Annual Meeting of Mathematics and Natural Sciences Forum of Indonesian Institutes of Teacher Training and Education Personnel (MatricesFor IITTEP)

In Conjuntion With:

International Conference on Mathematics, Natural Sciences, and Education (ICoMaNSEd 2015)

August 07-08, 2015, Aryaduta Hotel Manado, Indonesia

Book of Abstracts & Program

Theme:

"Enhancement and Acceleration on Research and Learning in Mathematics and Natural Sciences for the Utilization of Natural Resources"

Supported and Coordinated by:

UM UNDIKSHA UNESA UNG UNIMA UNIMED UNJ UNM UNNES UNP UNY UPI

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WELCOME MESSAGE FROM EVENTS CHAIR

Best wishes to us

May God bless upon us

Assalamu'alaikum wa Rahmatullahi wa Barakatuh

Your excellency The President of Manado State University (UNIMA) Prof. Dr. Ph. E. A. Tuerah, M.Si., DEA., ladies and gentlemen, good morning and welcome to Manado, North Sulawesi, especially to Manado State University.

This seminar entitled the International Conference on Mathematics, Natural Sciences, and its Education (ICoMaNSEd): ***Enhancement and Acceleration on Research and Learning in Mathematics and Natural Science for the Utilization of Natural Resources*** is organized by Faculty of Mathematics and Natural Sciences, Manado State University, supported and coordinated by 12 members of Association of the Faculty of Mathematics and Natural Sciences from Teacher Program (LPTK).

Ladies and gentlemen, on behalf of the committee of this conference, I would like to thanks and give the highest appreciation to keynote speakers including:

1. Prof. David F. Treagust, Ph.D., FSB., FAERA (Courtin University, Perth, Australia)
2. Rebecca Johnson, MA (Columbia University, USA)
3. Ed van den Berg, Ph.D (Free University, Amsterdam, The Netherlands)
4. Assoc. Prof. Dr. Vichit Rangpan (Yala Rajabhat University, Thailand)
5. Prof. Dr. Syamsu Qamar Badu, M.Pd (State University of Gorontalo, Indonesia)

I would like also to give thanks and gratitude to the invited speakers from 12 universities including:

1. Assoc.Prof. Dr. Kamisah Osman (The National University of Malaysia)

2. Dr. Ir. Sri Nurdiati, M.Sc (Bogor Agricultural University, Indonesia)
3. Prof. Ferdy S. Rondonuwu, Ph.D (Satya Wacana Christian University, Salatiga, Indonesia)
4. Prof. Dr. Zulkardi, M.I.Komp, M.Sc (Sriwijaya University, Palembang, Indonesia)
5. Prof. Dr. Julius H. Lolombulan, MS (Manado State University, Indonesia)
6. Prof. Drs. Manihar Situmorang, M.Sc., Ph.D (Medan State University, Indonesia)
7. Prof. Dr. Liliasari, M.Pd (Indonesian Education University, Bandung, Indonesia)
8. Dr. Slamet Suyanto (Yogyakarta State University, Indonesia)
9. Dr. Suharto Linuwih, M.Si (Semarang State University, Indonesia)
10. Prof. Dr. Subandi, M.Si (Malang State University, Indonesia)
11. Dr. Hj. Yuni Sri Rahayu, M.Si (Surabaya State University, Indonesia)
12. Suwardi Anas, M.Sc., Ph.D (Makasar State University)

Now, I would like to special thanks to 156 speakers and all of participant required in this seminar.

Ladies and gentlemen, to be able to display text in the real international standard, required not only the international community of scientists involved in the research process, but is also involved in the process of publication. Therefore, I expect this event to be a dissemination of the lecturer researches.
Finally, I am delighted to thank to all the members of the committee who have been working very hard for the success of this conference.

Please enjoy the conference and enjoy in Manado city. Thank you very much.

Dr. Rymond J. Rumampuk, M.Si

WELCOME MESSAGE FROM DEAN

Best wishes for all of us
Assalamu'alaikum wa Rahmatullahi wa Barakatuh

Distinguished Rector of the State University of Manado with the vices rector of Unima, Deans of the Faculties and Chairs of the Institutions;
Distinguished Rector of the State University of Gorontalo and chairmans present today;
Distinguished Chairman of the Forum of Mathematics and Natural Science of Indonesian Institution of Teacher Training and Education Personels (IITTEP)
Distinguished Deans of Mathematics and Natural Sciences Forum members of IITTEP along with vice deans and heads of Departments and Study Programs, and delegates from Faculty of Mathematics and Natural Science of IITTEP;
Especially, distinguished Keynote Speakers, invited Speakers, all the speakers in ICoMaNSEd 2015, and Participants joining this Scientific Conference,

