



SCIENCE
TECHNOLOGY
ENGINEERING
MATHEMATICS

TEACHER EDUCATION IN
INDONESIA

Country Profile of Indonesia and Science Curriculum in Indonesia

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My Publications

- Zidny, R, Fadhilah, GA, Melda, GE, Sholihah, II, Widiastuti, NL, Haerunnisa, N and **El Islami, RAZ.** (2019). Simple and Low-Cost Chemical Experiment Kits to Observe the Concept of Gas Laws. *Jurnal Penelitian dan Pembelajaran IPA.* **5** (1): 16-25. **(Web of Science Indexed)**
- Parmin, P., Nuangchalerm, P., and **El Islami, RAZ.** (2019). Exploring the Indigenous Knowledge of Java North Coast Community (Pantura) Using the Science Integrated Learning (SIL) Model for Science Content Development. *Journal for the Education of Gifted Young Scientist.* **7** (1): 71-83. **(Scopus Indexed)**
- **El Islami, R.A.Z.,** IJ Sari, S Sjaifuddin, M Nurtanto, M Ramli, and A Siregar. (2019). An Assessment of Pre-service Biology Teachers on Student Worksheets Based on Scientific Literacy. *Jornal of Physics: Conferences Series.* **1151** (1): 1-5 **(Scopus Indexed and Web of Science Indexed)**
- Nurtanto, M., Fawaid, M , Nurhaji, S , Kholifah, N , Hamid, M.A., Purmadi, A , Yasdin, Sukmara, S, Widjanarko, D., **El Islami, R.A.Z,** Handoyono, N. A, Rabiman (2019). [Information media literacy to improve working concept comprehension of ignition system with contact breaker through problem based learning.](#) Proceedings of International Conference of Social Science 2018. ICOSS 2018, September 21-22, Denpasar, Indonesia. **(Scopus Indexed)**
- **El Islami, R. A. Z.,** Nuangchalerm, P., Sjaifuddin, S. (2018). Science Process of Environmental Conservation: A Cross National Study of Thai and Indonesian Pre-Service Teachers. *Journal for the Education of Gifted Young Scientist.* **6** (4): 72-80. **(Scopus Indexed)**
- Nuangchalerm, P., and **El Islami, R.A.Z.** (2018). Context of Science on Environmental Conservation: Comparative Study between Thai and Indonesian Novice Science Teacher Students. *Jurnal Penelitian dan Pembelajaran IPA.* **4**(1): 60-67. **(Index Copernicus International Indexed)**
- Nuangchalerm, P., and **El Islami, R.A.Z.** (2018). Comparative study between Indonesian and Thai Novice Science Teacher Students in Content of Science. *Journal for the Education of Gifted Young Scientist.* **4**(1): 60-67. **(Scopus Indexed)**
- Saefullah, A., Rakhmawan, A., Samanhudi, U., Nulhakim, L., Berlian, L., Rohimah, B., **El Islami, R. A. Z.** (2017). [Efforts to Improve Scientific Literacy of Students through Guided Inquiry Learning Based on Local Wisdom of Baduy's Society.](#) *Jurnal Penelitian dan Pembelajaran IPA.* **3**(2): 84-91. **(Index Copernicus International Indexed)**
- **El Islami, R.A.Z.,** Nahadi, Permanasari, A. (2016). MEMBANGUN LITERASI SAINS SISWA PADA KONSEP ASAM BASA MELALUI PEMBELAJARAN INKUIRI TERBIMBING. *Jurnal Penelitian dan Pembelajaran IPA.*



Education System in Indonesia

- Education System in Indonesia Divided to:
 1. Formal Education
 2. Nonformal Education
 3. Informal Education



Formal Education in Indonesia

- Formal Education Divided to:
 1. Basic Education
 2. Middle Education
 3. Higher Education



Basic Education

- Basic Education divided to:

- Elementary School
- Junior High School

- Elementary School consist of 6 levels:

1st Grade

2nd Grade

3rd Grade

4th Grade

5th Grade

6th Grade

Science integrated in Indonesian Language Subject on theme

Science as subject

- Junior High School consist of 3 levels:

