
- Looking at past project titles e.g., theses.
- Discussions: with friends and tutors are good sources
- Searching the literature: journals, reports, books

2. Creative thinking

- Keeping a notebook of ideas
- Exploring personal preferences using past projects
- Relevance trees: Map of issues and questions under the area of interest.
- Brainstorming: problem-solving: list issues, problems and questions from the broad area

Using both techniques is recommended

SCAMPERR

- S = Substitute
- C = Combine
- A = Adapt
- M = Modify
- P = Put to other use
- E = Eliminate
- R = Reverse
- R = Rearrange

Re + Search

SCAMPERR

- **Substitute**: Remove some parts of the accepted situation, thing, or concept and replace it with something else
- **Combine**: Join, affiliate, or force together two or more elements of your subject matter and consider ways that such a combination might move you toward a solution
- **Adapt/Adjust**: change some part of your problem so that it works where it did not before
- **Modify**: Consider many of the attribute of the thing you're working on and change them, arbitrarily, if necessary. Attributes include: size, shape, other dimensions, texture, colour, attitude, position, history, and so on

SCAMPERR

- **Put other use**: modify the intention of the subject. Think about why it exists, what it is used for, what it's supposed to do. Challenge all of these assumptions and suggest new and unusual purposes.
- **Eliminate**: arbitrarily remove any or all elements of your subject, simplify, reduce to core functionality
- **Reverse/Rearrange**: Change the direction of orientation. Turn it upside-down, inside-out, or make it go backwards, against the direction it was intended to go or be used.

What Blocks Creativity

- Fear of Failure
- Allergy to Ambiguity
- Conformity
- Resource Myopia
- Rigidity

Steps of generating research ideas

- Do some background reading
- Start narrowing down your area
- Mapping ideas
- Refining the ideas
- Researching the main ideas through literature review
- Taking notes and deciding the topic
- Examining originality

Re + Search

Ideas are cheap and don't get too hung over by them

Generate as many ideas as possible and forget about constraints first

Sources

Observation

Decision Dilemma

Academic Experience

Daily Experience

Field Situations

Reading

Consultations

Brain Storming

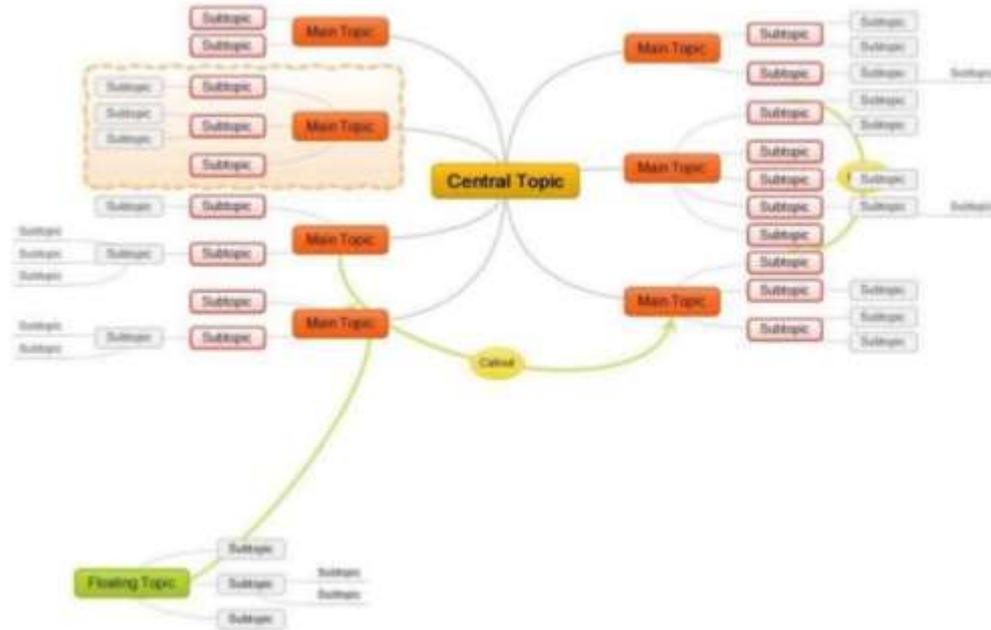
Research

Intuition

Translating Idea To Research

- For the idea to develop; research idea should be of genuine interest to researcher.
- it's not possible to have a research question in mind and not be curious at the same time
- After you come up with an idea, you need to decide on what aspects of that idea you will emphasize

Organizing the Idea



Criteria for Selecting Research Topic (FINER)

- **F**easible
 - adequate number of subjects/technical expertise
 - affordable in time and money/manageable in scope
- **I**nteresting to the investigator
- **N**ovel
 - confirms or extends previous findings
 - provides new findings
- **E**thical
 - acceptable physical risks or secured privacy
- **R**elevant
 - to scientific knowledge
 - to clinical and health policy
 - to future research direction

Include **SMART** Personal objectives

- S**pecific
- M**easurable
- A**chievable
- R**ealistic
- T**imely

Factors Critical to Successful Undergraduate Research

- Start early
 - Know your foundational knowledge and skills
 - Let passion guide your research interests and goals
 - Build positive relationships with your lab colleagues
 - Keep an open mind and do not be afraid to ask questions
 - Foster open communication with your research mentor and maintain a work/life balance
 - Learn research by doing it
 - Be organized
 - Find opportunities to present your work
 - Keep up with the scientific literature
- (Yu and Kuo, PLoS Comput Biol., 2017)

Benefits of Publishing for Students

1. To assist improve writing and research skills.
2. To experience the scholarly publication process.
3. To attach with professors and researchers.
4. To display leadership and initiative.
5. To professionalise the undergraduate experience.
6. To tell a future career path.

research isn't done until it's published

Benefits of Publishing for Students



UNIVERSITAS GADJAH MADA

Bulaksumur, Yogyakarta 55281 Telp. +62 274 588688, +62 274 562011 Fax. +62 274 565223

<http://ugm.ac.id>, E-mail: setr@ugm.ac.id

PENGUMUMAN

Nomor: 5822/UN1.P.IV/SDM/PR/2020

TENTANG

**SELEKSI PENERIMAAN DOSEN TETAP NON PNS
DI LINGKUNGAN UNIVERSITAS GADJAH MADA
TAHUN 2020**

4. Membuat surat pernyataan kesanggupan apabila diterima dan diangkat menjadi Dosen Tetap UGM segera melanjutkan studi Doktor/Spesialis 2 maksimal 3 (tiga) tahun sejak diangkat menjadi Dosen Tetap;
5. Memiliki publikasi pada jurnal nasional terakreditasi atau jurnal internasional bereputasi.

Steps for Cultivating Successful Student Research

- 1) Start strong: jointly design clear, established goals and metrics for feedback (that advance *their* careers)
- 2) Put yourself in their shoes (acknowledge limitations)
- 3) Treat all students like colleagues
- 4) Actively mentor students
- 5) Be willing to put in a little extra
- 6) Give undergraduates the opportunity to be first author

“Tell me and I forget. Teach me and I remember. Involve me and I learn”. Benjamin Franklin

Thank You

Q/A