Praise and thanks to the presence of the Lord, because ICoMaNSEd 2015 event can be held today. We are proud because as a part of the academic community, we can take part in enriching the scientific communication forum between scholars through ICoMaNSEd. Through this Scientific Conference, we are present here, to share and to exchange experiences through various experts in the field of Mathematics and Natural Science Education from several countries and various parts of Indonesia. For the implementation of ICoMaNSEd 2015, we thanked to Rector of State University of Manado, Chairman of the Forum of Science IITTEP, deans of Mathematics and Natural Sciences Faculty of IITTEP along with vice deans and heads of departments and study programs, Lecturers and students who support this event so it could be held. In particular, we express our gratituted to Keynotes Speakers and Invited Speakers who have agreed to attend and to present their articles in ICoMaNSEd 2015.

Implementation of Scientific Conference or other sciehtific meetings forms such as symposium, seminar or FGD, etc by a university or research institute, is a form of scientists activities that always continue to strengthen scientific attitude

and the scientists identity to be opened, objectived, and criticals to the science developments, especially for the further of science development. In ICoMaNSEd forum 2015, these things are reflected in the context of improvement and development in the learning of Natural Sciences and Mathematics. The experts involved not only from IITTEP-universities, but also involve the faculty of Mathematics and Natural Sciences of non- IITTEP ones. We strongly hope that the implementation of present Scientific Conference in State University of Manado, will be the pillars and a reference for the implementation of other scientific events in Indonesia, especially Manado, North Sulawesi. We welcome all the audiences to Manado, North Sulawesi, land of Nyiur Melambai, which is famous for its hospitality and beautiful landscapes.

Distinguished participants and honorable guests,
Last but not least, on this occasion, I would like to quoted from a Nobel laureate in Medicine Physiology back in 1960, Sir Peter Medawar, a British scientist, born in Rio de Janeiro Brazil. His advice for us academics and scientists started from the following question: "Do we need a sharp mind to be able to succeed as a scientist?". It is an anxiety that does not need to be considered, because one does not need to be too clever in order to be a successful scientist. Well-thoughts must be possessed. On the other hand, it would be very helpful to have some good qualities from ancient times that somehow now have been regarded as a trait that less ignored by the scientists. Those properties are: a practical view; perseverance; determination; ability to concentrate; tenacity to not despair when facing difficulties ".

Hopefully the advice from the Nobel laureate Sir Peter Medawar, could be an inspiration to all the academics who gathered today towards successful stages in our scientific careers. Keep this adage: "God does not call us to be a successful man, but to believe. Believe, in order to succes ".

Shaloom,
Wasalamu alaikum warahmatulahi wabarakatuh.
Thank you.

Manado, August 3, 2015,
Dean of the Faculty Unima,
Prof.Dr.Cosmas Poluakan, M.Si

WELCOME MESSAGE FROM RECTOR

Honourable Vice Rectors and Deans of all faculties,

Honourable keynote speakers from outstanding universities,

Distinguished all invited speakers and all other speakers,

Distinguished guests,

All participants,

Ladies and gentlemen,

Syaloom,
Assalamu'alaikum warrahmatullah wabarakatuh.
May peace and God's blessings be upon you all.

I am delighted to be here with you today, as you start the Annual Meeting of Mathematics and Natural Sciences Forum of Indonesian Institute for Teacher Training and Education Personnel (Matrices for IITTEP), conducted and sponsored by 12 universities former known as IKIP, in conjunction with International Conference on Mathematics, Natural Sciences and Education (ICoMaNSEd). It is my privilege and pleasure to welcome you all to the Forum and Conference organized by the Faculty of Mathematics and Natural Sciences, State University of Manado in North Sulawesi, Indonesia in which researchers and practitioners on mathematics and science and the education, to get together, share ideas, experiences, expectations, and research findings. I want to extend a warm welcome to all of you, on behalf of the State University of Manado. It is a great honour to host so many distinguished keynote speakers from the USA, Australia, Netherland, and Thailand, distinguished invited speakers from 12 Indonesian Universities namely: UNJ, UPI, UNY, UNNES, UNESA, UM, UNP, UNIMED, UNDIKSHA, UNM , UNG, and UNIMA, and also Malaysia and all participants.

Distinguished guest, Ladies and gentlemen,

The theme of the conference is " Enhancement and Acceleration on Research and Learning in Mathematics and Natural Sciences for the Utilization of Natural Resources".

This event is aimed to providing dissemination and publication media for research results, theoretical studies, and best practices in the field of Mathematics, Natural Sciences, and Education; more over, strengthening the interaction and communication between researchers , promote mathematics and science research activities by the researchers in Indonesia and overseas, in hope to build networks and collaborations.