7th Grade

8th Grade

9th Grade

Science as subject



Middle Education

1. Senior High School

- Senior High School consist of 3 levels:

10th Grade

11th Grade

12th Grade

Science divided to; Chemistry Subject, Physics Subject, and Biology Subject

2. Vocational High School

10th Grade

11th Grade

12th Grade

Science as subject in some Vocational High Schools



Higher Education

- Higher Education divided to:
 1. Diploma (For Vocational Education)
 2. **Bachelor** (For Academic Education)
 3. **Master** (For Academic Education)
 4. Spesialis/Profesional Education (For Profesional; teacher, doctor, dentist, lawyer, accountant, Notary Public, etc)
 5. **Doctoral** (For Academic Education)



Science Education in Higher Education

- Science Education in Higher Education Consist of:
 1. Bachelor Program in Science Education
 2. Master Program in Science Education
 3. Doctoral Program in Science Education



TEACHING LEARNING OUTCOMES

- Indonesia has Curriculum 2013
- The curriculum objectives include four competencies:
 1. Spiritual Attitude Competence
 2. Social Attitudes Competence
 3. Knowledge Competence
 4. Skills Competence

For Spiritual Attitude Competence (1), Social Attitudes Competence (2) achieved by indirect teaching such as; exemplary, Habits, School Culture.



Example of Science Curriculum at 7th grade

Core Competence 3 (Knowledge)	Core Competence 4 (Skills)
3. Understanding knowledge (factual, conceptual, and procedural) based on the curiosity about science, technology, art, cultural related phenomena and the occurrence of visible eyes	4. Trying, processing, and presenting in the concrete aspect (using, parsing, stringing, modifying, and making) and abstract aspect (writing, reading, counting, drawing, and composing) in accordance with what is learned in school and other sources that are the same in point of view / theory
Basic Competence 3.1	Basic Competence 4.1
3. 1 Implement the concept of measuring various quantities using standard units (standard)	4. 1 Presenting measurement data with appropriate measuring instruments on yourself, other living things, and objects around using standard units and standard units



TEACHER RESOURCES FOR ASSESSMENT



- Technical Guidelines for Assessment of Learning Outcomes Based on Curriculum 2013 (Ministry of Education and Culture of Republic of Indonesia) pages 65
- Silabus Model of the Junior High School/Madrasah Tsanawiyah (Ministry of Education and Culture of Republic of Indonesia) pages 78



SCIENTIFIC PRACTICES

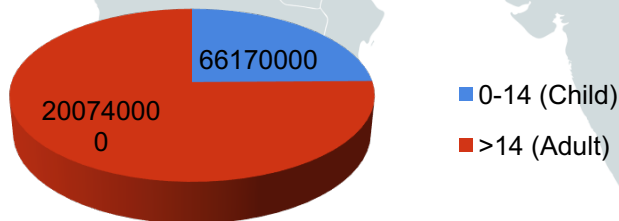
1. Live life with a positive, honest and open attitude; with the power of thought critical, creative and innovative; and collaborating, based on the nature of science
2. Understanding natural phenomena around it, based on the results of learning science nature in an integrated manner through its specific fields ; Physics, Chemistry and Biology
3. Evaluate existing thinking products in the community based on principles of natural science and ethics
4. Solve problems and make decisions in life based on scientific and ethical principles
5. Recognize and play a role in efforts to solve human problems, such as the problems of food availability, health, energy crisis, and living environment .
6. Understand the impact of the development of natural science in an



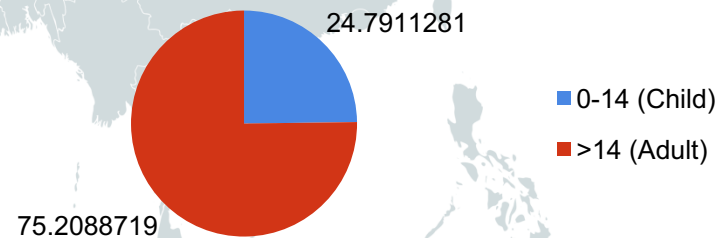
Demographics

- Based on survey in year 2015, the prediction number of Indonesian citizen in year 2019 is 266,910,000 people (Bappenas, 2019).
- 0-14 years (child) is 66,170,000 or 24.8% from total population. (Bappenas, 2019).

