ISSN
2338-0128

PROCEEDINGS BOOK

THE 8th ANNUAL BASIC SCIENCE INTERNATIONAL CONFERENCE

6-7 March 2018
Ijen Suites Hotel Resort & Convention
Malang, Indonesia

Convergence of Basic Sciences, Toward the World's Sustainability Challenges

Topics

Energy
Environmental Science and Technology
Instrumentation and Measurement
Material Science and Technology
Mathematics, Statistics, and Modelling
Molecular and Health Science
Science and Technology Education

UNIVERSITAS BRAWIJAYA

2018 BaSiC

The 8th Annual Basic Science International Conference

Convergence of Basic Sciences, Toward the World's Sustainability Challenges

6 -7 March 2018

Ijen Suites Resorts & Convention

Malang, East Java

Indonesia

Proceedings Book

Topics:

1. Energy
2. Environmental Science and Technology
3. Instrumentation and Measurement
4. Material Science and Technology
5. Mathematics, Statistics, and Modelling
6. Molecular and Health Science
7. Science and Technology Education

Brief Contents

BRIEF CONTENTS i

ABOUT BaSIC ii

WELCOME MESSAGE iii

BaSIC 2018 COMMITTEE v

CONFERENCE VENUE xi

SCHEDULE xii

TABLE OF CONTENTS xiv

KEYNOTE AND INVITED SPEAKERS 1

SCIENTIFIC PAPERS

A. ENERGY 11

B. ENVIRONMENTAL SCIENCE AND TECHNOLOGY 47

C. INSTRUMENTATION AND MEASUREMENTS 153

D. MATERIAL SCIENCE AND TECHNOLOGY 206

E. MATHEMATICS, STATISTICS, AND MODELLING 285

F. MOLECULAR AND HEALTH SCIENCE 433

G. SCIENCE AND TECHNOLOGY EDUCATION 526

Copyright © The Annual Basic Science International Conference

About BaSIC

The Annual Basic Science International Conference (BaSIC) is an annual scientific meeting organized by Faculty of Science, Brawijaya University, Indonesia. This meeting aimed to promote mutual exchange between scientists and also experts, to discuss innovative ideas in scientific research, and to tackle contemporary problems through the application of knowledge that rise from science. The scope of this conference is fundamental and applied research in chemistry, biology, physics, and mathematics. The origin of this conference was initiated in year 2000, by the Faculty of Science of Brawijaya University, under the name of Seminar Nasional Kemipaan (National Science Conference). Since then, the conference has been organized regularly on annual basis. In 2004, the conference changed its name to Basic Science Seminar (BSS) and started to invite international speakers and participants. The conference then expands its scope to international in 2011 and formally adopting the current name. The last Annual Basic Science International Conference was organized successfully on March 7-8th, 2017 at Ijen Suites Hotel Resort and Convention, Malang with participants from many countries including Australia, Switzerland, Japan, and Germany.

Currently, the 8th Annual Basic Science International Conference 2018 (8th BaSIC 2018) has been held on March 6-7th, 2018 at Ijen Suites Hotel Resort and Convention, Malang. The recent theme of the 8th BaSIC was "Convergence of Basic Sciences, toward World's Sustainability Challenges" which covered broad range of basic science research. This particular theme was intended to promote convergence science as a transformative trend to address the global challenges, such as ensuring energy, health, water resources and food security in a sustainable world. This international forum also provided a platform where national and international academia or researchers, policy makers, and other stakeholders to translate technology, exchange ideas, and help stimulate multidisciplinary international collaborations in a convergent-manner for shaping a worldwide sustainable development. It was worth noting that, the 8th BaSIC event genuinely highlights the important of convergence of basic science research to address world's sustainability challenges.

Objectives

- To gain insights on current trends in basic science research and education, such as the contribution of interdisciplinary approaches to solve
- To enhance multidisciplinary collaborations among scientists and relevant stakeholders in a convergent-manner for shaping a worldwide sustainable development

Copyright © The Annual Basic Science International Conference

Welcome Message from the Dean of Mathematics and Natural Sciences

Assalamu'alaikum warohmatulloohi wabarokaatuh

On behalf of the Dean of Faculty of Mathematics and Natural Sciences, Universitas Brawijaya, I would like to extend my warmest welcome to all delegates from all over the world. Welcome to Malang, where Malang is one of the educational city in Indonesia. There are about 40 Universities in Malang, States and Privates. One of it is Universitas Brawijaya, the top ten University in Indonesia. Malang, which is about more than 400 meters above sea level, has many tourist destinations, highlands, mountains, some natural beaches, and other. Malang is like a bowl, surrounded by some volcanoes in the east (Semeru and Bromo), west (Kawi and Kelud) and north (Arjuna and Welirang Complex), and in the south are coastal areas, where we have many beautiful new opening beaches.

We are very pleased to welcome you in the proceedings book of the 8th Annual Basic Sciences International Conference 2018. This proceedings is one of the continuations for the conference. Based on these papers, hopefully, more collaborations can be initiated or should be followed up between us. I would like to express my gratitude to all of the participants, keynote and invited speakers as well. Many thanks also go to the reviewers and the editorial team for their big effort in supporting this proceedings book. Last but not least, my big appreciation to the steering and organizing committees, in realizing this proceedings book.

Thank you
Wassalamu 'alaikum wr wb.

Adi Susilo, P.hD
Dean Faculty of Mathematics and Natural Sciences,

Copyright © The Annual Basic Science International Conference

Welcome Message from the Chairman of BaSIC 2018

On behalf of the organizing committee, it is a great pleasure to welcome all the participants, delegates and keynote speakers to the 8th Basic Science International Conference (BaSIC) 2018 at the Ijen Suites Hotel Resort and Convention in Malang, Indonesia. Taking place every year, the theme of this year's conference is "Convergence of Basic Science, toward World's Sustainability Challenges" which covers broad range of basic science research.

This particular theme is intended to promote convergence science as a transformative trend to address the global challenges, such as ensuring energy, health, water resources and food security in a sustainable world. This international forum also provides a platform where national and international academia or researchers, policy makers, and other stakeholders to translate technology, exchange ideas, and help stimulate multidisciplinary international collaborations in a convergent-manner for shaping a worldwide sustainable development. It is worth noting that, the 8th BaSIC event genuinely highlights the important of convergence of basic science research to address world's sustainability challenges.

This conference has been participated by almost 500 participants. The conference scientific board has accepted 380 papers to be presented either oral or poster presentation. The organising committee is gratified to have a total of 108 full-papers submitted to this proceedings book either from students (bachelor and postgraduates), academic staff (lecturers) or researchers. We would like to acknowledge the terrific support of proceedings editorial team and reviewers in managing this proceedings book. We also would like to thank all participants who present their academic works in the 8th BaSIC 2018, and especially to our distinguished keynote and invited speakers for their collaboration and contribution for the success of the 8th BaSIC 2018.