By promoting collaboration across disciplines, we can further extend the opportunity to discover innovations, gain better understanding and enhance the advancement of science body.

The development of Mathematics and Natural Science can not be separated from the scientific charateristics that encourage high-curiosity in doing research. We hope, IITTEP always creating, maintaining, facilitating, and developing the world class academic atmosphere that encourage students and faculty to continue doing research, and community services

Research is one of the Tri Dharma of the higher education . It is a systematic effort to solve the problems or answer the questions through data collecting , formulating the generalities based on the data, then finding and developing organized knowledge by scientific method. It is expected that from research activities valuable empirical facts can be obtained to improve and develop the theory and practice to bring a better quality of education. We do hope this conference will bear fruitful results and promote networking and future collaborations for all participants from diverse background of expertise, institutions, and countries to promote science, mathematics, and the education.

Distinguished guest, Ladies and gentlemen,
In this very precious moment, I would like to express my highest appreciation and gratitude to the keynote speakers from Australia, the USA, Netherland, Thailand and Indonesia.

I also would like to take this opportunity to express my gratitude to all delegates for their full support, cooperation and contribution to the Forum and Conference 2015. I also wish to express my gratitude especially to the Dean of Faculty of Mathematics and Science, Prof. Dr. Cosmas Poluakan, M.Si, and to the Organizing Committee who dedicated their time and energy to attend meeting and for their hard work to make this conference a big success. However, should you find any shortcomings and inconveniences, please accept my apologies.

In closing, I realize that you are fully dedicated to the sessions that will follow but I do hope you will also take time to enjoy fascinating Manado with its tropical ambience.

Let me wish you all a productive conference and enjoyable stay here in Manado . Also I wish you all great success and this international conference will bring us fruitful benefits in education.
Thank you very much.
Syaloom

Wassalamu'alaikum warahmatullah wabarakatuh.
May peace and God's blessings be upon you all.

Manado, 8 August 2015

Rector,

Prof. Dr. Ph. E A Tuerah, M.Si, DEA

ICoMaNSEd 2015 COMMITTEE

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Dr. Adensi Timomor, SH., MH.	(2nd Vice Rector)

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Prof. Dr. Revelson Mege, M.Si	(Proceeding Division)
Dr. A. Komansilan, M.Si	(Proceeding Division)
Dr. A. Mandolang, M.Pd	(Proceeding Division)
Dr. F. Dungus, M.Si	(Proceeding Division)
Dr. J. Mamangkey, M.Si	(Proceeding Division)

FINAL SCHEDULE OF THE EVENTS: ICoMaNSEd2015

Saturday, August 08 2015		
07.00-08.00	Registration for ICoMaNSEd Participant	Grand Ballroom Lobby
08.00-08.30	Opening Ceremony	Grand Ballroom MC: Dr. Hetty Langkudi, M.Pd.
08.30-08.45	Scienza Choir	Grand Ballroom
08.45-10.00	**Plenary Lecture I (Talk Duration for Every Keynote Speaker: 30 min)**	Grand Ballroom Moderator: Mercy Rampengan, S.Pi., M.App.Sc., Ph.D.
	• **Prof. David F. Treagust, Ph.D, FSB, FAERA** Curtin University, Perth, Australia *"Current Issues in Science Education Research"*	
	• **Rebecca Johnson, MA.** Columbia University, USA *"Developing STEM and Environmental Literacy via 21st Century Instruction"*	
	• **Prof. Dr. Otto Cornelis Kaligis, SH., MH.** OCK & Associates, Indonesia *"Legal Aspect of the Utilization of Natural Resources: Some Advocacy Experience in the Case of Exploitation of Natural Resources"*	
	Discussion (15 min)	
10.00-10.15	Coffee Break + Poster Presentation	Grand Ballroom Lobby
10.15-12.00	**Plenary Lecture II (Talk Duration for Every Keynote Speaker: 30 min)**	Grand Ballroom Moderator: Dian O. Howan, S.Si., M.Phil.
	• **Ed van den Berg, Ph.D.** Free University, Amsterdam, The Netherlands *"Generating Pedagogical Content Knowledge in Science Teacher Education Student"*	
	• **Assoc. Prof. Dr. Vichit Rangpan** Yala Rajabhat University, Thailand *"Pattani Watershed Management for Sustainable in the Future"*	
	• **Prof. Dr. Syamsu Qamar Badu, M.Pd.** State University of Gorontalo, Indonesia *"Leadership in Higher Education: An Experience of State University of Gorontalo"*	
	Discussion (15 min)	
12.00-13.00	Lunch + Poster Presentation	Grand Ballroom Lobby

