

Program & Abstract Book



ICOMSET

The 3rd ICOMSET & AMLI 2018

*International Conference
on Mathematics, Sciences, Education and Technology
& Asosiasi MIPA LPTK Indonesia (AMLI) Meeting 2018*

***"Current Advances in Research
on Mathematics, Sciences, Education
and Technology for Fulfilling Global Needs"***

Thu - Fri, 04 - 05 October 2018
Universitas Negeri Padang
Padang, West Sumatra, Indonesia



Organized by
Faculty of Mathematics and Science, Universitas Negeri Padang
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Faculty of Mathematics and Science
Universitas Negeri Padang
Padang, West Sumatra, Indonesia.
Thu - Fri, 04 - 05 October 2018



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CERTIFICATE

This is to certify that

Astin Lukum

has participated as **Presenter**

in **The 3rd International Conference on Mathematics, Science, Education and Technology (ICOMSET) & Asosiasi MIPA LPTK Indonesia (AMLI) Meeting 2018**

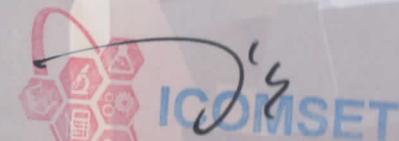
04 - 05 October 2018 at Universitas Negeri Padang,
Padang, West Sumatra, Indonesia

Padang, 05 October 2018



Prof. Dr. H. Lufri, M.S

Dean
Faculty of Mathematics and Natural Sciences,
Universitas Negeri Padang



Budhi Oktavia, M.Si., Ph.D

General Chairman
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THE 3rd INTERNATIONAL CONFERENCE ON MATHEMATICS, SCIENCES,
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(THE 3rd ICOMSET & AMLI 2018) PADANG, 4th – 5th OF OCTOBER 2018

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MATHEMATICS, SCIENCES, EDUCATION AND TECHNOLOGY AND
ASOSIASI MIPA LPTK INDONESIA (THE 3rd ICOMSET & AMLI 2018)
FACULTY OF MATHEMATICS AND SCIENCE
UNIVERSITAS NEGERI PADANG

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=: Hary Sanjaya, M.Si
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Opening Remark
from the
Rector of Universitas Negeri Padang

It gives me great happiness to extend my sincere and warm welcome to the participants of The 3rd International Conference on Mathematics, Science, Education and Technology and Asosiasi MIPA LPTK Indonesia (The 3rd ICOMSET & AMLI 2018). On behalf of Universitas Negeri Padang, let me welcome all of you to the conference in Padang, West Sumatra, Indonesia.

We believe that from this scientific meeting, all participants will have time to discuss and exchange ideas, findings, creating networking as well as strengthen the existing collaboration in the respective fields of expertise. One way to succeed is by initiating and developing collaborative work with many partners from all over the world. This program is in line with our university vision "*Being one of the leading universities in Southeast Asia in the field of education, science, technology, sports, and art*". On the other hand, through this conference we can improve the quality of our researches as well as innovation and trend in education, mathematics, science and technology for global challenges.

I would like to express my sincere appreciation to FMIPA UNP and organizing committee who have organized this event and sponsors for their support. This is a great opportunity for us to be involved in an international community. I would also like to extend my appreciation and gratitude to keynote speakers and participants of this conference for their contribution to this event.

Finally, I wish all participants get a lot of benefits at the conference. I also wish all participants can enjoy the atmosphere of the city of Padang, West Sumatra.

Thank you

Prof. Ganefri, Ph.D
Rector

Welcome Message
from the
Dean of Faculty of Mathematics and Natural Science
Universitas Negeri Padang

The honorable Governor of West Sumatera
The honorable Rector of Universitas Negeri Padang, Vice Rectors
Dean, Head of Department,
Ladies and Gentlemen

I am delighted have this opportunity to welcome you in the 3rd International Conference on Mathematics, Science, Education and Technology, which is hosted by Faculty of Mathematics and Natural Science. We are especially honored by the presence of the eminent keynote speaker, who has graciously accepted our invitation. To all speakers and participants, I am greatly honored and pleased to welcome you to Padang.

This conference is a special occasion for those who work in mathematics, science, education, technology, and other related fields. It will be an occasion to meet, to share information, to exchange new ideas and application experiences, and to find partners for future collaboration. Hopefully, this conference will contribute for innovation and trend in education, mathematics, science and technology for global challenges.

In closing, I wish the participants a very fruitful and productive meeting, but I do hope you will also take time to enjoy fascinating Padang, with its tropical setting, friendly people and multi-cultural cuisine. I would like to express my gratitude to all sponsors for their full support and contribution to the 3rd ICOMSET & AMLI 2018. I also wish to express my gratitude to the Organizing Committee and the Scientific Committee for their diligence.

Finally, we respectfully request the Rector of Universitas Negeri Padang to open the 3rd ICOMSET & AMLI 2018 officially.

Thank you,

Prof. Dr. Lufri, M.S
Dean

THE 3rd INTERNATIONAL CONFERENCE ON MATHEMATICS, SCIENCES,
EDUCATION AND TECHNOLOGY AND ASOSIASI MIPA LPTK INDONESIA
(THE 3rd ICOMSET & AMLI 2018) PADANG, 4th - 5th OF OCTOBER 2018

Preface: The 3rd International Conference on Mathematics, Science, Education and Technology (ICOMSET 2018)

Distinguished Guests, Respected Colleagues, Ladies and Gentlemen.

First at all, give thanks for God's love and grace for us. Welcome to the International Conference on Mathematics Science, Education and Technology (ICOMSET 2018). On behalf of the conference committee I would like to welcome all presenters and participants to the conference. The conference is organized by Faculty of Mathematics and Science, Universitas Negeri Padang (UNP). The conference is considered as an opportunity for researchers, teachers, and students to share their research and experience.