Sincerely,

Yoga Dwi Jatmiko, M.App.Sc., Ph.D
Chairman of BaSIC 2018

Copyright © The Annual Basic Science International Conference

BaSIC 2018 Committee

Steering Committee

Prof. Dr. Ir. Mohammad Bisri, M.S.
Rector, Universitas Brawijaya

Drs. Adi Susilo, M.Si., Ph.D
Dean, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Dr. Serafinah Indriyani, M.Si
Vice Dean I, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Sukir Maryanto, S.Si., M.Si., Ph.D
Vice Dean II, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Darjito, S.Si., M.Si.
Vice Dean III, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Advisor

Dr. Ir. Moch. Sasmito Djati, M.S.
Vice Rector IV, Universitas Brawijaya

Luchman Hakim, S.Si., M.Agr.Sc., Ph.D
Head of Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Drs. Hari Arief Dharmawan, M.Eng., Ph.D
Department of Physics, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Organizing Committee

Yoga Dwi Jatmiko, S.Si., M.App.Sc., Ph.D
Chairperson
Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Ellya Indahyanti, S.Si., M.Eng.
Vice Chairperson
Department of Chemistry, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Dr. Sri Widyarti, M.Si
Secretary
Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Zulfaidah Penata Gama, S.Si., M.Si., Ph.D
Treasurer
Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Eka Ernawati
Treasurer
Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Wuri Fitriani Utami, S.E., M.M.
Treasurer
Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Copyright © The Annual Basic Science International Conference

Irfan Mustafa, S.Si., M.Si., Ph.D.
Secretariat Coordinator
Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Muhammad Yusuf, S.Si., M.Si.
Secretariat
Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Hamdani D. Prasetyo, S.Si., M.Si.
Secretariat
Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Dr. Eng. Agus Naba, M.T.
Web Administrator
Department of Physics, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Husnin Kholidah, S.Kom
Web Administrator
Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Tri Ardyati, M.Agr., Ph.D.
Program Division Coordinator
Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Dra. Sri Wardhani, M.Si.
Program Division
Department of Chemistry, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Dra. Gustini Ekowato, M.Ling
Banquet Division Coordinator
Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Dra. Nanik Dwi Rahayu
Banquet Division
Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Setiyawati, S.Si.
Banquet Division
Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Drs. Sofy Permana, M.Sc., D.Sc.
Transportation and Equipment Division Coordinator
Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Purnomo, S.Si., M.Si.
Transportation and Equipment Division
Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Ismail Marjuki
Transportation and Equipment Division
Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Copyright © The Annual Basic Science International Conference

Kusnu
Transportation and Equipment Division
Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Sukarman, S.H.
Transportation and Equipment Division
Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Muh. Hasan Muhajir, S.T.
Transportation and Equipment Division
Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Suliono
Transportation and Equipment Division
Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Agung Kurniawan
Transportation and Equipment Division
Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Saiful Bakhri
Transportation and Equipment Division
Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Djoema'ali, S.E.
Documentation Division
Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Tri Wahyu Basuki, S.E.
Documentation Division
Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Nia Kurniawan, S.Si., M.P., D.Sc.
Funding Division
Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Drs. Johan Andoyo Effendi Noor, M.Sc., Ph.D.
Funding Division
Department of Physics, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Chomsin Sulistya Widodo, S.Si., M.Si., Ph.D.
Funding Division
Department of Physics, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Prof. Dr. Marjono, M.Phil.
Funding Division
Department of Mathematics, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Rodliyati Azrianingsih, S.Si., M.Sc., Ph.D.
Scientific Administration Division (Proceeding)
Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Copyright © The Annual Basic Science International Conference

Mauludi Ariesto Pamungkas, S.Si., M.Si., Ph.D.
Scientific Administration Division Coordinator (Proceeding)
Department of Physics, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Anna Safitri, S.Si., M.Sc., Ph.D.
Scientific Administration Division (Proceeding)
Department of Chemistry, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Nurjannah, S.Si., M.Phil., Ph.D.
Scientific Administration Division (Proceeding)
Department of Statistics, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Corina Karim, S.Si., M.Si., Ph.D.
Scientific Administration Division (Proceeding)
Department of Mathematics, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Local Scientific Committee

Dr. Dra. Catur Retnaningdyah, M.Si.
Scientific Division Coordinator
Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Prof. Sutiman B. Sumitro, SU., D.Sc.
Scientific Division
Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Prof. Dra. Fatchiyah, M.Kes., Ph.D.
Scientific Division
Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Amin Setyo Leksono, S.Si., M.Si., Ph.D.
Scientific Division
Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Ir. Retno Mastuti, M.Agr.Sc., D.Agr.Sc.
Scientific Division
Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Masruri, S.Si., M.Si., Ph.D.
Scientific Division
Department of Chemistry, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Akhmad Sabarudin, M.Sc., Dr.Sc.
Scientific Division
Department of Chemistry, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Lukman Hakim, S.Si., M.Sc., Dr.Sc
Scientific Division
Department of Chemistry, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Dr. rer. nat Rachmat Triandi Tjahjanto, S.Si., M.Si
Scientific Division
Department of Chemistry, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Copyright © The Annual Basic Science International Conference

Drs. Adi Susilo, M.Si., Ph.D.
Scientific Division
Department of Physics, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Ir. D.J. Djoko H. Santjojo, M.Phil., Ph.D.
Scientific Division
Department of Physics, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Dr. -Ing. Setyawan Purnomo Sakti, M.Eng.
Scientific Division
Department of Physics, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Drs. Unggul Pundjung Juswono, M.Sc.
Scientific Division
Department of Physics, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Prof. Dr. Agus Suryanto, M.Sc.
Scientific Division
Department of Mathematics, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Drs. Abdul Rouf Alghofari, M.Sc., Ph.D.
Scientific Division
Department of Mathematics, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Indah Yanti, S.Si., M.Si
Scientific Division
Department of Mathematics, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Nur Shofianah, S.Si., M.Si., Ph.D.
Scientific Division
Department of Mathematics, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Achmad Efendi, S.Si., M.Sc., Ph.D.
Scientific Division
Department of Statistics, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Rahma Fitriani, S.Si., M.Sc., Ph.D.
Scientific Division
Department of Statistics, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Dr. Adji Achmad Rinaldo Fernandes, S.Si., M.Sc.
Scientific Division
Department of Statistics, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Dr. Dra. Ani Budi Astuti, M.Si.
Scientific Division
Department of Statistics, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

International Scientific Committee

Prof. Mikio Nishizawa, M.D., Ph.D.
Ristumeikan University, JAPAN

Prof. James R. Ketudat-Cairns, Ph.D.
Suranaree University of Technology, THAILAND

Copyright © The Annual Basic Science International Conference

Prof. Dr. Kostas Konstantinou
National Central University, TAIWAN

Prof. Senthil Natesan, Ph.D.
Tamil Nadu Agricultural University, INDIA

Setia Pramana, Ph.D.
Institute of Statistics, INDONESIA

Student Committee

Wirdatun Nafisah
Ayu Zahrotul Fuadati
Hazna Noor Meidinna
Dea Jolie Chrestella
Feri Eko Hermanto
Radityo Ari Nugroho
Bayu Ardi Putranto
Meylinda Kurniawati
Mas Adam Lukman Chaubah
Aby Latifa Rochma
Muhammad Farisan Auzan
Kurnia Rahmawati
Fitriya Ramadhani
Farida Rachmawati
Nurul Aulia
Gabriella Chandrakirana
(Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya)