	Contributed Talk from Invited Speaker (Talk Duration for Every Invited Speaker: 20 min)			
	Mathematics and Mathematics Education *Room 1*	**Chemistry and Chemistry Education** *Room 2*	**Biology and Biology Education** *Room 3*	**Physics and Physics Education** *Room 4 & 5*	**Natural Sciences Education** *Room 6*
13.00-14.00	**Prof. Dr. Zulkardi, M.I.Komp., M.Sc.** University of Sriwijaya, Palembang *"Using PMRI and PISA for Improving Research and Learning on Mathematics Literacy of Indonesian Student"*	**Prof. Dr. Subandi, M.Si.** Department of Chemistry, Faculty of Mathematics and Natural Science, State University of Malang (UM)	**Dr. Slamet Suyanto** State University of Yogyakarta (UNY)	**Prof. Ferdy S. Rondonuwu, M.Sc., Ph.D.** Satya Wacana Christian University, Salatiga *"Carotenoids: From Photosynthetic Pigments to Biosolar Cells"*	**Prof. Dr. Liliasari, M.Pd.** Natural Science Education, Indonesian Education University *"Enhancing Students' Higher Order Thinking Skills Through Sciences Education"*
	Prof. Dr. Julius H. Lolombulan, MS. State University of Manado "Mistakes of Statistical Methodology in Educational Research"	**Dr. Ir. Sri Nurdiati, M.Sc.** Bogor Agricultural University *"The Role of University to Raise STEM Performance in Indonesian Secondary Education"*	**Dr. Hj. Yuni Sri Rahayu, M.Si.** Invited Speaker from **State University of Surabaya (UNESA)**	**Kamisah Osman** The National University of Malaysia	**Prof. Drs. Manihar Situmorang, M.Sc., Ph.D.** State University of Medan (UNIMED)
				Suwardi Annas, M.Sc., Ph.D. State University of Makassar (UNM)	
				Dr. Suharto Linuwih, M.Si. State University of Semarang (UNNES)	
	Discussion (15 min)	Discussion (15 min)	Discussion (15 min)	Discussion (15 min)	Discussion (15 min)
14.00-17.15	**PARALLEL SESSION**				

Contribute Talk from Oral Presentation Session I, II, III (Talk Duration for Every Presenter: max. 8 min)									
SESSION	Mathematics and Mathematics Education	Chemistry		Biology	Biology	Biology Education	Physics		
	ROOM 1	ROOM 2	ROOM 3	ROOM 4	ROOM 5	ROOM 6	ROOM 7	ROOM 8	ROOM 9
	Moderator:	Moderator:	Moderator:	Moderator:	Moderator:	Moderator:	Moderator:	Moderator:	Moderator:
14.00-14.08	080Math	023Chem	021ChemEd	027Bio	112Bio	050BioEd	030Phys	025PhysEd	029NSEd
14.08-14.16	121Math	024Chem	031ChemEd	035Bio	114Bio	051BioEd	037Phys	029PhysEd	033NSEd
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14.24-14.32	055MathEd	058Chem	076ChemEd	041Bio	116Bio	089BioEd	046Phys	034PhysEd	077NSEd
14.32-14.40	063MathEd	073Chem		042Bio	126Bio	097BioEd	047Phys	036PhysEd	079NSEd
14.40-14.48	083MathEd	074Chem		045Bio	132Bio	098BioEd		039PhysEd	086NSEd
Discussion (10 min)									
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Discussion (10 min)									
17.15-18.30	BREAK								
18.30-18.40	GATHERING AT LOBBY HOTEL FOR GALA DINNER								
19.00-21.00	CLOSING CEREMONY AND GALA DINNER AT MAYOR HOUSE								

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ORAL PRESENTATION

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The Influence of Cooperative Learning Model Towards Learning Outcomes in Mathematics Based on Students' Learning Style at X Class at SMANegeri 3 Makassar

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Exploring Elementary Teachers' Belief and Understanding about Mathematical Problem Solving

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The Design and Effectiveness of Mathematics Learning Packages Based on Bilingual Method

120MathEd **Janet Trineke Manoy and Ika Sulistiyorin**

Creative Problem Solving Process of High School Students to Solve the Problem of Open-Ended Mathematics

146MathEd **Abadi**

The Use of Context and Representations for Developing Learning Lines to Understand Mathematical Concepts in Elementary School

148MathEd **Evi Hulukati, Sumarno Ismail, and Ali Rustam**

The Effect of the Guided Discovery Model with Superitem

074MathEd **Santje Mutulende Salajang**

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024Chem **Sintia Stefana Hingkua, Euis Julaeha, Dikdik Kurnia**