The committee has selected around 340 papers to be presented in the conference. After the conference these selected papers will be reviewed by internal and external independent reviewers and the selected papers will be included in the conference proceeding published by IOP, indexed in Scopus.

The organizers are thankful to the authors for their excitement. Moreover, we are grateful for the hard work of all reviewers, and all the committee members, dean of FMIPA UNP and rector of Universitas Negeri Padang.

Hopefully, this proceeding can help the readers to expand their knowledge about the research.

Thank you for your participation, have a great conference and enjoy your stay in Padang!

Thank you!

Budhi Oktavia, M.Si., Ph.D.
Conference Chair

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The Program of THE 3rd ICOMSET & AMLI 2018)
PADANG 4th - 5th OF OCTOBER 2018

Day 1: Thursday, 4 October 2018		
07.00-08.00	REGISTRATION	
08.00-09.30	OPENING CEREMONY	
09.30-10.00	COFFEE BREAK	
10.00-12.30	KEYNOTE LECTURE I Keynote Speaker : - Dr. Keisuke Kawamoto - Dr. Eng. Kuwat Triyana, M.Si - Prof. Dr. Yun Hin Taufiq-Yap	Moderator : Yohandri, PhD
12.30-13.30	LUNCH, POSTER VIEWING	
13.30-16.00	KEYNOTE LECTURE II Keynote Speaker : - Assoc. Prof. Dr. Laurinda Brown - Assoc. Prof. Dr. Che Radziah Che Mohd Zain	Moderator : Fitra Arya Dwi Nugraha, M.Si
	KEYNOTE LECTURE III Keynote Speaker : - Dr. Shah Muhammad - Prof. Dr. Hj Zuhaimy Hj. Ismail	Moderator : Miftahul Khair, PhD
END OF CONFERENCE PROGRAMME (DAY 1)		

OPENING CEREMONY
The 3rd International Conference on Mathematics, Science, Education, and
Technology (ICOMSET 2018) and AMLI

Time	Event Agenda
08.00 - 08.05	Opening preparation
08.05 - 08.15	Indonesia national anthem
08.15 - 08.30	Pasambahan Dance
08.30 - 08.45	Holy Al-Quran recitation
08.45 - 08.55	Welcome Address by ICOMSET Chairman
08.55 - 09.10	Welcome Message by Dean FMIPA UNP
09.10 - 09.25	Opening remark by Rector UNP
09.25 - 09.30	Prayer

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3		ICOMSET2018-073	Muhammad Haris Effendi-Hsb, Fuldariatman, Urip Sulisty	LEARNING TO ARGUE: THE EFFECT OF THREE COOPERATIVE LEARNING STRATEGIES ON CHEMISTRY STUDENTS' ARGUMENTATION SKILL IN JAMBI INDONESIA	
4	08.45-09.45	ICOMSET2018-289	Iryani, Z Fitriza, W Yunisa, P Ifelicia	DEVELOPMENT OF BUFFER SOLUTION MODULE BASED ON GUIDED INQUIRIES AND MULTIPLE REPRESENTATIONS	
5		ICOMSET2018-184	Andromeda, Ellizar, Iryani, Yerimadesi, Fatia Rahmah	The effectiveness of guided inquiry based colloid system modules integrated experiments on science process skills and student learning outcomes	
6		ICOMSET2018-267	Suryelita, Guspatni, Pradila Defriati	Description of Learning Difficulties on Atomic Structure and Periodic Table Topics of Tenth Grade Students in SMAN 7 Padang	
7		ICOMSET2018-308	Yerimadesi Yerimadesi, Yanuar Kiram, Lufri Lufri, Festiyed Festiyed	VALIDITY AND PRACTICALITY OF GUIDED DISCOVERY LEARNING MODEL FOR CHEMISTRY LEARNING IN SENIOR HIGH SCHOOL	
(09.45-10.00) coffe break					
8	10.00-11.00	ICOMSET2018-158	N A Suri, M Azhar	Description of High Secondary Student's Understanding Category about Chemical Bonding Using Two-Tier Multiple Choice Diagnostic Instrument	Parallel session II class C gedung MIPA TERPADU
9		ICOMSET2018-188	Astin Lukum, Erni Mohamad, Mustari S. Tamalu, Kostiawan	Effect of Problem Solving Learning Models on Self-confidence and Student Learning Outcomes: on Topics of Reduction-	

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			Sukamto, Yoseph Paramata	Oxidation	
10		ICOMSET2018-281	Sudding, Taty Sulastry, Anugrah Alam	The Effect of Prompting Question on Students' Worksheet - Based on Guided Inquiry towards Students' Learning Achievement and Activity of class X MIA of MA Negeri 1 Makassar. (Study on Electrolyte and Nonelectrolyte Solution)	
11		ICOMSET2018-282	Muhammad Danial and Muhammad Yunus	Critical Thinking Skills and Student Learning Independence of Chemistry Department Undergraduate Program in Lectures of Chemistry Education Seminar With Critical Analysis Techniques	
12	11.00-12.00	ICOMSET2018-321	Sukarmin, Suyono, Wasis	IDENTIFICATION STUDENT'S MISCONCEPTIONS OF GALVANIC CELLS	
13		ICOMSET2018-144	I Wayan Subagia, I Gusti Lanang Wiratma, I Nyoman Selamat	TEACHERS' HANDICAPE IN CONDUCTING LEARNING PROCESS USING SCIENTIFIC APPROACH: A CASE ANALYSIS OF IN HOUSE TRAINING RESULTS OF SENIOR HIGH SCHOOL TEACHERS	
14		ICOMSET2018-222	Ovi Rosita, Bayharti, Yerimadesi	Effectiveness of Redox and Electrochemical Cell Modules Based Guided Discovery Learning on Critical Thinking Skills and Student Learning Outcomes	
15		ICOMSET2018-264	Yenni Kurniawati, Fitri Refelita, Afrida	VIRTUAL CHEMISTRY LABORATORY AS PRE-LAB EXPERIENCES: STIMULATING STUDENT'S	