Conference Secretariat

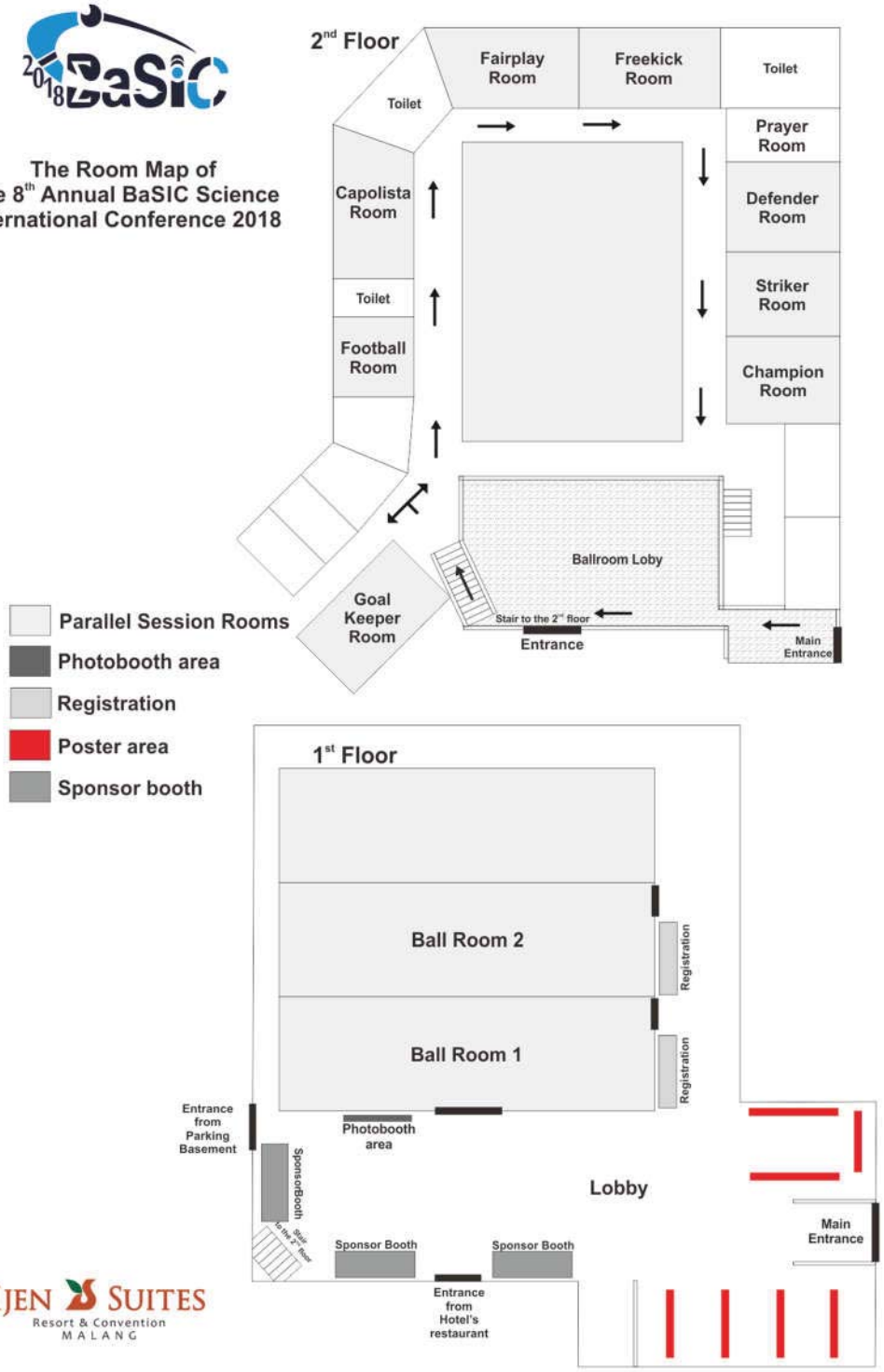
Faculty of Mathematics and Natural Sciences
Universitas Brawijaya
Jl. Veteran, Malang, East Java, Indonesia 65145
Phone: +62 0341 575833
Fax: +62 0341 575834
E-mail: basicscience@ub.ac.id
Website: http://basic.ub.ac.id

Photo Documentation

Copyright © The Annual Basic Science International Conference

Conference Venue

The Room Map of
The 8th Annual BaSIC Science
International Conference 2018



Copyright © The Annual Basic Science International Conference

Schedule

Tentative time schedule of BaSIC 2018

Day 1 Tuesday, March 6th, 2018 - Vanue : Ballroom	
07.30-08.30	**Registration**
08.30-09.00	**Opening Ceremony** 1. Speech by Chairman of BaSIC 2018 2. Speech by Dean of Faculty of Mathematics and Natural Sciences 3. Welcome Dance
09.00-09.15	**Coffee Break**
PLENARY SESSION 1 (9.15 – 10.45), Moderator: Anna Safitri, PhD	
09.15-09.35	**Prof. Mikio Nishizawa, M.D., Ph.D.** *Ristumeikan University, JAPAN (Plant Medicines)* "**iNOS Sense Oligonucleotides to Treat Septic Shock**"
09.35-09.55	**Prof. James R. Ketudat-Cairns, Ph.D.** *University of Technology, THAILAND (Enzymology in Plants and Humans)* **"The Structural Basis for Inborn Errors of Metabolism and Development"**
09.55-10.15	**Prof. Senthil Natesan Ph.D.** *Center of Innovation, Agricultural College and Research Institute, Madurai, Tamil Nadu Agricultural University, INDIA (Plant Breeding Biotechnology)* **"Cereal Domestication and its Impact on Crop Adaptation and Grain Nutrition"**
10.15-10.45	**Panel Discussion**
PLENARY SESSION 2 (10.45 – 11.45), Moderator: Nurjannah, PhD	
10.45-11.05	**Prof. Kostas Konstantinou** *National Central University, TAIWAN (Volcano Seismology Volcanic Processes and Hazards)* **"Forecasting Volcanic Eruptions by Using Permutation Entropy Variations In AmbientSeismic Noise"**
11.05-11.25	**Setia Pramana, Ph.D.** *Sekolah Tinggi Ilmu Statistik, INDONESIA (Biostatistic and Bioinformatics)* **"Machine Learning Development to Generate New Biomedical Understanding"**
11.25-11.45	**Panel Discussion**
11.45-12.00	**Sponsor Presentation**
12.00-13.00	**Lunch Break**

Copyright © The Annual Basic Science International Conference

Afternoon Session

Time	Program	Venue
12.45-13.15	**Poster Presentation**	Lobby
13.15-15.00	**Parallel Session**	Parallel room
15.00-15.30	Coffee Break	Lobby
15.30-17.00	**Parallel Session**	Parallel room

Day 2 **Wednesday, March 7th, 2018 - Venue : Ballroom**		
Time	**Program**	**Venue**
07.30-08.00	**Registration & Morning Tea**	Lobby
08.00-12.15	**Parallel Session**	Parallel room
12.15-13.00	Lunch Break	Lobby
13.00-15.30	**Parallel Session**	Parallel room
15.30-16.00	Coffee Break	Lobby
16.00-16.30	**Closing Ceremony**	Parallel room