Number

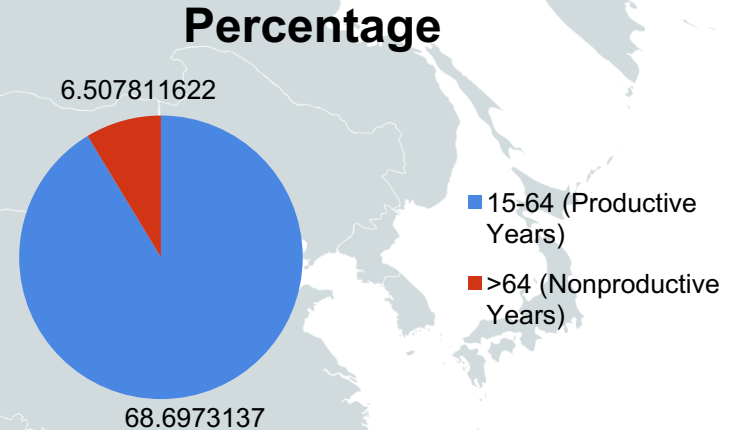
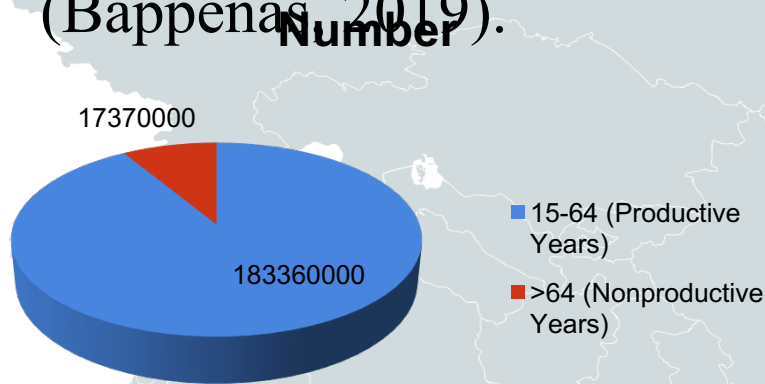


Percentage

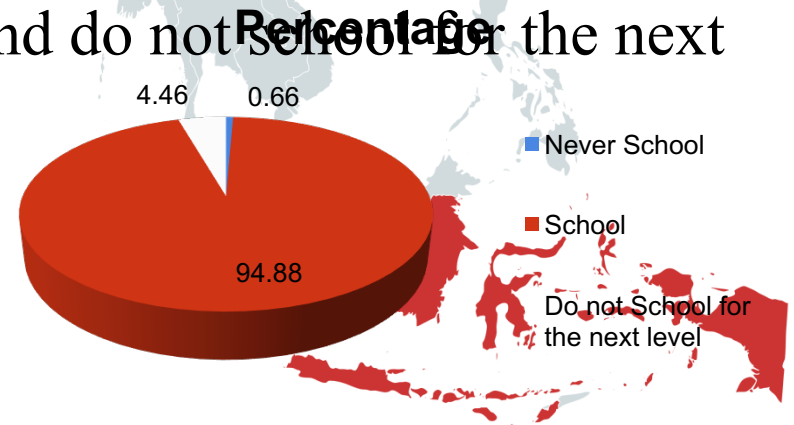




- The citizen between 15-64 years (Productive years) is 183,360,000 people or 68.7%, and > 65 years (Non-productive years) is 17,370,000 or 6.51% from total population (Bappenas, 2019).



- In year 2016 the citizen between 13-15 years who never school is 0.66%, who school 94.88% and do not school for the next level 4.46% (BPS, 2017)





Structure of Ministry of Education in Indonesia

- **Ministry of Education and Culture** with role to organize the early childhood education, basic education, middle education, community education, and management of culture to help President in organizing the nation.



- **Ministry of Research, Technology, and higher education** with role to organize research, technology, and higher education to help President in organizing the nation.



Religious Education

Ministry of Religious Affairs with role to organize religious aspect to help President in organizing the nation.