ID: ICOMSET2018-185

**MODULE DEVELOPMENT BASED ON PROTOTYPE OF MECHANICAL
ENERGY TO ELECTRICAL ENERGY CONVERTER**

Muhammad Yakob¹, Dona Mustika², Teuku Hasan Basri¹

¹Departemen Pendidikan Fisika, Universitas Samudra, Jl. Meurandeh, Langsa Lama, Aceh
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Abstract. The biggest problem that happened in physics laboratory activity is lack of necessary equipment and materials for understanding the physics concept. The purposes of this study is develop energy conversion module based on the equipment of mechanical-electrical energy converter. This study is kind of research development by steps : Define, Design and Develop. Define is the first step in observation and analysis the needs for development of practicum module in basic physics laboratory at Basic Laboratory of Universitas Samudra. Design is the step in making design for energy converter (mechanical–electrical) equipment, and also making design for module. Develop is the step in developing the module according to the equipment. In this step judgment is carried out by expert for revision. The judgment carried out is accuracy of instrument/module draft both in terms of content or construction. The final product of this research is a converter prototype and the module. The expert test result got the prototype/equipment and module was effective for implementation in basic physics laboratory.

Keywords: Energy Converter Prototype, Mechanical Energy to Electrical Energy Conversion, Module Development.

ID: ICOMSET2018-186

**PRACTICALITY OF STUDENT WORKSHEET BASED ON CONCEPT
APPROACH AND PROBLEM SOLVING TO IMPROVE STUDENT'S ABILITY
TO UNDERSTAND CONCEPT AND HIGH-LEVEL THINKING IN ANIMAL
DEVELOPMENT COURSE**

Lufri, Rahmadhani Fitri, Relsas Yogica

Biology Department, Faculty of Mathematics and Science, Universitas Negeri Padang,
Indonesia

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Abstract. The learning process requires a media that can be used as an intermediary to deliver material to students. Learning media that can be used are worksheets. This research is a development research on product (student worksheet) practicality test stage. Student Worksheets developed based on concepts and problem solving to improve students' ability to understand high-level concepts and thinking in animal development courses. This Student Worksheet tried out to student of Biology Departmen in animal development courses. The results showed the student worksheet practicality value of 4.16 (practical). Based on the results of this study can be concluded student worksheet based on concept

approach and problem solving to improve students' ability to understand the concept and high-level thinking in the course of animal development is practical.

ID: ICOMSET2018-187

**DETERMINE OXIDE CONTENT IN SAND AND ROCK OF PUBLIC MINING
USING XRF METHOD IN WEST SUMATERA**

Rindang Kembar Sari¹

¹ Faculty member of IAIN Bukittinggi, email:rindangkembarsari@gmail.com

Abstract. Indonesia is a country with abundant in various minerals and oxide sources due to its location on two earth plates supporting the formation of mineralization. The purpose of this study is as a preliminary study to analyze the element of atom / oxide contained in rocks and sand found in public mining of West Sumatra Province. The initial identification done is to perform X-ray fluorescence test (XRF) on rock samples taken from Jorong Bukit Harapan Darmasraya Regency and manggani 50 Kota Regency. The sand samples are taken from Kupitan area Sijunjung Regency, Pinti Kayu Gadang Muara Labuh and Jorong Pulau Sitiung Darmasraya regency. XRF test results for rock and sand samples from these five areas indicate the presence of six dominant oxides with large percentage i.e. Al₂O₃, SiO₂, P₂O₅, CaO, TiO₂, Fe₂O₃ oxides. The content of SiO₂, Al₂O₃, Fe₂O₃, CaO, TiO₂, and P₂O₅ founfdon rock samples is quite high 53.01-57.77%, 29.982-32.191%; 5.113-10.302%; 2.119-2.367%; 0.902-1.809%, and 0.685-0.968% respectively. Meanwhile, the sand samples indicate the content of SiO₂, Al₂O₃, Fe₂O₃, CaO, TiO₂, and P₂O₅ 15.103-52.652%; 5.379-17.621%; 9.22-58.593%; 1.54-9.22%; 0.702-12.238% and 1.261-2.545% respectively.

Keywords: Oxide, rock and sand, XRF

ID: ICOMSET2018-188

**EFFECT OF PROBLEM SOLVING LEARNING MODELS ON SELF-
CONFIDENCE AND STUDENT LEARNING OUTCOMES ON TOPICS OF
REDUCTION-OXIDATION**

Astin Lukum¹, Erni Mohamad¹, Mustari S. Tamalu¹, Kostiawan Sukamto¹, Yoseph
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Abstract. This study aims to determine the effect of using the Problem Solving learning model on Self-Confidence and student learning outcomes on the topic of reduction-oxidation. The research design used was Quasi-Experimental Design with Pretest-Posttest Control Group Design. The sample of this study amounted to 58 students, where 29 students in the experimental class and 29 students in the control class. In the experimental class, the Problem Solving learning model was applied while in the control class

conventional learning models were applied. Data analysis for hypothesis testing using a separated variant t-test. The results of the data analysis showed that self-confidence at a significant level of 0.05 with $dk = 56$ was obtained $t_{count} 2,284 > t_{table} 1,672$, then H_0 was rejected and H_1 was accepted so that there was an effect of the problem-solving learning model on self-confidence. Results of data analysis Learning outcomes show that at a significant level of 0.05 with $dk = 56$ obtained $t_{count} 7.519 > t_{table} 1.672$.