Copyright © The Annual Basic Science International Conference

Table of Contents

Plenary Lectures

Energy iNOS Sense Oligonucleotides to Treat Septic Shock..... 1
Mikio Nishizawa, Tetsuya Okuyama, Rich Nakatake, Tadayoshi Okumura

The Structural Basis for Inborn Errors of Metabolism and Development..... 2
James R. Ketudat, Lukana Ngisara, Salila Pengthaisong, Phannee Sawangareetrakul, Voraratt Champattanachai, Piranit Kantaputra, Jisnuson Svasti

Cereal Domestication and its Impact on Crop Adaptation and Grain Nutrition..... 3
Senthil Natesan

Forecasting Volcanic Eruptions by Using Permutation Entropy Variations in Ambient Seismic Noise 4
K.I. Konstantinou

Machine Learning Development to Generate New Biomedical Understanding..... 5
Setia Pramana

Invited Papers

Developing Motorcycle Particulate Filtering System Based on Different Method 6
Arinto Y. P. Wardoyo

The Power of Mutation: Support Sustainability by Producing New Varieties 7
Estri Laras Arumingtyas

Sustainable Chemical Sources from Pine Forest (*Pinus merkusii* Jungh Et De Vriese). 8
Masruri

Reconstruction the Flexible Structural Modeling..... 9
Solimun

Global in Time Solution to a System of Reverse Flow Reactor..... 10
Ratno Bagus Edy Wibowo, Takashi Suzuki, Ryo Takahashi

Energy

Energy Sustainability Analysis on Palm Oil Industry Using Analytic Hierarchy Process (AHP)..... 12
Nyoman Ade Satwika, Ridho Hantoro

Development of Fresnel Lens-Based Solar Cooker..... 18
Ahmad Marzuki, Pupus Qira, Mohtar Yunianto, Nurul Azizah

Copyright © The Annual Basic Science International Conference

Tip Speed Ratio Selection of Three Bladed Small Scale Horizontal Axis Wind Turbine 22
Sigit Iswahyudi, Sutrisno, Prajitno

Comparison of Electrical Energy Consumption in Drip Irrigation Systems using Overhead Water Tank and Pressure Controlled Water Pump 28
Suwito, M Ashari, Muhammad Rivai, Muh. Anis Mustaghfirin

The Influence of Coloring against Absorption Power of Thermal Radiation on Flat-Plate Copper as Solar Collector 35
Gancang Saroja, Lailatin Nuriyah, Mikhael F. Novanata

Conversion of Anthocyanin from Dragon Fruit (*Hylocereus costaricencis*) to Metal Complexes: Prospects for sensitizer in Solar Cells 41
Veni Rori Setiawati, Agus Abhi Purwoko, Saprizal Hadisaputra

Environmental Science and Technology

The Effect of Perforated Aluminum Skin in Building to Reduce Classroom's Temperature Case Study : New Media Tower, Universitas Multimedia Nusantara 48
Anggraeni Dyah, Sri Kurniasih

Analysis the Performance Of Biofilter for Removing Total Ammonia Nitrogen in Recirculating Aquaculture System Using Various Loads 53
Asoka Bagaswari, Setyo Sarwanto Moersidik

Kraft Paper Production from Combination of *Borassus flabellifer* L. Leaf Midrib Pulp and Cardboard Waste with Kraft Methods 58
Azmi Alvian Gabriel, Syafrina Farahdillah

Characteristics and Biodegradation Ability on Low-Density Polyethylene Plastic (LDPE) by Isolated Raincoat Molds 65
Dwiki Prasetiya, Sonia Latifah, Muhson Isroni, Anna Rakhmawati

Dieng Plateu as An Educational-Based Tour Places 75
Eka Suci Anja. K., Mukminan

Identification of Atmosphere Conditions During Cempaka and Dahlia Cyclone Cycle Based on Weather Parameters Analysis and Satellite Imaging 79
Hanifa Nur Rahmadini, Audia Azizah Azani, Ahmad Fadlan

Electrodegradation Of Nonylphenol Ethoxylate (NPE-10) With Silver Ion Catalyzed Cerium (IV) In Sulfuric Acid Medium 90
Mhd. Muslim Syaifullah, Henry Setiyanto, Muhammad Ali Zulfikar

The effect of Explant Age and BAP on *In Vitro* Callus Development of Mangrove Plant (*Rhizophora apiculata* BI) 97
Nuraini Fadhilasari, Erma Prihastanti, Yulita Nurchayati , Rini Budi Hastuti

Copyright © The Annual Basic Science International Conference

Analysis of Green Industry Standard Implementation in Indonesia: Case Study of Flat Glass Industry PT. X 103
Reviana Revitasari, Bambang Heru Susanto

Potential Ecotourism and Development Strategy of Kelimutu National Park, Ende, East Nusa Tenggara 111
Selfiyah Karimah, Hastuti

The El Niño Southern Oscillation (ENSO) Impact on the Amount of Madura Rainfall 115
Yoshua A. Nugroho, Prasetyo U. Firdianto, Dany Pangestu, Ratih S. Ramadhanti, Dedi Sucahyono

Agronomical Response of Soybeans Lines to Different Doses of Phosphate under Bemisia tabaci Infestation..... 125
Nur Lina Safitri, Siti Zubaidah, Heru Kuswantoro

Identification of Groundwater Potential Zone Using VES Geoelectrical Method: A Case Study in Driyorejo Sub-District, Gresik Regency 134
Anik Hilyah, M Singgih Purwanto, Dihein Reksa Ikmaluhakim, Welayaturromadhona

Optimization of Biotransformation Process Benzonitrile to Benzoic Acid Using Whole Cells of *Rhodococcus pyridinivorans* Strain LP3 139
Nunik Sulistinah, Bambang Sunarko

Carbon Content in Macroalgae Species Against Temperature Regime..... 147
Tri Dewi Kusumaningrum Pribadi, Ramdan Nurdiana, Yudi Nurul Ihsan

Instrumentation and Measurements

Design and Manufacture of Electronic Control System for Final Caulking Horn Machine Based on Omron CJ2M CPU13 PLC13 in XYZ Inc. 154
Ahmad Jati Widodo, Lin Prasetyani

Speed Control of Single Phase AC Motor on Cocoa Beans Fermentation Process using PID Controller..... 164
Alex Taufiqurrohman Zain, Ali Musyafa, Brian Raafiu

Phenol Concentration Measuring Instrument Using Fiber Optic Biochemical Sensors Based on Absorption of Evanescent field and Atmega32u4 as Acquisition Media... 172
Ahmad Marzuki, Bangun Wahyu Sasongko, Venty Suryanti

Smart Monitoring of Solar Panel System in Saving of the Electrical Power with Internet of Things 176
Brian Raafiu, Purwadi Agus Darwito

Key Determinants of Information and Communications Technology (ICT) Development in Indonesia at 2012-2015 184
Neli Agustina, Setia Pramana

Copyright © The Annual Basic Science International Conference

Development of Measuring Method for Accuracy of NC Machine Tools on CNC Machine 194
Yudi Oktriadi, Muslim Mahardika