Terpenoid Compound from the Stem of Mangrove Plant Avicennia marina Against Human Pathogenic Bacteria Staphylococcus aureus and Pseudomonas aeruginosa

049Chem **Suyatno, Nurul Hidajati, Erika Widiarini and Anandya Wahyuningtyas**

The Matteucinol Flavonoid Isolated From The Stem Of The Fern Chingiasakayensis (ZEILLER) HOLTT

058Chem **Siang Tandi Gonggo and Afadil**

Synthesis of s-ABS-LS-Kaolin Blend as Electrolyte Membrane for Fuel Cells

073Chem **Septiany Palilingan**

Enzymatic Production of Virgin Coconut Oil (VCO) Using the Bromelain in the Extract of Pineapple Stem and Purification

VCO Using Carbon Adsorbent

074Chem **Suleman Duengo, Rurini Retnowati and Warsito**

Synthesis 10,12,14-Octadecatrienylacetat Compound from α-Linolenic Acid Basil Seed Oil (OcinumBasilicum L.)

091Chem **Emma J. Pongoh, Adriana E. Karundeng,**

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Flavonoid Glycoside Putative Antibacterial from the Bark of Ebony (Disopyroscelebica)

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An Extensive High-Field NMR Study on Triterpene Saponins

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Sturcture-Activity Relationship (SAR) of Endocytosis Inhibitors

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Screening Bioactive Compound of Stem Bark Soursop (Annonamuricata Linn) Potential for Anti-Cancer

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176Chem **Akram La Kilo**

Study of Stabilization of Mg^{2+} DOPED α-$Bi_2VO_{5,5}$

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The Implementation of Curriculum 2013 on Primary and Secondary Education Level in Yogyakarta

[illegible]ChemEd **Astin Lukum and Oktaviane Dalanggo**

Identification of Student Learning Styles Using Felder-Silverman's Model

[illegible]ChemEd **Hetty Hortentie Langkudi**

The Effect of Instructional Model and Thinking Skill on Students Achievement in Chemistry at SMA Negeri 2 Tondano Minahasa Regency

[illegible]ChemEd **Maria BenediktaTukan, S.Pd.,M.Pd.**

Development of the Teaching Materials Based on Process Skills Approach to Increase the Student Concept Mastery and Student Critical Thinking Skills on Colloid Topic at Senior High School

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097BioEd **Jusna Ahmad and Elya Nusantari**

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Paper ID : 116Bio

BIOSORPTION HEAVY METAL PB AND CU ON PLANT *Ipomoea aquatica* forks AND *Eichornia crassipes*

Kandowangko, N.Y[1*], and Ishak Isa[2]

[1]*Department of Biology Education, Faculty of Mathematics and Natural Science, State University of Gorontalo , Gorontalo, Indonesia*

[2]*Department of Chemistry Education, Facultyof Mathematic and natural Science, State University of Gorontalo, Gorontalo, Indonesia*

*novri1968@gmail.com

Abstract

The purpose of this research was to find out biosorption of heavy metals Pb and Cu by plant *Ipomoea aquatic* forks and *Eichornia crassipes* at the time of contact 7, 14, 21, and 28 days. Heavy metal concentrations used were 40 ppm Pb and 35 ppm Cu. The method used was experimental method. Parameters measured were accumulated capabilities and efficiency of absorption of heavy metals by plants indicator. To measure the concentrations of Pb and Cu in the growing medium and plants used Atomic Absorption Spectroscopy. Data accumulation capability and efficiency of absorption of heavy metals Pb and Cu by plants were analyzed descriptively. The results showed that: 1) *Eichornia crassipes* have the ability absorption of heavy metals Pb and Cu were higher than *Ipomoea aquatic* forks plants; 2) the ability of the accumulation of heavy metals Pb and Cu by *Ipomoea aquatic* forks plants tend to be equal at any time contact, whereas for *Eichornia crassipes* plants, the longer the contact time with the crop of heavy metals Pb and Cu, the lower the absorption capability; 3) The efficiency of heavy metals Pb uptake by plants *Ipomoea aquatic* forks and *Eichornia crassipes* tends to fluctuate at any time contact, otherwise the efficiency of absorption of Cu by plants *Ipomoea aquatic* forks and *Eichornia crassipes* tends to decrease by the plant contact time.

Keywords: Biosorption, Pb, Cu, *Ipomoea aquatica*, *Eichornia crassipes*.