Keywords : Problem solving, Self-Confidence, Learning Outcomes

ID: ICOMSET2018-189

**DYE SENSITIZED SOLAR CELL (DSSC) USES ANTHOCYANIN RED WINE
FRUIT EXTRACT (*VITISVINIFERA*) AS A DYESTUFF**

Hardeli, Minda A., Yulia Restika
Chemistry Department, Universitas Negeri Padang, Indonesia
hardeli1@yahoo.com

Abstract. Dye sensitized solar cell (DSSC) is a sensitized dye-based solar cell which is an alternative to meet energy needs. This study aims to determine the effect of dyes obtained from fermented grapes, the effect of electrolyte types, and the influence of the concentration of Polyethylene Glykol (PEG) polymer as a semi-solid electrolyte on the efficiency of DSSC. Electrolytes used in DSSC are liquid electrolytes (I- / I3-) and semi-solid electrolytes using PEG polymers with various concentrations of 0.1M, 0.25M, and 0.5M. DSSC is assembled to form a sandwich structure consisting of two electrodes. Working electrodes are coated with TiO₂ with a surface area of 1cm and immersed in anthocyanin dyes for 24 hours, then electrolyte drops. The opposing electrode is coated with carbon. Anthocyanin dye is obtained from red grapes extracted using a mixture of methanol, water, and acetic acid. Dyestuffs are also obtained from the fermentation of grapes using *Saccharomyces Cerevisiae*. The dyes that have been obtained are characterized using UV-Vis and FTIR. UV-Vis characterization results obtained λ_{max} 520 nm for dyes from fermented grapes and λ_{max} 527 nm for dyes from grape extract. Based on UV-Vis data, pelargonin (λ_{max} 520nm) and peonidin (λ_{max} 527) anthocyanins were obtained. FTIR spectrum data both dyes have functional groups including OH, C = O, C-O, C-H. Efficiency measurement is done with 24 Watt UV lamp. The efficiency of DSSC using Dye from grape fermentation was higher than dye from grape extract with an efficiency of 1.50% using semi-solid electrolyte with PEG 0.25M concentration.

Keywords : DSSC, red wine (*Vitis vinifera*), dye, electolite, PEG polymer, efficiency.

ID: ICOMSET2018-190

**PHYTOCHEMICAL ANALYSIS AND TOTAL LIPID CONTENT OF MARINE
MACROALGAE FROM BINUANGEUN BEACH**

Bumiarto Nugroho Jati, Chicha Nuraeni*, Retno Yunilawati, Eva Oktarina
Center for Chemical and Packaging, Ministry of Industry, Indonesia
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Abstract. Marine macroalgae has potential to be used in many applications for functional food, pharmaceutical and cosmetic. Some species of green and brown macroalgae from Binuangeun Beach were collected and analyzed its phytochemical and total lipid content. Phytochemical analysis is conducted to discover bioactive compound of the algae. It is known that the lipid of algae contains fatty acid, oxylipins and sterol which has nutritional dan chemo-taxonomic properties. The analysis showed the presence of bioactive compounds such as flavonoids, saponin and steroid. The total lipid content analysis revealed that brown macroalgae have higher total lipid content than green macroalgae, i.e. above 5% dry weight.

Keywords: Binunganeun, Macroalgae, Phytochemical analysis, Total lipid content

ID: ICOMSET2018-191

**SYNTHESIS OF ZNO NANOPARTICLES IN POLYVINYL ALCOHOL
SOLUTIONS USING LASER ASSISTED SYNTHESIS IN SOLUTION (LASIS)
METHOD**

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Abstract. ZnO nanoparticles are widely studied because of their superior properties so they are widely used in various applications. Structural modification with the right synthesis method is the key to getting the superior properties of the ZnO nanoparticles. In this experiment, Laser Assisted Synthesis in Solution (LASIS) method has been used to synthesize ZnO nanoparticles. The LASIS method has been carried out using a metal plate Zn as a target placed in a solution of polyvinyl alcohol (PVA) with different concentrations, namely 1%, 2%, 3%, and 4%. This laser ablation results in a gray colloidal ZnO nanoparticle solution. Different PVA concentrations do not affect the color of the produced ZnO nanoparticle solution. The properties and structure of ZnO nanoparticles were characterized using UV-Vis spectrophotometer, Particle Size Analyzer (PSA), and Transmission Electron Microscopy (TEM). Spectrum measurement using UV-Vis spectrophotometer showed that the peak absorption characteristic of ZnO nanoparticles was observed at a wavelength of 344 nm. The value of the maximum absorbance is higher with increasing PVA concentration and reaching a maximum value at a concentration of

Effect of Problem Solving Learning Models on Self-confidence and Student Learning Outcomes on Topics of Reduction-Oxidation

Astin Lukum^{1*}, Erni Mohamad¹, Mustari S. Tamalu¹, Kostiawan Sukamto¹,
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¹Department of Chemistry, Universitas Negeri Gorotalo

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Abstract. This study aims to determine the effect of using the Problem Solving learning model on Self-Confidence and student learning outcomes on the topic of reduction-oxidation. The research design used was Quasi-Experimental Design with Pretest-Posttest Control Group Design. The sample of this study amounted to 58 students, where 29 students in the experimental class and 29 students in the control class. In the experimental class, the Problem Solving learning model was applied while in the control class conventional learning models were applied. Data analysis for hypothesis testing using a separated variant t-test. The results of the data analysis showed that self-confidence at a significant level of 0.05 with $dk = 56$ was obtained $t_{count} 2,284 > t_{table} 1,672$, then H_0 was rejected and H_1 was accepted so that there was an effect of the problem-solving learning model on self-confidence. Results of data analysis Learning outcomes show that at a significant level of 0.05 with $dk = 56$ obtained $t_{count} 7.519 > t_{table} 1.672$.

Keywords: Problem solving, Self-Confidence, Learning Outcomes

1. Introduction

Education is a conscious and planned effort to realize a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality intelligence, noble morals and skills needed by themselves, society, nation, and the State [1].

The problem that is now faced in the world of education is how to improve the quality of education which is generally associated with the high or low learning achievement obtained by students. Various efforts have been made by the education manager in order to improve student learning achievement, one of them is by making curriculum changes and changing the learning process in school. But in reality, student learning achievement is still not in accordance with what is expected. In addition, problems also occur in the learning process that students are less able to understand the material delivered by the teacher, this is due to the method applied in the learning process mostly using the lecture method and the teacher often considers students to have a passive role in the learning process.