Ministry of Religious Affairs with role to organize the religious education in Islam, Protestant, Katolik, Hindu, Buddha, and Khonghucu.



Vocational Education

- Some Vocational Education Schools are organized by other ministry
- However the main ministry which organized all educations in Indonesia are **Ministry of Education and Culture** for basic and midle education and **Ministry of Research, Technology, and higher education** for higher education



Teacher Training in indonesia

Since 2017 to become a teacher;

- Have a Bachelor Degree in Education (S.Pd) or Bachelor Degree non-Education in 4 years
- Have a sertificate from Teacher Profesional Education (PPG) in one year

Or through Feasibility and Equality Test by University which selected by Ministry



Requirement of science teacher

Since 2017 to become a science teacher;

- Have a Bachelor Degree in Science Education/Physics Education/Biology Education/Chemistry Education (S.Pd/B.Ed) or Bachelor Degree non-Education; Physics/Biology/Chemistry (S.Si/S.Sc.) in 4 years
- Have a sertificate from Teacher Profesional Education (PPG) in one year

Or through Feasibility and Equality Test by University which selected by Ministry





Preservice Science Teacher

- Graduated from Senior High School
- Passed the national selection to university



PISA

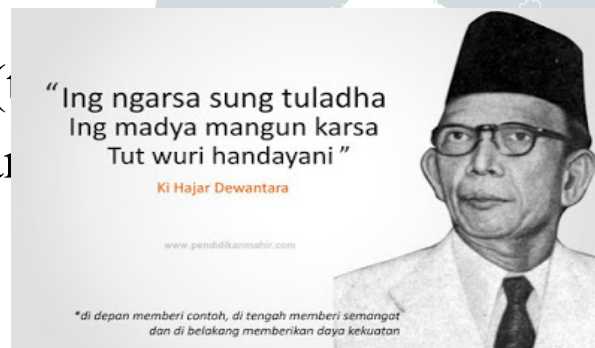
Scientific Literacy of Indonesian Students in PISA 2000-2015





Cultural Beliefs; the role of Education in every day life

- > 87% citizen in Indonesia (222,000,000 people) are muslims, they believe that Education is in long time and education must be carried out (al-Qur'an and ash-Sunnah)
- Some Indonesian people believe that education is investment for better future
- Many Indonesian people believe that education are;
 1. Ing Ngarsa Sung Tuladha (the one in front sets example).
 2. Ing Madya Mangun Karsa (the one in the middle builds the spirit and encouragement).
 3. Tut Wuri Handayani (the one in the back gives support)
(Ki Hajar Dewantara's motto in Indonesia)





Science in Everyday Life





Science in Everyday Life

- Many Indonesian people or Indonesian students do not realize that there are many scientific aspects in everyday life
- Indonesia is the largest archipelago country
- Many new living things in the sea that have not been explored
- Many natural objects can be explored in Indonesia to promote in science learning



STEM in Everyday life

- Many Indonesian people or Indonesian students do not understand about STEM Education in everyday life.
- Few studies about STEM Education in Indonesia



Curriculum in school

- Year 2004 Kurikulum Berbasis Kompetensi (KBK)
- Year 2006 Kurikulum Tingkat Satuan Pendidikan (KTSP)
- Year 2013 Curriculum 2013 (K-13)
- Indonesia has a new curriculum in 2013 or K-13. In K-13 teachers use the scientific approach in learning especially in science learning. The regulation of ministry of education year 2016 describes the scientific approach as observing, questioning, experimenting, associating and communicating. Learning process by scientific approach in Indonesia's school with K-13 make the learning process oriented to recognise scientific issues, it can be explored scientifically and recognise the key features of a scientific investigation
- Curriculum 2013 has revised in year 2016
- Curriculum 2013 has been revised in year 2017
- The implementation of Curriculum 2013 which revised year 2017 for all schools in Indonesia conducted in year 2018



Implementation of K-13

- Alawiyah (2016) explain that obstacles experienced by teachers in one of the school is the many aspects that must be assessed in the assessment of K-3, the assessment is done simultaneously with the learning process, thus making the learning process becomes less effective and the teachers feel burdened because they have to add up the value of each student as a whole and then describe the value obtained per subject