Measurement of Position and Quality of Ground Water Around Oil Palm Plantation by Using Geo-Electric Method 201
Muhammad Farid, M. Lutfi Firdaus, Dwi Alfina S

Material Science and Technology

Synthesis Citric Cellulose as an Adsorbent Cadmium Ions (Cd^{2+}) 207
Adil Ginting, Mimpin Ginting, Sevty R. Agustina, Lina Tarigan

Characterization of Oil and Gas Reservoir in "X" Field's Sandstone Using Extended Elastic Impedance (Eei) 213
Arga Wahyudi Muslim, M. Syamsu Rosid

Geopolymerization Kinetics of Fly Ash using Isoconversional Kinetics..... 220
Arie Satya Adelizar, Himawan Tri Bayu Murti Petrus, Muhammad Olvianas, Achmad Widiyatmoko

Adsorption of Congo Red Using Eggshell: Contact Time, Activation, Equilibrium and Kinetics Studies..... 224
Himmatuts Tsuroyya, Anif Mega Hidayati, Ajeng Febri Nurpalupi, Eko Santoso

Effect of Calcination Temperature on Nanocrystalline CeO_2 Characteristics Synthesized by Precipitation Process..... 232
Meilani Mandhalena Manurung, Heri Hermansyah, Hanif Yuliani

Separation Green Chemical From Wood Vinegar Produced from Pyrolysis of Jabon Wastes..... 238
Mohammad Wijaya , Muhammad Wiharto, Muhammad Danial

Leaf Waste Processing Into Transparent Leaves for Interior Wall Decoration 243
Putri Suryandari

Identify Activated Fracture Area Using HC-Plot Methode in Sulawesi Region 250
Ramadhan Priadi,Teuku Hafid Hududillah, Novita Sari

Determination of Temperature on Cattle Milk Pasteurization Control System Using MADM Technique..... 260
Tijaniyah, Honainah, Durrotul Hikmah

Coordination Polymers of M(II) Tartrate Hydrate (M = Cu, Mn, Cd) Crystallised from Aqueous Solution..... 267
Mohammad Misbah Khunur, Yuniar Ponco Prananto

Properties of Metal Matrix Composites by Pressureless Infiltration (PRIMEXX)..... 272
Agus Pramono, Anistasia Milandia, Klodian Dhoska, Lembit Kommel

Copyright © The Annual Basic Science International Conference

Landslide Analysis at Bendan Dhuwur Village, Gajahmungkur District, Semarang City, Central Java, Indonesia..... 280
Najib, Devina Trisnawati, Annisa Fitratul Husna

Mathematics, Statistics, and Modelling

Application of Zero Inflated Poisson (ZIP) Regression on Maternal Pregnant Deaths Data in Depok, Bogor, and Sukabumi..... 286
Eka Aditya Pramudita, Yekti Widyaningsih

Analysis of Human Development Index of Thirteen Districts in West Kalimantan by Panel Regression..... 299
Evy Sulistianingsih

Mathematical Creative Thinking and Communication Ability: Exploring the Relationship Between Mathematical Creative Thinking and Communication Ability in Problem Posing Scenario..... 304
Heni Lilia Dewi, Marsigit

Web-Based Interface Development for Analysis of Latent Variables and Use on Academic Data at University of Jember..... 312
Indriasih Yanuwijaya, I Made Tirta

The Comparison of Tool Performance in Weka and Rapidminer Data Mining For Classification Algorithms..... 317
Mochammad Faid, Tijaniyah, Moh Jasri

The Rainbow Connection Number of Spectrum Graphs..... 324
Melina, A.N.M. Salman

Time Series Analysis of Claims Reserve in General Insurance Industry..... 328
Mujiati Dwi Kartikasari, Nurul Imani

The Application of Spatial Regression and Foster-Greer-Thorbecke for Analyzing Poverty in Papua..... 333
Yoga Dwi Nugroho, Nurani Wahyuning Aprilia, Raden Rara Nurariza Rahmadhanty

Analysis of Algebraic Literacy Ability of Middle School Student..... 342
Rahayu Febrina Sari, Tatang Herman, Dadan Dasari

Application of Generalized Space-Time Autoregressive (GSTAR) Model on Distribution of Death Case in 8 District of Central Jakarta..... 348
Rahmat Febriyanto, Yekti Widyaningsih, Siti Nurrohmah

Numerical Study of Flow Through Square Duct and Elbow 90^{o} with Diamond Inlet Disturbance Body..... 359
Rizka Nur Faila, Sutardi, Randi Purnama P

Copyright © The Annual Basic Science International Conference

Estimation Parameters Geographically Weighted Zero Inflated Poisson Regression (GWZIPR) With Fixed Bisquare Kernel..... 364
Adeliana, Sri Harini

Rainbow Connection Number on Cypress Graph..... 370
Vivien Restianim

GGE Interaction Biplot in the RCIM Model and the Evaluation for the Outlying Observations..... 379
Upik Susilowati, Alfian Futuhul Hadi, Dian Anggraeni

Numerical Study of the Flow Through a Square Duct and 90^o Elbow with a Diamond Inlet Disturbance Body at 10^o Inlet Elbow..... 382
Yogi Eka F, Sutardi, Randi Purnama P

Optimization on Transportation Route for PT Coca Cola Semarang Product Distribution Using Clustering Analysis and TSP Method..... 390
Arum Handini Primandari, Triadi Arie Santoso

Parameter Estimation and Statistical Test in Bivariate Gamma Regression Model..... 397
Purhadi, Jauhara Rana Budiani, Santi Wulan Purnami

Construction of Confidence Interval for Semiparametric Spline Truncated Bivariate Regression Parameter Using Pivotal Quantity..... 406
Zahrotul Azizah, I Nyoman Budiantara, And Ismaini Zain

K-Means Clustering of Coconut Productivity in Sleman Regency in 2016..... 416
Nyi Putihal Qolbiatunas, Achmad Fauzan, Liem Astuti

Moran's I Test for Spatial Panel Data Dynamic Models with Time Invariant Spatial Weight Matrix..... 426
Dwi Endah Kusrini, Setiawan, Budi Nurani Ruchjana, Heri Kuswanto

Molecular and Health Science

Genetic Characteristic of Strain *Staphylococcus aureus* Bacteria from Cross Section of Urinary Catheter..... 434
Bq. Mutmainnah, Afaf Baktir, Ni'matuzahroh

Grouping Indonesia's Provinces According the AIDS Case's Number by Using Importance Performance Analysis..... 438
Edy Widodo, Novi Setiawati, Lira Fuji Astuti, Gustiara Dayu Amrinda, Welly Nur Armawati, Molydah S

Test of Polymerase Chain Reaction (PCR) Detection and The Specificity in Gen Hd *Salmonella typhi* in RS. Ibnu Sina..... 447
Hasta Handayani Idrus, Yusriani Mangarengi, Nurul Salsabila Mustajar

Copyright © The Annual Basic Science International Conference

Expression of γ-H2AX in Nuclear Medicine and Cath Lab as Medical Radiation Workers **451**
Iin Kurnia, Yanti Lusiyanti, Nastiti Rahajeng