Based on the results of observations at school, the learning process tended to use the lecture method only and still applied the KTSP Curriculum. The results of interviews with Class X Chemistry teachers that in the learning process Chemistry teachers use conventional models such as lectures as learning methods. This method causes students' confidence to disappear because learning only focuses on the teacher.

One of the shortcomings of the lecture method is that students tend to forget quickly about the material that has been taught [2]. In addition, in the learning process that uses the lecture method what is conveyed by the teacher is what will be mastered by students. So, when students are given posttest students tend to have difficulty working on it because they forget about the material that has been taught and the student is only mastered as limited as the material presented by the teacher [3]. This is evident from the results of interviews with several students who said that they forgot how to solve problems related to the equation of chemical reactions.

Self-confidence is a positive assessment of yourself about the abilities that exist within him to deal with various situations and challenges as well as mental abilities to reduce the negative influence of doubts that encourage individuals to achieve success without being dependent on other parties and responsible for decisions that have been set [4]. Without the confidence that is firmly embedded in the soul of the child (student), pessimism and inferiority complex will be able to master it easily. Based on the understanding of confidence, the understanding of students' confidence is very important so that students can develop optimally. Confidence is a faith or belief in oneself and one's own abilities to succeed. It is the belief that one will act in a right, proper, or effective manner [5].

Student self-confidence can be developed by providing opportunities to make responsible choices and provide space for differences of opinion and desires. Learning is an effort made by a person to obtain a change in behavior as a result of his own experience in interaction with the environment [6]. Giving space to make choices, express opinions, and desire to make students have the freedom to think in the learning process. One method of learning that can accommodate the development of student self-confidence is the Problem Solving method.

Problem Solving learning methods provide opportunities for students to think and understand, answer, work alone while working with others. Cooperative learning with the Problem Solving method is easy to apply to all subjects [7]. Problem Solving Method is a way of teaching which is done by training students to face various problems to be solved alone or together. In problem-solving methods, problems that can be used can be raised from real life problems. Problem-solving models can be used to improve self-confidence in these students because the provision of problems related to the daily life they have experienced, the student will continue to try to solve these problems [5]. At that time there will be a sense of confidence that he is able to solve these problems with his own abilities.

The results of previous studies indicate that learning using problem-solving methods has proven to be more effective in increasing students' self-confidence and student learning outcomes [8]. This is consistent with the results of other studies which stated that there were differences in learning outcomes between experimental classes using problem-solving learning models with control classes using conventional models, which can be seen from the results of t-test calculations. Other research Safarullah (2017) stated that the use of the problem-solving method on the subject of the redox reaction needs to get special attention so that in this case the researcher sets this subject is the subject to be examined [9].

2. Method

This study was conducted to see how the effect of problem-solving models on Self-Confidence and student learning outcomes on the material of reduction-oxidation reaction. In this study, the method used is a quasi-experiment design with nonequivalent design control design. The design used is pretest and posttest and giving questionnaires. In this design, there are two groups used for research. This design group given treatment is called the experimental group and the group that is not treated is called the control class.

Table 1. Research Design

Class	Pretest	Treatment	Posttest
Experiment	O ₁	X	O ₂
Control	O ₃	-	O ₄

Where:

- X = treatment (problem solving)
- = no treatment (conventional)
- O₁ = pretest experimental class
- O₂ = posttest experimental class
- O₃ = pretest control class
- O₄ = posttest control class

In this design, there are two groups selected randomly, then given a pretest to find out the initial state whether there is a difference between the experimental group and the control group. Good pretest results if the value of the experimental group is not significantly different. The effect of treatment is $(O_2 - O_1) - (O_4 - O_3)$ [10]. Data collection techniques in this study are indirect communication in the form of a Self-Confidence questionnaire that uses the Guttman scale presented in the following table.

Table 2. Self-confidence questionnaire that uses the Guttman scale

Variable	Sub Variables	Indicator	Number of Items	No. Item	
				(+)	(-)
Self-confident	Confidence	Willingness and effort	7	1, 7, 20, 44	27, 32, 39
		Optimistic	7	2, 8, 14, 45	21, 33, 40
	Positive attitude	Independent	4	9, 34	15, 22
		Not easily give up	8	10, 23, 28, 35, 41	3, 16, 46
		Able to adjust	7	4, 11, 36, 42	17, 24, 29
	Make use of the advantages	Have and utilize excess	6	5, 12, 18, 37	25, 30
		Having mental and physical support	7	6, 13, 19, 26	31, 38, 43
		Amounts	46	27	19

The score for each item questionnaire is positive, the value given is for the answer always with a score of 4, often with a score of 3, sometimes with a score of 2, and never with a score of 1. For a negative item questionnaire answer, the value given is for answers always with a score of 1, often with a score of 2, sometimes with a score of 3, and never with a score of 4. Based on the results of the self-confident questionnaire scoring can be classified as follows:

- Score 149-184 Full of self-confidence
- Score 112-148 Having high self-confidence
- Score 75-111 Having moderate self-confidence
- Score 37-74 Has low self-confidence
- Score 0-36 Do not have confidence[9]

The measurement technique in the form of a written test (pretest and posttest) in form of objective tests. Questionnaires and questions that will be used first are tested using validity (product moment) and reliability testing in this study is done using the *Alpha Crombach* formula. The normality test using Lilliefors test and homogeneity test in this study uses Fisher's test, to test the hypothesis using t-test (Separated variance). Objective test instruments are presented in Table 3.