Aplicability of STEM in daily life

- Many Indonesian people or Indonesian students do not understand about STEM in everyday life.
- Many natural objects can be explored in Indonesia to promote in STEM Learning



How does the government promote STEM (economics)

- Education and Training STEM Integrated in Implementation Curriculum 2013 on 24 May 2018
<https://p4tkipa.kemdikbud.go.id/berita/detail/diklat-integrasi-stem-dalam-implementasi-k13>

Other

- Opinion in mass media from scientist
<https://www.google.com/amp/s/m.republika.co.id/amp/nkvou7>
- Some Universities organize the international conference on STEM Education Theme
<https://conference.urpiuinradenintan.org/>
- Researchers do study about STEM Education by, many research about STEM as approach in science learning



Several studies about STEM Education in Indonesia

The Effect of STEM-Based Worksheet on Students' Science Literacy

2018



Sulistiyowati Sulistiyowati, Abdurrahman Abdurrahman, Tri Jalmo

- The results showed that the application of STEM-based worksheet could effectively increase the science literacy with N-gain of 0.43 (medium category).
- The highest increase was in the indicator of "explains the science phenomenon" and the lowest was on the "drawing conclusions" indicator.
- The results of the students' questionnaire responses after using the developed worksheet was 92,73 (very high category).
- This means that the developed students' worksheets effective in increasing science literacy.

Designing an Inquiry-based STEM Learning strategy as a Powerful Alternative Solution to Enhance Students' 21st-century Skills: A Preliminary Research

2019

Abdurrahman¹, F Ariyani¹, A Achmad¹ and N Nurulsari¹



- We conduct a cross-sectional non-experimental descriptive survey approach using questionnaire to 75 teachers in Lampung, Indonesia.
- Based on data analysis, it indicated that all of the teachers realized about the importance of STEM in education and career dimension and they should take a part in overcoming the 21st-century challenges.

Future Physics Learning Materials Based on STEM Education: Analysis of Teachers and Students Perceptions 2019



Widayanti¹, Abdurrahman¹ and A Suyatna¹

- The results showed that to support STEM learning in national curriculum needed teaching materials to include lesson plans, books, animation, stimulation, and video.
- In the national curriculum, the teacher has not started STEM-based teaching materials. So in the future, there needs to be the development of STEM-based teaching materials to support the national curriculum that is designed to the maximum.



THE IMPLEMENTATION OF SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS (STEM) APPROACH FOR IMPROVING MULTIPLE-REPRESENTATION SKILL OF SENIOR HIGH SCHOOL STUDENT ON NEWTON'S LAW ABOUT MOTION

Karlina Maya Mulyana, Abdurrahman Abdurrahman, Undang Rosidin
2018

- it was known that control class had N-gain average score in the amount of 0,55, while the experiment class had N-gain average score in the amount of 0,63.
- Based on T Test result analysis showed that there was difference of N-gain average score of students' multiple-representation skill between experimental class and control class.
- Students who learned with the STEM approach have significantly better of multiple-representation skill than those who learned with the scientific approach

The Effectiveness of Applying STEM Approach to Self-Efficacy and Student Learning Outcomes for Teaching Newton's Law 2018



Irmawati Ibnah Muthi'ik, Abdurrahman, Undang Rosidin

- Based on the research above, the average value of Ngain in self efficacy and students' learning outcomes before and after being taught through learning using the STEM approach
- The average gain of n gain in self efficacy and students' learning outcomes have increased with the moderate category
- The result showed that STEM learning approach was effective to improve self- efficacy and student's learning outcomes

Design and Validation of Inquiry-based STEM Learning Strategy as a Powerful Alternative Solution to Facilitate Gifted Students Facing 21st Century Challenging 2019



Abdurrahman¹ , Farida ARIYANI² , Hervin MAULINA³ , and Novinta NURULSARI⁴

- In a field study of an inquiry-based STEM learning strategy, we examine the design and operational characteristics that were important for the expressive role of the learning strategy.
- The pilot study indicated that the inquiry-based STEM learning strategy could improve gifted students' abilities in accordance with 21st century learning frameworks.
- The results of teacher perception saw the excellent potential on the application of STEM, because the teacher's perception leads to the conclusion that STEM must be applied and developed in the dimensions of education and career.
- However, it still seems that there were some respondents' perceptions that lead to negative responses, respondents assumed that STEM education did not need to be applied because of minimal urgency, wasting time in its application, and disinterest.