Detection of Micronuclei and γH2AX on Lymphocyte in Medical Workers Cronically Exposed to Low Dose Ionizing Radiation **457**
Yanti Lusiyanti, Iin Kurnia, Siti Nurhayati, Nastiti Rahajeng

The Influence of Distance House with Waste Shelters Against Leptospirosis Incidence in Yogyakarta City **464**
Lilis Suryani

Relationship of Knowledge, Attitude, and Action with Symptoms of Poisoning in Pesticides in the Village of Pematang Cermai, District Serdang, Bedagai on 2017 .. **468**
Lina Tarigan, Isyatun Mardhiyah, Muhammad Ridwan

Growth and Storage Medium for Endophytic *Actinomycetes* UICC B-92 ..... **476**
Rina Hidayati Pratiwi

The Effect of Extract Purple Sweet Potato (*Ipomoea batatas L.*) on the Decrease in the Count of Spermatids in Male Mice (*Mus musculus*) Exposed to Cigarette Smoke **480**
Siti Julaikha, Soelistya, Muhlis

Steroidal Saponin Isolates of *Dioscorea alata L.* Induced B220IgE and B220IgG1 *In Vitro* **486**
Sri Nabawiyati Nurul Makiyah

Profile of 16sRNA DNA Barcode on *Basillus licheniformis* Indigenous West Halmahera Island **492**
Deasy Liestianty, Muhammad Amin, Muliadi, Sundari

The Identification of *Escherichia coli* and *Staphylococcus aureus* Bacteria Found on Fish Paste Sold at Pasar Baru Market in Tuban City **499**
Supiana Dian Nurtjahyani, Kholifatul 'Ulya

Relationship of Physical Intelligence with Healthy Living Attitude of Factory Employees **507**
Tri Pitara Mahanggoro

Antimicrobial Activity of Ethyl Acetate Extract of Mesocarp of Atung Fruit (*Atuna racemosa*) Against Bacteria and Yeast **511**
Heddy Julistiono, Dewi Mikhal Lewier, Ahmad Fathoni, Dewi Puspa Lotulung

Antidiabetic Activity of Kepok Banana Peel Extract (*Musa paradisiaca*) **516**
Ratna Indriawati, Yunita Dwi Setyawati

Spreading Pattern of DHF Cases in Sleman Regency: Inter-Year Comparative Study, from 2008-2013 ..... **520**
Tri Wulandari Kesetyaningsih, Sri Andarini, Sudarto, Henny Pramoedyo

Copyright © The Annual Basic Science International Conference

Science and Technology Education

The Development Strategy of Science Learning Based on Paikem Model With Discovery Learning to Increase Students' Activities in Laboratory Especially in Sub Topic The Meaning of Environment 527
Agus Salim, Mohammad Masykuri, Maridi

The Effectiveness of Thinking Aloud Pair Problem Solving (TAPPS) Strategy on Student's Achievement and Curiousity About Mathematics 535
Annisa Hasanah, Karyati

Development of Teaching Materials Chemistry Model Guided Discovery Based KAPRA (Relating, Nature, Thinking, Discuss, Apply) to Improve the Learning Result of Study Participants 540
Baiq Chairun Nisa, Yayuk Andayani, Dadi Setiadi

Blended Learning: An Adaptive Learning Method of the New Age 546
Chici Yuliana Nadi, Brian Trinanda Kusuma Adi

Science Process Skill (SPS) of Elementary Students in Indonesian Curriculum (2013 Curriculum) 552
Elfrida Novianty, St. Y. Slamet, Sri Yamtinah, Idam Ragil Widianto Atmojo

Learning Media Development to Increase Learning Interest 557
Eliana Trisnaning, Heru Nurcahyo

Research Design Prototype of Teacher and Student Book to Train Critical thinking Skill of Class VII Junior High School 562
Eva Lestari

Development of Chemical Learning in SMA Based VAK (Visual Auditory Kinestetic) to Optimize Critical Thinking Student's High School 566
Falentina Lede, Agus Abhi Purwoko, Nyoman Sridana

The Development of Learning Device with Guided Inquiry Model's using Virtual Laboratory on Kepler Laws to Improve Learning Outcomes for High School Students 572
Fitriya S

Increasing Science Proses Skill Using Guided Discovery Learning Method in Biology 579
Galuh Arga Wisnu Saputra, Bambang Subali

Meta Analysis – Effect of Project Based Learning Model on Metacognitive Skills of Student in Chemistry Learning 584
Hidmi Gramatolina Ramdhayani, Agus Abhi Purwoko, Muntari

An Analysis of Outdoor Learning in Biology Learning 588
Istanti Yuli Astuti, Djukri

Copyright © The Annual Basic Science International Conference

The Development of Student's Attitude Assessment Instrument in Statistic Learning 593
Lian G. Otaya, Sumarlin Adam, Herson Anwar

Analysis of Remedial Learning Activities in Biology Subjects Senior in High School 600
Lilik Tri Utami, Paidi

Development of teaching materials based on problem-based learning (PBL) to improve student learning outcomes 606
Moh. Khaerul Azmy, Agus Abhi Purwoko, Saprizal Hadisaputra

Polya Model Application to Solve the Problem of "Maximum and Minimum" in Civil Engineering State Polytechnic of Malang 612
Mutia Lina Dewi

Meta-Analysis on the Influence of Problem Based Learning (PBL) Model on Students Metacognition 618
Nishfiya Ramdoniati, Muntari, Saprizal Hadisaputra

Forest Utilization by Community in Wolasi Sub-District, Southeast Sulawesi 623
Nur Hasanah, Hastuti

Development of Prototype of Teachers and Student Book on Dynamic Fluid Material with Guided Inquiry to Train Critical Thinking Skills of High School Students 627
Nur Hidayatur Rochmah

The Role of Curriculum Integration Toward The Students' Mastery in Disaster Knowledge at Senior High Student in Pangkalpinang 630
Reni, Dyah Respati Suryo Sumunar

The Students' Mapping Tools (SMT) Based on Psychological Response at NFBSL Indonesia Boarding School 634
Riana Bagaskorowati, Deasyanti

Validity of Knowledge Test to Improve the Ability of Science Literacy on Global Warming Material Based on Socio-Scientific Issues (SSI) 641
Pungky Dilaka Putri, Tukiran, Harun Nasrudin

Student Worksheet Based-Problem to Improve Student's Creativity in High School 647
Try Setianingsih, YayukAndayani, Nyoman Sridana

Development of Learning-Based Pogil (Process Oriented Guided Inquiry Learning) to Improve Mastery of Base Student Concept of Acid Base Material in Senior High School 652
Yaumul Chairiah Ningsih, Agus Abhi Purwoko, Saprizal Hadisaputra

Improving Students' Visual-algebraic Geometry Ability Using Geogebra in Analytic Geometry Course 659
Yurizka Melia Sari, and Shofan Fiangga

Copyright © The Annual Basic Science International Conference

Validity of Knowledge Test to Improve the Ability of Science Literacy on Global Warming Material Based on Socio-Scientific Issues (SSI)

Pungky Dilaka Putri[1,a)], Tukiran[2], and Harun Nasrudin[2]

[1] *Postgraduate Program, Science Study Program, The State Universitas of Surabaya*
[2] *Department of Science Education, The State Universitas of Surabaya*

[a)]Corresponding author: pungkyputri16070795023@mhs.unesa.ac.id

Abstract. This study aims to determine the validity of knowledge tests to improve the ability of science literacy on the material of global warming based on Socio-scientific Issues (SSI). The research method used was 4-D, namely: (1) define, (2) design, (3) develop, and (4) disseminate. The results showed that the assessment of science knowledge on science literacy on the material of global warming based on Socio-scientific Issues (SSI) were namely: the validity of the material domain obtained a percentage of 94.44% with very decent category, the validity of the construction field obtained a percentage of 93, 33% with very decent category, and validity from language domain got percentage equal to 91,66% with very decent category. From this research, it can be concluded that science knowledge on science literacy on the global-based heating material of Socio-scientific Issues (SSI) deserves to be used as supporting media of learning process to improve science literacy ability.