Table 3. Objective test instruments

No.	Indicator	Rated aspect		
		C ₂	C ₃	C ₄
1.	Determine non-redox reactions based on the concept of oxygen release and binding		√	
2.	Determine the oxidation of an element in a compound		√	
3.	Determine the compound bilox based on the level of halogen oxidation number		√	
4.	Determine the highest oxygen oxidation number in some compounds		√	
5.	Describes pure metal ore processing	√		
6.	Determine the highest oxidation number of Mn in a compound		√	
7.	Determine non-redox reactions based on chemical process events that occur around		√	

8.	Determine the oxidizer in a redox reaction equation	√
9.	Determine the same biloks an element in a compound with elements in other compounds	√
10.	Make a redox reaction based on the reaction provided	√

3. Result and Discussion

Descriptive data analysis is used with the aim of describing data. The problem-solving ability test is given to two classes, namely the experimental class and the control class. For the experimental class using Problem Solving learning model (Class X.A) while for the control class using conventional learning (Class X.B), with the number of students each class amounted to 29 people. Whereas the Self-Confidence questionnaire is given at the time before the treatment with and after treatment is used using the Problem Solving method in the experimental class and conventional methods in the control class. Final Questionnaire Data Self-confidence and Post-test of Student Problem Solving Ability in Redox Reaction Material are presented in Table 4 and Table 5.

Table 4. Final Questionnaire Self-confidence Students' Problem Solving Ability

Subject	Experiment class	Control class
N	29	29
Average	136.759	127.276
Criteria	(Score 112-148) Having high self-confidence	(Score 112-148) Having high self-confidence

Table 5. Post-test data for Students' Problem Solving Ability

Subject	Experiment class	Control class
N	29	29
Average	7.724	3.414
Criteria	10	6

The normality test is conducted to determine whether the data is normally distributed or not. If the collected data is normally distributed, parametric statistics are used. Conversely, if the data collected is not normally distributed, then non-parametric statistics are used. In this study testing the normality of data using the Liliefors test with a significant level of $\alpha = 0.05$, then the L_{tabel} obtained is 0.161. The results of the calculation of the pretest and posttest normality tests were presented in tables 6 and 7.

Table 6. Pretest and posttest normality test results of the experimental class

Class	N	Criteria	L_{count}	L_{tabel}	Conclusion
Experiment	29	<i>Pretest</i>	0,14652	0.161	Normal
	29	<i>Posttest</i>	0,12835	0.161	Normal

Because the data from the pretest and posttest in the experimental class showed that $L_{count} < L_{tabel}$, then H_a was accepted so it can be concluded that the data were normally distributed with $\alpha = 0.05$ and $n = 29$.

Table 7. Test results of the pretest and posttest normality control class

Class	N	Criteria	L_{count}	L_{tabel}	Conclusion
Control	29	<i>Pretest</i>	0,13231	0.161	Normal
	29	<i>Posttest</i>	0,13763	0.161	Normal

Pretest and posttest data in the control class showed that $L_{count} < L_{tabel}$, then H_a was accepted so it can be concluded that the data were normally distributed with $\alpha = 0.05$ and $n = 29$. The results of the normality questionnaire for the initial questionnaire and the final questionnaire for the experimental class and control class are presented in tables 8 and 9.

Table 8. The results of the Normality Test for the initial questionnaire and the final questionnaire for the control class

Class	N	Criteria	L_{count}	L_{tabel}	Conclusion
Control	29	Initial questionnaire	0.132334	0.161	Normal
		Final questionnaire	0.124134	0.161	Normal

The initial questionnaire data and the final questionnaire in the control class indicate that $L_{count} < L_{tabel}$, then H_a is accepted, it can be concluded that the data is normally distributed with $\alpha = 0.05$ and $n = 29$.

Table 9. Normality Test of the initial questionnaire and the final questionnaire of the experimental class

Class	N	Criteria	L_{count}	L_{tabel}	Conclusion
Experiment	29	Initial	0.144737	0.161	Normal
		questionnaire	0.135025	0.161	Normal
		Final questionnaire			

Pretest and posttest data in the experiment class shows that $L_{count} < L_{tabel}$, then H_a is accepted, it can be concluded that the data is normally distributed with $\alpha = 0.05$ and $n = 29$.

Homogeneity test aims to obtain information on whether the two samples in the study have a homogeneous variance or not. Homogeneity variance testing was carried out by Fisher's test (the largest variance test divided by the smallest variance) at a significance level of 5% ($\alpha = 0.05$) with the following criteria: The results of the calculation of the questionnaire homogeneity test and learning outcomes using Fisher's test are presented in Tables 10 and 11.

Table 10. The results of the calculation of the homogeneity of the test data on learning outcomes

Class	N	Dk	F_{count}	$F_{table} (\alpha=0,05)$	Conclusion
Experiment	29	28	2.033783784	3.37	Homogeneous
Control	29	28			

Table 11. The results of the self-confidence questionnaire data homogeneity test calculation

Class	N	Dk	F_{count}	$F_{table} (\alpha=0,05)$	Conclusion
Experiment	29	28	0.98382366	3.37	Homogeneous
Control	29	28			

Based on the data in Table 10, the value of $F_{count} < F_{table}$ at a significance level of 0.05 with the degree of freedom (dk) denominator = 29 and the degree of freedom (dk) numerator = 28, thus H_0 is accepted. This shows that the two groups of data problem-solving abilities of students come from a homogeneous population. Similarly, the group of Self-confidence questionnaire data has a value of $F_{count} < F_{table}$ at a significance level of 0.05 with a degree of freedom (dk) denominator = 29 and a degree of freedom (dk) numerator = 28, so H_0 is accepted. This shows that both groups of questionnaire data Self-confidence and student learning outcomes come from a homogeneous population.

From the results of testing the requirements of the data analysis above, it can be concluded that both data from the population are normally distributed and have a homogeneous population variance. Thus, the t-test requirement test of two independent samples has been fulfilled so that it can be used to test the research hypothesis.