BIOSORPTION HEAVY METAL Pb AND Cu ON PLANT *Ipomoea aquatica forks* AND *Eichornia crassipes*

Kandowangko, N.Y[1*], and Ishak Isa[2]
[1]*Department of Biology Education, Faculty of Mathematic and Natural Science, Gorontalo State University , Gorontalo City, Indonesia*
[2]*Department of Chemistry Education, Facultyof Mathematic and natural Science, Gorontalo State University, Gorontalo city, Indonesia*
[*]novri1968@gmail.com

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1. INTRUDUCTION

The negative impact of the development and growth of the industry are produced various kinds of waste. Waste generated from industrial processes, among others, contain heavy metals such as lead (Pb) and copper (Cu). In the marine environment these metals are in sediments and in solution in dissolved form.

Heavy metals lead and copper is widely used in the battery industry, electroplating industry, paint industry, color / textile, electrical wiring and fuel additives in motor vehicles. The existence of these metals in aquatic environments will cause pollution to the biota that live in it. If this is allowed to take place constantly then it is certain heavy metals that are toxic will be entered into the human body through the food chain.

To remove heavy metals Pb, and Cu in the waters needed a technology with the help of plants (phytoremidiation) having detergency and accumulators / biosorption). With the process of heavy metals in sediments and waters can be eliminated or minimized so it is safe for the environment.

Cuprum (Cu) potentially toxic to plants and harmful to humans because it is carcinogenic (Notodarmojo, 2005). Cu metal content in plant tissue that normally grows about 5-20 mg / kg, while in critical condition in the media of 60-120 mg / kg and in the plant tissue of 5-60 mg / kg. In the critical condition of plant growth falters as a result of poisoning Cu (Alloway, 1995) and according Lasat (2003) concentration of more than 10 ppm can be toxic to plants. Similarly, the impact of Pb in plants. Research results Novita and Tarzan (2012), Pb at high concentrations can cause chlorosis on the leaves and inhibits growth rate *Elodea canadensis* so that growth becomes stunted.

The use of aquatic plants and semi-aquatic such as water hyacinth, water spinach to absorb the heavy metals lead (Pb), copper (Cu) of the contaminated solution is still being developed. Based on the research results and Saefudin Hidayati, 2003; Juhaeti et al., 2005 there are some plants that have high metal accumulation ability of the plant tissues, such as *Ipomoea* sp. which is able to absorb plumbum (Pb) to 44.00 ppm, cyanide (Cn) to 35.70 ppm and 1.4 ppm Cd, and Micania cordata is able to absorb up to 11.65 ppm and 3.66 ppm Pb Cn (Hidayati and saefudin, 2003; Juhaeti et al., 2005). *Azolla* is grown on waste water containing 94 ppm Pb; while genjer and hyacinth each containing 167 and 196 ppm (Juhaeti and Sharif, 2003)

If you pay attention to the ability of plants to clean heavy metal waste pollution, so it is necessary to study how the absorption of heavy metals Pb and Cu in plant water spinach (Ipomoea aquatic forks) and hyacinth (Eichornia crassipes).

The purpose of this study was to determine the absorption ability and efficiency of accumulation of heavy metals Pb and Cu by plant water spinach (Ipomoea aquatic forks) and hyacinth (Eichornia crassipes) at the time of contact 7, 14, 21, and 28 days.

2. Materials and Methods

This study was conducted in March-June 2015 in the Laboratory of Biology and Chemistry, State University of Gorontalo. Materials used in the form of plant materials include plant material that is water spinach and water hyacinth. Water spinach form buds stem cuttings measuring 30-35 cm were taken from the rice fields Gorontalo city, while the water hyacinth plant size 350-400 gram wet weight and have had 3 stolon, taken from Lake Limboto; chemicals used are Pb (NO3) 2 as the source of Pb, Cu (NO3) 2 as a source of Cu, HNO3. The tools used in the form of plastic pan with a diameter of 30 cm as maintenance of water spinach and water hyacinth, analytical balance, oven, hotplate, set of Atomic Absorption Spectroscopy (AAS) brand Simatzu AA 6300, and equipment beaker.

Experimental Design

This experiment was designed using the experimental method, with a completely randomized design.

Working procedure

After a week of the election of the plant, weighed and acclimatization for 2 weeks in the pan until the plant thrives then added heavy metals Pb and Cu with an initial concentration of 35 – 40 ppm and pH 5.5.

Water sampling and plant indicator done every week or every 7 days until day 28. Samples of water and the plants then analyzed for levels of Pb and Cu using Atomic Absorption Spectrophotometer (AAS) brand Shimadzu.
Data analysis capabilities biosorption of heavy metals by plants is done by using the formula: Heavy metals in plants/plant weight (mg/kg) and to determine the efficiency of metal accumulation by plants is determined by the following calculation: (Total Metal in plant / Metal in the media) x 100%

3. Result and Discussion

Water spinach ability and hyacinth plants accumulate metals in Pb and Cu at different contact time indicated on the chart 1. Based on the graph 1 it appears that plants have the ability to accumulate water hyacinth Pb and Cu were higher than in water spinach. The ability of plants water hyacinth to absorb Pb and Cu are influenced by the growth time. The greater growth of water hyacinth, the ability to accumulate Pb and Cu decreased. The reality is not found in plant water spinach. Ability to absorb Pb and Cu in water spinach plants are not affected by the time plant growth. The longer time growth of water spinach, the ability of accumulation have the same tendency is great.