Keywords: science literacy, socio-scientific issues, validity

INTRODUCTION

Current science education is geared toward preparing students for successful living in the 21st century. Breakthroughs and advances in science and technology have brought great changes in improving the quality of human life in various parts of the world. These developments arise new problems related to the ethics, morals and global issues that actually threaten human dignity and survival. For example, the developments in the automotive field in the form of modern transportation creates new hope for human survival, but also cause new problems that threaten human life, such as air pollution due to emissions of motor vehicles that can trigger the occurrence of global warming. This problem not only worries individuals but also the global community and the problem can only be solved through means of communication and cooperation among the global community. Rahayu (2014) stated that to solve the emerging problems, it is necessary for the community to have an understanding of scientific ideas, intellectual ability, creativity, logical, and must have concern for issues and problems that occur in nature [1]. People who have these skills are said to have scientific literacy.

Science literacy is defined as the ability to conduct science knowledge to explain and predict natural phenomena in order to overcome natural problems through scientific methods [2,3]. In fact, the development of science literacy has become a top priority in the field of science education in schools [4]. In addition, the school curriculum for science should also direct the learning of science in order to manifest students who later become a science-literate of society. The new curriculum revised 2013 curriculum revised also expects this to be achieved by defining the competencies that students must possess in the future such as: (a) the ability to communicate, (b) the ability to think critically, (c) the ability to consider problems in the moral side and (d) the ability to live in a global society.

This 2013 curriculum revised demonstrates the importance of incorporating Socio-scientific Issues (SSI) into the classroom of teaching and learning activities. Levinson proposed a three-stranded framework for teachers in teaching SSI in classroom teaching activities, namely: 1) reasonable categories of disagreements; 2) good communication or essential characteristics to engage in reasonable disagreements; 3) narrative ideas and narrative experiences that can explain the best disagreements [5].

Copyright © The Annual Basic Science International Conference

Socio-scientific Issues (SSI) is a strategy that aims to stimulate intellectual, moral and ethical development, and awareness of the relationship between science and social life [6,7]. SSI learning has moral and ethical implications. Therefore, the impetus for scientific literacy is indispensable to the moral and ethical implications of social-scientific issues. Science literacy is important for all students. Literacy of science is the ability to engage with issues related to science and with scientific ideas as reflective citizens. A person who has scientific literacy means the person is willing to engage in issues related to science and technology that require competence to: (a) explain scientific phenomena; (b) evaluate and design scientific inquiry; (c) interpret data and scientific evidence [8].

SSI learning is a learning that features controversial social issues related to science [6]. SSI is conducted in science education in order to organize science literacy that emphasizes the development of scientific and moral reasoning to cope with the phenomena that occur in society. SSI can be found in a global context on environmental issues in society such as global warming. In this study, the material chosen is the material of global warming. The issue used in this material is the issue of global warming in accordance with SSI learning because it is local and also a problem that can be seen even felt in the life of the students. This issue presents the relationship between the concept of the science that is related global warming with people's lives. This study aims to produce the literature of science literacy capability on the material of global warming based on Socio-scientifis Issues (SSI) valid. The validity is only reviewed from the results of the validation of experts.

EXPERIMENTAL DETAILS

The type of this research is the research of the development of the 4-D model by developing science literacy capability instrument on the global warming material based on Socio-scientifis Issues (SSI). The research development model is the 4-D model of Thiagarajan, Semmel, and Semmel [9]. Four stages of this development model include define, design, development and disseminate. But at the stage of dissemination is not done considering the realm of research development which very extensive and takes a long time so that the development research is designed only until the development stage (develop) to obtain a valid literacy ability skills.

The subject of this research is an instrument of science literacy knowledge which has been validated by three experts/experts in their field. The instrument on instrument validation sheet about science literacy knowledge used to collect data in this research is the instrument validation sheet of literacy ability of science. The instrument validation literacy literature sheets developed contain guidance and appeal to the validator to provide an assessment of the developed literacy instruments. The data collection technique that is done in this research is using the instrument validation technique literacy skills in which the assessment is done by a validator who has qualifications and experience in the field of science education.

RESULTS AND DISCUSSION

Science literacy is used to measure students' ability after the learning experience. This knowledge science literacy issue refers to indicators of knowledge with competency indicators of science literacy PISA 2015. The number of items as many as 15 questions in the form of multiple-choice questions. The formulation of knowledge indicators with competence indicators of science literacy PISA 2015 can be seen in **TABLE 1**.

TABLE 1. The Formulation of Knowledge Indicators with Competence Indicators of Science Literacy PISA 2015

No	PISA 2015 Scientific Competencies	Competency Indicators	Learning Indicators	Test indicator	No. Test
1.	Explain phenomena scientifically	Recall and apply appropriate scientific knowledge	Apply human effort to invite others in overcoming global warming	Given a number of options, students can apply human efforts to engage others in addressing global	1

Copyright © The Annual Basic Science International Conference

No	PISA 2015 Scientific Competencies	Competency Indicators	Learning Indicators	Test indicator	No. Test
				warming	
		Identify, use and generate explanatory models and representations	Identify the sector of human activity and the percentage of greenhouse gas emissions generated	Presented in greenhouse gas percentage diagrams, students can identify the sector of human activity and the percentage of greenhouse gas emissions generated	2
		Make and justify appropriate predictions	Analyze the impact of global warming on ecosystems	Given a problem about the impact of global warming, students can analyze the impact of global warming on ecosystems	3
		Offer explanatory hypotheses	Identify the influence of the role of vegetation in overcoming global warming	Given an appropriate problem-formulation article, students can identify the influence of vegetation's role in overcoming global warming	4
		Explain the potential implications of scientific knowledge for society	Identify the causes of global warming	Presented images of global warming posters, students can identify the factors that cause global warming	5
2.	Evaluate and design scientific enquiry	Identify the question explored in a given scientific study	Identify ways to reduce the effects of global warming	Presented a percentage reduction diagram of CO_2 gas from various sectors, students can identify ways to reduce the effects of global warming	6
		Distinguish questions that could be investigated scientifically	Determine the impact of global warming on the environment	Given 4 statements about the impact of global warming, students can determine the impact of global warming on the environment	7
		Propose a way of exploring a given question scientifically	Formulate measures to reduce the effects of global warming	Presented table of observations in different regions of Indonesia with different forest areas, students can formulate measures to reduce the effects of global warming	8
		Evaluate ways of exploring a given question scientifically	Linking the government's policy on how to tackle the waste problem to explain the 3R's relationship with global warming principles	Given a problem in the environment with garbage accumulation, students can link government policy ways to tackle waste issues to explain the 3R principle relationship with global warming	9