3.1. Effect of Problem Solving Models on Self-Confidence

This study involved two classes X SMA 2 Tilamuta Gorontalo, namely class X.A as the Experiment class and class X.B as the control class. The Experiment Class was given a treatment using the Problem Solving model while the control class was treated using conventional models. This study aims to see the self-confidence between students who use problem-solving learning models with conventional

models and determine the influence of problem-solving models on student learning outcomes. In this study, student self-confidence is divided into three aspects, namely self-confidence, positive attitude, and utilizing strengths. The initial questionnaire was given after the pretest, while the final questionnaire was given before the posttest.

Based on the results of the final questionnaire test, Self-confidence of the experimental class students in participating in chemical learning activities (Figure 1). The high level of confidence in the experimental class students in taking chemistry lessons is influenced by the presence of students' motivation to solve the problems of daily life they have experienced. The use of problem-solving methods will make students highly motivated by problems of problems related to real life, especially if the problem is related to their own experience. With the presence of student motivation, students' confidence in solving problems will also increase [11].

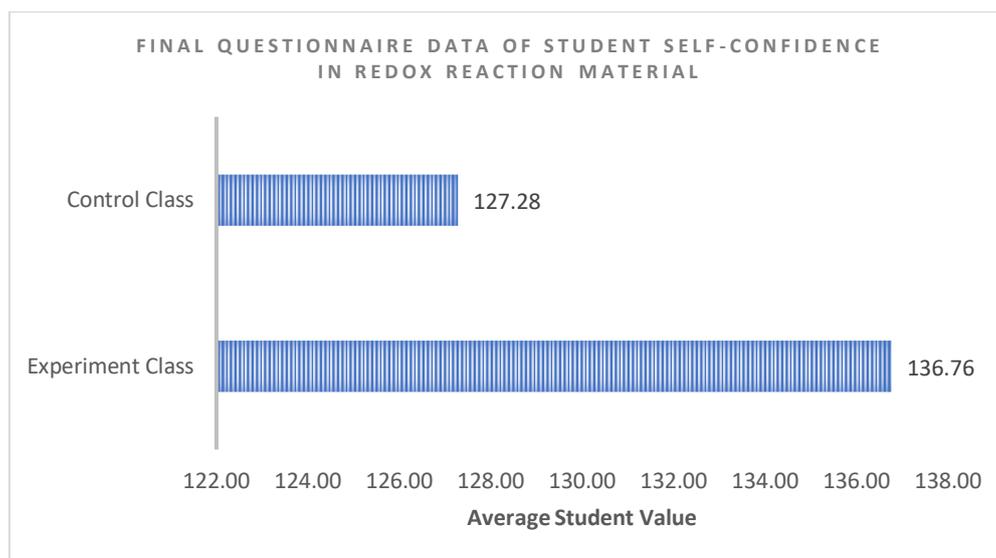


Figure 1. Average value of student questionnaire

Based on observations, as long as the teacher explains the material in front of the class, most of the students do not focus on the explanation given by the teacher, such as talking with friends, joking, and so on. From the results of interviews conducted on students whose grades did not reach the Minimum Completeness Criteria, that student was not focused on the explanation given by the teacher.

Results of the review from the opinion of the education science development team FIP-UPI (2007: 164), that students chat or do other activities when the teacher is explaining because students feel bored with the teaching patterns applied by their teachers. So, it can be concluded that students are not focused on the teacher's explanation because students feel bored with the model applied.

The decrease in the confidence of control class students in taking chemistry lessons is due to students being lazy, not understanding the material, and feeling difficult in doing the exercises. Feelings of laziness, lack of patience, difficulty, difficulty, or low self-esteem can cause a lack of confidence. So it can be concluded that students who are not confident tend to be unsure of their own abilities and are not independent. As the opinion of [12].

In the experimental class that uses the Problem-solving learning model, students are free to choose the method or concept of the redox reaction that they will use to solve the problem so that students get the freedom to solve the problem in the way they want. This flexibility makes students become confident in their own abilities. The use of ill-structured problems in the Problem Solving model allows students to solve problems in the way they choose. Students have the freedom to express their ideas in solving the given problems. This freedom provides an opportunity for students to develop their confidence in the subjects concerned [5].

No or lack of attention of students to the subject matter being discussed shows that the student feels lazy to follow the learning because he is bored. Hakim (2000:70), states that a student who initially

diligently studies can become lazy to learn because of being saturated. Based on the results of interviews that have been conducted that students feel bored when participating in chemical learning activities. Students feel bored because in conventional learning students tend to be passive [13]. Opinions from Anas (2014: 12-15), state that learning using the lecture method tends to be boring, so it needs to be interspersed with other methods to eliminate students' boredom [14]. Djamarah (2000) also mentions the weaknesses of the lecture method [15], including making passive students and if the learning lasts long can make students become bored [16].

Statistical test results with t-independent test with a significant level is $\alpha = 0.05$, obtained the value of $t_{\text{tab}} = 1.67252$. The test results show that $t_{\text{count}} > t_{\text{table}}$, $2.28431357 > 1.672$ so that it can be concluded that H_0 is rejected and H_1 is accepted. Thus it can be concluded that there is an effect of Problem Solving learning model on students' self-confidence. So the average learning outcomes that use Problem Solving learning models are higher than conventional learning models. In other words, there is an effect of problem-solving models on students' self-confidence in the redox material of class X SMA 2 Tilamuta, Gorontalo.

3.2. Effect of Problem Solving Learning Models on Student Learning Outcomes

The second objective is to determine the effect of Problem Solving methods on student learning outcomes. The results of the observation also showed that most of the control class students found it difficult when doing the exercise questions given, and from the results of the interviews found that there were students who did not understand the material presented. In addition, judging from the results of the Posttest given, there are several students who scored below 6, in this case, are not complete. This indicates that the student does not really understand the material presented.

Therefore, it can be concluded that the lack of self-confidence of students in the control class in taking chemistry learning is caused by students being lazy, not understanding the material, and feeling difficult in doing the exercises. There is an indication that learning in school is not running properly. This is due to the readiness of the teacher in designing and implementing learning, as well as the lack of support from the principal in organizing learning programs in schools [17].