Biosorption heavy metal Pb and Cu

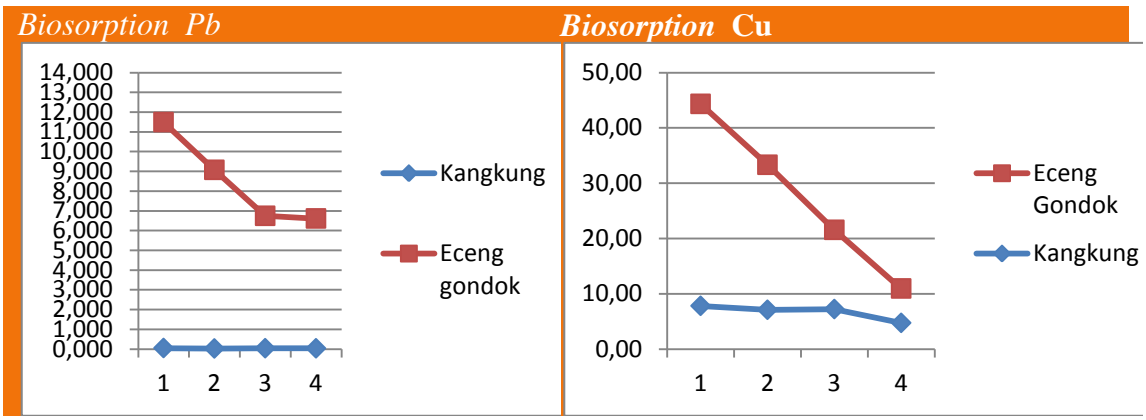

Figure 1. Accumulation of Pb and Cu in water spinach and Hyacinth at different contact time.

This is supported by the growth characteristics of plants as shown in Table 1. In water spinach plants in every segment of the nodus has the ability to produce new shoots and roots. So the impact on the addition of shoot and root dry weight at each time of observation This fact is expected to support the ability of plants to accumulate metals in an amount that is not much different. Instead the water hyacinth plants, the process of forming a new individual comes from stolons and roots growth of new stolons. Based on the data in Table 1. turns dry weight gain roots and canopy of water hyacinth plants were contaminated by Pb increased until the third week, further decreasing plant dry weight. However, the water hyacinth plants were contaminated by Cu, increased dry weight with age of the plant.

Table 1. Data Dry weight plant after application heavy metals Pb and Cu

		Dry weight Plant after application heavy metal Pb (gram plant^{-1})				Dry weight Plant after application heavy metal Cu (gram plant^{-1})			
		7	14	21	28	7	14	21	28
Water spinach	**Shoot**	26,040	46,280	64,140	63,370	3,066	3,474	3,304	4,702
	Root	0,850	0,670	8,760	9,730	0,300	0,511	0,348	0,484
	Total	26,890	46,950	72,900	73,100	3,366	3,985	3,653	5,186
Hyacinth	**Shoot**	0,533	0,632	0,964	0,870	0,316	0,348	0,468	0,762
	Root	0,226	0,240	0,430	0,419	0,182	0,231	0,251	0,324
	Total	0,759	0,872	1,394	1,289	0,498	0,579	0,718	1,086