Student's STEM Literacy in Biotechnology Learning at Junior High School 2017



N Nurlaely^{1,2}, A Permanasari¹ and R Riandi¹

- The results show that student's STEM literacy achievement was low.
- Science literacy aspect was the lowest, while mathematical literacy gained better than another aspect.
- The low achievement of students' STEM literacy was because of learning activities that have not been able to integrate science, technology, engineering, and mathematics in science learning.
- The literacy profile indicates the importance of applying STEM approach to science learning, and it is recommended to improve students' STEM literacy

Efektivitas virtual lab berbasis STEM dalam meningkatkan literasi sains siswa dengan perbedaan gender

2016



Ismail Ismail, Anna Permanasari, Wawan Setiawan

- The results showed that there are differences the resulting increase inscientific literacy class students women (7B) of 0.46 and a class of men (7D) of 0.29 with both of them in the medium category.
- The value of effect size using STEM-based virtual lab on the science content domain and competencies of 0.39 with the moderate category and attitude domain of 0.75 to a high category.
- <https://journal.uny.ac.id/index.php/jipi/article/view/8570/9023>

SCIENCE TECHNOLOGY ENGINEERING AND MATHEMATICS (STEM) EDUCATION APPROACH AGAINST A MICROSCOPIC REPRESENTATION SKILL IN ATOM AND MOLECULE CONCEPT



2018

Asih Widi Wisudawati

- STEM Education can improve students' microscopic representation skill from 30.18 to 54.62 in average score and based on student result in painting molecule with ChemDraw and Avogadro's application, there are a lot of improvement in understanding concept.

Integrating STEM (Science, Technology, Engineering, Mathematics) and Disaster (STEMD) Education for Building Students' Disaster Literacy

2015

Pandu J. Sampurno, Yessi A. Sari, and Agusta D. Wijaya



- Indonesia is risk of many disasters e.g. earthquake, tsunami, volcanic eruption, and flood. Through STEM-D students are taught the relation between STEM concepts and disasters occur in Indonesia. The six steps of STEM-D are observing, identify and planning, discussion, question and answer, elaboration, and reflective.



Career motivation of secondary students in STEM: a cross-cultural study between Korea and Indonesia

2018

Sein Shin¹ • Arif Rachmatullah² • Fenny Roshayanti³ •

Minsu Ha² • Jun-Ki Lee¹

- To test for differences, we used Rasch analysis, 3-way ANOVA, correlation analysis, and multiple group path analysis.
- STEM career motivation was found to be significantly affected by interactions between country, gender, and educational level.
- Overall, Indonesian students had more STEM career motivation than Korean students.
- Korean students showed larger gender differences in STEM career motivation than Indonesian students.

IMPLEMENTASI LKS DENGAN PENDEKATAN STEM (SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS) UNTUK MENINGKATKAN KEMAMPUAN BERPIKIR KRITIS SISWA



2018

Diyah Ayu Budi Lestari* , Budi Astuti, Teguh Darsono

- Result of the n-gain test pretest-posttest scores around 0.5 (medium level categorized). The highest improvement is 0.9 at evaluation aspect and lowest increase is 0.3 at interpretation aspect.

Students' Attitudes towards STEM Education: Voices from Indonesian Junior High Schools

2016

Nadi SUPRAPTO



- The results indicated that, first, the instrument used in this study had satisfactory validity and reliability.
- The construct validities of the AT-STEM were varying from .60 and .96 and explained 86.84% of the variance.
- Overall, the Cronbach's alpha coefficient of the instrument was .94. Second, the dimension of Mathematics came in the first rank and followed by Science as well as the degree of attitudes towards STEM. Last, the results also showed a significant interrelationship among dimensions of attitudes towards STEM.



Thank you so much