Copyright © The Annual Basic Science International Conference

No	PISA 2015 Scientific Competencies	Competency Indicators	Learning Indicators	Test indicator	No. Test
		Describe and evaluate how scientists ensure the reliability of data, and the objectivity and generalisability of explanations	Identify the factors causing the gases that trigger global warming	Given a research result of activity that leads to global warming, students can identify the factors that cause the gases that trigger global warming	10
3.	Interpret data and evidence scientifically	Transform data from one representation to another	Determine the shape of the image about the causes of global warming	Presented image of the cause of global warming, students can determine the shape of the image about the causes of global warming	11
		Analyse and interpret data and draw appropriate SUMMARY	Analyze the process of greenhouse effect	Presented image of greenhouse effect process, students can analyze the process of greenhouse effect	12
		Identify the assumptions, evidence and reasoning in science-related texts	Predicting the rise in the earth's surface temperature over the next few years proposed by the IPCC	Presented graphs on the rise in surface temperature of the earth IPCC disclosed, students can predict the rise in surface temperature of the earth the next few years proposed by the IPCC	13
		Distinguish between arguments that are based on scientific evidence and theory and those based on other considerations	Distinguish between arguments based on scientific evidence and theories about earth temperature rise that affect weather and climate	Given a problem of climate and climate change, students can distinguish between arguments based on scientific evidence and theories about earth temperature rise that affect weather and climate	14
		Evaluate scientific arguments and evidence from different sources	Evaluating efforts in tackling global warming	Given a number of options, students can evaluate efforts to tackle appropriate global warming	15

Prior to the test, the knowledge about science literacy on global-based heating material Socio-scientifis Issues (SSI) has been made validated by two lecturers of science and science teachers of science subjects. The purpose of this validation is to get a validity score and get suggestions and comments from the validators. Validator consists of three people, namely Dr. Elok Sudibyo, S.Pd., M.Pd., Dr. Harun Nasrudin, M.Si., and Asmaul Lutfauziah, S.Pd., M.Pd. The validation stage is done by filling the validation sheet with a rating scale of 1-4. The results of media validation can be seen in **TABLE 2**.

At the validation stage, there are several suggestions provided by the validator as the reference for further improvement. Judging from the validation result, got the score of each aspect that is validity from the realm of material got percentage equal to 94,44% with very proper category, validity from construction aspect got percentage equal to 93,33% with very proper category, and validity from sphere language got percentage equal to 91,66% with very decent category.

Copyright © The Annual Basic Science International Conference

TABLE 2. The Result of Validation of Knowledge About Literacy of Science on Global Warming Material Based on Socio-scientifis Issues (SSI)

No	Component	Assessment		
		V1	V2	V3
Matter Sphere				
1	Item according to indicator	3	4	3
2	The content of the material matches the purpose of measurement	4	4	4
3	The content of the material in question according to the level, type of school, and grade level	4	4	4
Total score			34	
Percentage			94,44%	
Construction Sphere				
1	The subject matter (stem) is clearly defined	4	4	3
2	The subject matter does not contain double negative statements	4	4	4
3	If forced to use a negative word, it must be underlined, or printed otherwise	4	3	4
4	Discourse images or tables really works	3	4	4
5	The items are not dependent on each other	4	3	4
Total score			56	
Percentage			93,33%	
Language Sphere				
1	The formulation of a communicative sentence	4	3	3
2	Sentences using good and correct language and in accordance with the language	3	4	3
3	Formulation of sentences does not lead to multiple interpretations	4	3	4
4	Using language or a common verb (not local)	4	4	4
5	The formulation of the question does not contain words that offend students	4	4	4
Total score			55	
Percentage			91,66%	
Average percentage overall			**93,14%**	
Category			**Very decent**	

There are some things that still need to be addressed even though it is included in the category very proper and declared valid, as the suggestion from the validator. First, it is advisable to add an indicator about connecting the knowledge indicator with the question indicator. Second, it is advisable to check the relevance of the cognitive level of the problem with the taxonomy of bloom. Thirdly, it is advisable to check the discourse of the image to be synchronic and fully functional.

SUMMARY

Based on the results of the analysis and discussion can be concluded that the science of science literacy on the material of global warming based on Socio-scientifis Issues (SSI) worthy of the validity so that it can be used in the learning process.

SUGGESTION

Suggestions that can be put forward based on research that has been done temporarily is the need to validate by the experts about all research instruments that have been developed before doing research to obtain and collect data to determine the practicality and effectiveness of all learning devices in the classroom.

Copyright © The Annual Basic Science International Conference

ACKNOWLEDGEMENT

We would also like to show our gratitude to the committee of the 8th Annual Basic Science International Conference 2018 for accepting our manuscript to be published in this conference proceeding.

REFERENCES

1. Rahayu, S. (2014). Menuju Masyarakat Berliterasi Sains: Harapan dan Tantangan Kurikulum 2013. Paper presented in Chemical National Seminar and Learning (SNKP) 2014, Chemistry Department FMIPA State University of Malang.
2. DeBoer, G. E. (2000). Scientific literacy: Another look at its historical and contemporary meanings and its relationship to science education reform. *Journal of Research in Science Teaching*, 37(6), 582-601. doi.org/10.1787/9789264208070-en.
3. OECD. (2014). PISA 2012 Results in Focus. *Programme for International Student Assessment*, 1–44.
4. Sadler, T.D. (2004). Informal Reasoning Regarding Socioscientific Issues: A critical Review of Research. *Journal of Research in Science Teaching*, 41(5); 513-536.
5. Gutierez, Sally B. (2015). Integrating Socio-Scientific Issues to Enhance the Bioethical Decision-Making Skills of High Shool Students. *Journal Canadian Center of Science and Education. International Education Studies*; Vol. 8, No. 1; 2015 ISSN 1913-9020 E-ISSN 1913-9039.
6. Zeidler, D.L. (2005). Beyond STS: A Research-Based Framework for Socioscientific Issues Education. *Journal of Science Education.* Vol 89 (3): 357-377.
7. Nuangchalerm, P. (2010). Engaging Students to Perceive Nature of Science Through Socioscientific Issues-Based Instruction. *European Journal of Social Sciences.* Vol 13 (1): 34-37.
8. OECD. (2016). PISA 2015 Assesment and analytical Framework: Science, Reading, Mathematic and Financial Literacy. http://doi.org/10.1787/9789264255425-en.
9. Thiagarajan, S., Semmel, D. S., Semmel, M., I. (1974). Instructional Development for Training Teachers of Expectional Children. Minneapolis, Minnesota: Leadership Training Institute/Special Education, University of Minnesota.
10. Nuangchalerm, Prasart & B. Kwuanthong. Teaching "Global Warming" through Socioscientific Issues-based Instruction. *Journal of Asian Social Science.* Vol 6 (8): 42-47 (2010).

Copyright © The Annual Basic Science International Conference