Efficiency biosrption of Pb and Cu in plant water spinach and water hyacinth

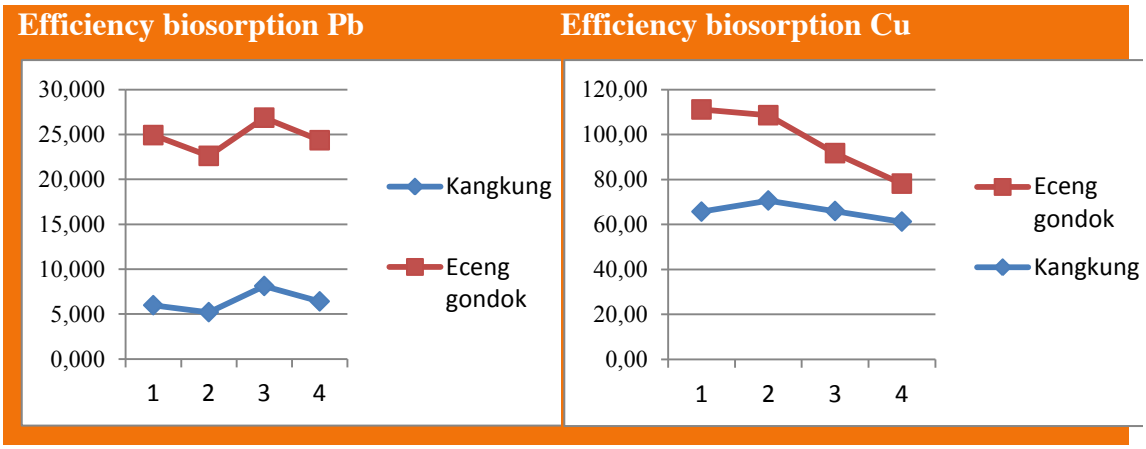

Figure 2. The efficiency of biosorption of Pb and Cu in water spinach and Hyacinth at different contact time

Furthermore, the efficiency of biosorption of Pb and Cu by water spinach and hyacinth shown in figure 2. The interesting thing turns on water spinach and hyacinth plants have an efficiency of absorption of Pb which fluctuates based on contact time with the metal Pb plants. Instead efficiency of absorption of Cu by water spinach and hyacinth has a tendency to decline.

4. Conclusion

The conclusions of this research are: 1) Water hyacinth plants have the ability biosorption of heavy metals Pb and Cu were higher than water spinach plants; 2) the ability of the accumulation of heavy metals Pb and Cu by water spinach plants tend to be equal at any time contact, whereas for Water hyacinth plants, the longer the contact time with the crop of heavy metals Pb and Cu, the lower the biosorption capability; 3) The efficiency of heavy metals Pb uptake by water spinach plants and Hyacinth tends to fluctuate at any time contact, otherwise the efficiency of biosorption of Cu by water spinach and Hyacinth tends to decrease by the plant contact time.

Acknowledgements

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CERTIFICATE

This is to certify that

Kandowangko, N.Y.

Has participated on

International Conference on Mathematics,
Natural Sciences and Education (**ICoMaNSEd 2015**) as

ORAL PRESENTER

Manado, Indonesia, August 08th 2015

Dean Faculty of Mathematics
and Natural Sciences

Prof. Dr. Cosmas Poluakan, M.Si

Chairman of the Events

Dr. Rymond J. Rumampuk, M.Si

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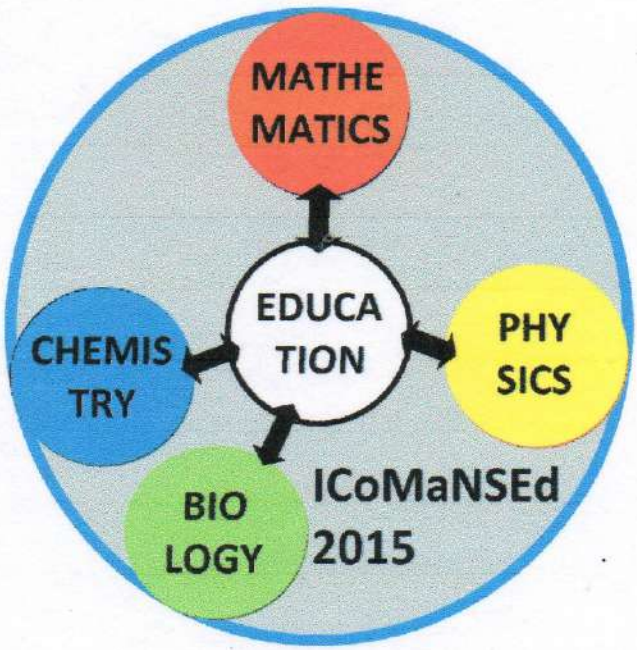
Basic form of a large circle symbolizes Mathematics, Science and Education as an integral unit of basic education and basic science, and states the symbol of mathematics geometry. Five small circle-shaped model of molymod express linkage development areas of Mathematics and Science which are centered on education activities. Red for Mathematics states: spirit, gives energy, symbol, action, passion, strength and joy. Yellow for Physics states: warmth and happiness, cheerful symbol and optimistic spirit, stimulate the mind and mental activity. Green for Biology states: calm and relax, the impression of balance the emotions, the symbol of openness and communication, color of hope and the future, justice and peace. Blue for Chemistry states: the calming effect and professional impression and trust. Stimulate communication skills, artistic expression, symbol of strength, able to calm the mind and improve concentration. Generally as a corporate base color, gray for Natural Science Education states: security, reliability, simplicity, and maturity. White for Education states: freedom and openness, represent the purity impression, chaste clean, symbol of peace.



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