In the experimental class, the majority of students were serious in solving iron cases on the Student Worksheet. Students look motivated to solve these problems. This was supported by the results of interviews conducted on several students of the experimental class that students were motivated by problems or cases of rusty iron contained in the Student Worksheet because students were curious and wanted to know why iron can generally rust. This proves that giving problems related to everyday life experienced by students can motivate students to solve these problems. With the emergence of motivation, students will be involved in solving problems. Students are free to choose the method or concept of the redox reaction they will use.

Students are given the flexibility to solve these problems in the way they want. This flexibility provides opportunities for students to develop self-confidence. Martyanti (2013: 19) states that the use of ill-structured problems in problem-solving learning models allows students to solve problems in the way they choose. Students have the freedom to express their ideas in solving problems given [5].

After the problem can be solved, there will be a sense of satisfaction in students because their curiosity about the problem has been answered. With the emergence of satisfaction, making students more confident, especially in studying chemistry. Haylock and Thangata (2007: 147-148) stated that students solve a problem there will be a sense of satisfaction and pleasure in themselves so that it will increase the students' confidence. So, the high self-confidence of students in the experimental class is because students have the flexibility and the emergence of satisfaction in students. In addition, increasing students' self-confidence can also be caused because students feel they have understood the material being studied [11].

In line with this, student learning outcomes of the experimental class are higher than those of the control class students. Based on the results of the study, it was obtained that the mean of the results of the experimental and control pretest classes was low. Judging from the results of the pretest in the control class none of the students who completed or did not reach the value of 6 while in the

experimental class only one student completed or achieved a value of 6. In the experimental class, only one student got 6 points and the rest got scores below 6. While in the control class 2 students did not answer at all. Other students answer questions but the answers given are wrong. Based on the results of interviews conducted on students that students have never received a redox reaction material.

After the two classes were given treatment, the experimental class and control class students' grades increased. However, the average posttest score of students in the experimental class was higher than the control class (Figure 2). Based on interviews with control class students revealed that there were still students who did not understand how to determine reduction and oxidation reactions. Students' misunderstanding in determining the reduction and oxidation reactions is caused when the teacher explains the material in front of the class, most students do other activities that are not related to learning activities, such as talking with friends, joking, and so on.

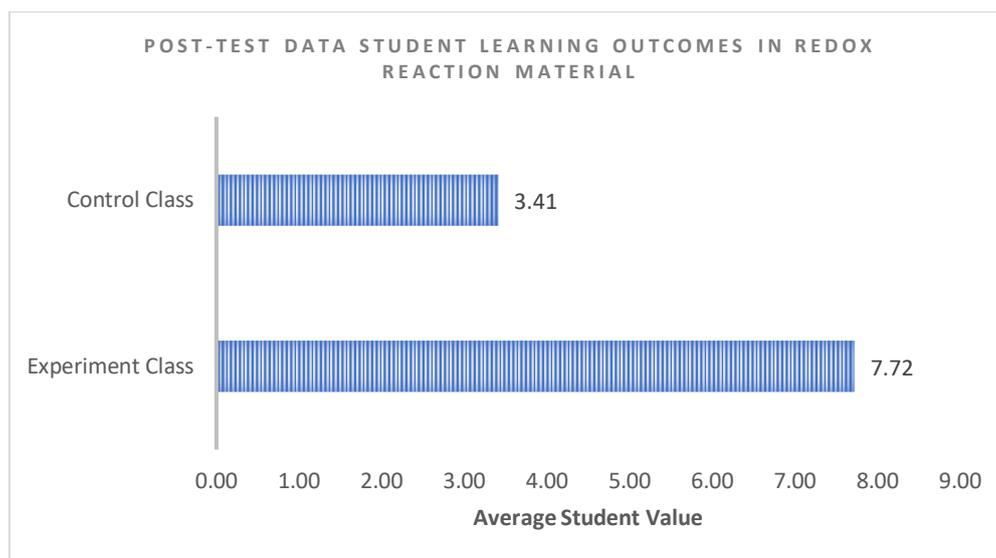


Figure 2. Average score of Student Post-test

Learning activities that apply lecture or conventional methods are generally physically in class, but mentally students do not follow the course of the learning process, as their thoughts drift everywhere. This is caused by the application of problem-solving learning models, where the knowledge that can be mastered by students is not only limited to those possessed by the teacher such as learning that uses the lecture method. In learning using this problem-solving model students tend to learn by digging their own information from various sources such as Student Worksheets, photocopies of material, the internet and the books they have so that the knowledge they acquire is not limited or broader than learning using conventional methods [3].

In addition, in this learning indirectly students have understood what they are reading so that learning is more meaningful. Mastery of better learning concepts is certainly due to optimal student involvement in learning. The learning process that starts with formulating problems, finding, investigating, and finding the answers to a problem in question, will provide more meaningful learning opportunities for students [18]. This meaningful learning will give women a long time to remember and provide a deeper understanding.

t-independent statistical test results with the significance value used is $\alpha = 0.05$ with $dk = 56$, obtained the value of $t_{table} = 1.67252$. The test results show that $t_{count} > t_{table}$, it can be concluded that H_0 is rejected and H_1 is accepted. It can be concluded that there are differences between learning outcomes that use Problem Solving learning models with conventional learning models. So, the average learning outcomes that use Problem Solving learning models are higher than conventional learning models.

4. Conclusions

Based on the results of the research and discussion it can be concluded that there is an effect of Problem solving learning methods on students' self-confidence in the redox reaction material. Where the results of hypothesis testing show that $t_{\text{count}} > t_{\text{table}}$, $2.284 > 1.672$. In addition, there is an effect of problem-solving models on student learning outcomes in the material of reduction-oxidation reactions. Where the results of hypothesis testing show that $t_{\text{count}} > t_{\text{table}}$, $7.519 > 1.672$. This shows that the Problem-solving learning model has a positive effect on increasing self-confidence and student learning outcomes.

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