



Book of ABSTRACTS

INTERNATIONAL CONFERENCE ON
STATISTICS, MATHEMATICS, TEACHING, AND RESEARCH

2nd ICSMTR 2017

Theme :

*Advanced Research on Statistics, Mathematics, Science and Education
for Enhancing International Publication*



Book of Abstracts

*International Conference on Statistics,
Mathematics, Teaching, and Research*

2nd ICSMTR 2017

Makassar, South Sulawesi, Indonesia

October 9 – 10, 2017

**Faculty of Mathematics and Natural Sciences
Universitas Negeri Makassar
Indonesia**



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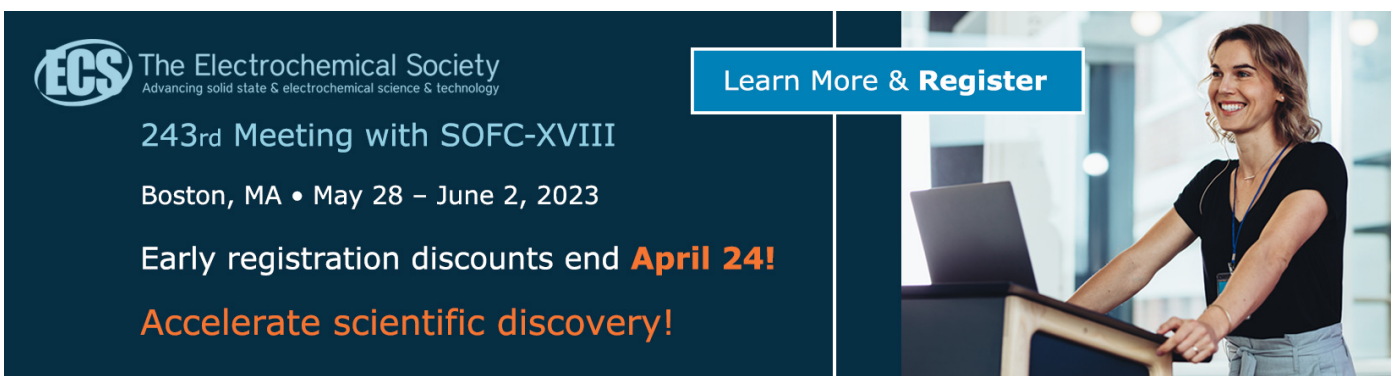
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WELCOME SPEECH

Forewords from the Head of Committee

Assalamu Alaikum Warahmatullahi Wabarakatuh.

The honourable, Rector of Universitas Negeri Makassar (UNM) and all Vice Rectors, the Dean of Mathematics and Natural Sciences Faculty and all Vice Deans, all invited Speakers and Participants.

First of all, let us praise and thank to Allah Subhana Wata'ala, because his Blessings and Helpings, we are able to gather here to attend this conference.

Second, I would like to give our welcome to all delegates, speakers, and participants coming today in The Second International Conference on Statistics, Mathematics, Teaching and Research 2017 (2nd ICSMTR-2017) "Advanced Research for Statistics, Mathematics, Sciences and Education for Enhancing International Publications" organized by Mathematics and Natural Sciences Faculty, UNM.

This conference is conducted in two days from 9th to 10th of October 2017 in Grand Clarion Hotel Makassar. It involves: a keynote speaker, six invited speakers and approximately 300 parallel speakers coming from the West to East Indonesia and several countries.

Ladies and gentleman as, I previously said, the conference proudly invites keynote speaker and six invited speakers coming from several countries. Therefore, on behalf of the committee, I would like to express my sincere thanks to them, specifically: 1) Directorate General of Research and Development Strengthening, Ministry of Research, Technology, and Higher Education; 2) Prof. M. Shaheed Hartley (University of Western Cape, South Africa); 3) Prof. Ahmed A. Bahnassy (King Fahd Medical City, Saudi Arabia); 4) Prof. Madya Dr. Ahmad Johari Bin Sihes (Universiti Teknologi Malaysia, Malaysia); 5) Prof. Dr. Khairil Anwar Notodiputro, MS (Bogor Agricultural University, Indonesia); 6) Abbas Panakkal, Ph.D (Ma'din Academy Research Center and International Study, India); 7) Prof. Hamzah Upu, M.Ed. (Universitas Negeri Makassar, Indonesia) and 8) Prof. Muhammad Arif Tiro, Ph.D. (Universitas Negeri Makassar, Indonesia).

Next, I would like thanks to all sponsors and also thanks to all organizing committee who have been showing very good work and determination for the accomplishment of this conference. All of them working since the beginning of the planning stage and they are still here today for all of us, even though, they are very busy with their personal responsibilities.

On this occasion, I would like to apologize to all of you when there are some inconvenience during the conference.

Finally, I would like thanks to the speakers and participants listed in the 2nd ICSMTR 2017. Have a nice conference and also that you have a very pleasant stay in Makassar city. Thank you very much for attention. Assalamu Alaikum Warahmatullahi Wabarakatuh.

Head of Committee,

Prof. Dr. Syafruddin Side, M.Si.



**Forewords from the Dean of Mathematics and Natural Sciences Faculty,
Universitas Negeri Makassar**

Your excellency Rector of Universitas Negeri Makassar
Honourable Vice Rectors and Dean of All Faculties
Honorable Keynote Speakers
Distinguished all invited speakers from outstanding universities
Distinguished all speakers and guests
All participants,
Ladies & Gentlement,

Assalamu'alaykum Warahmatullahi Wabarakatuh. My greetings for all of you. May peace and God's blessing be upon us all. *Alhamdulillah*, all praises be to the Almighty God, Allah *subhanahu wata'ala*.

It is my pleasure to welcome you all to the opening of The 2nd International Conference on Statistics, Mathematics, Teaching, and Research (2nd ICSMTR). I am delighted to see that the Mathematics and Natural Sciences Faculty has again organized the second conference that capitalize on our strength and built on our commitment to promoting Mathematics, Science, Teaching and Research.

I do hope that this conference would bring a great opportunity for all of us to strengthen our contribution to the advancement of our nation.

I would like to take this opportunity to thank the conference organizing committee for their diligent work. I would also like to thank participants, especially those of you coming from abroad, for joining us and sharing your valuable experiences. Should you find any inconveniences and shortcomings, please accept our sincere apologies.

Finally, let me wish you fruitful discussion and a very pleasant stay in Makassar.

Thank you,
Wassalamu'alaykum Warahmatullahi Wabarakatuh

Dean of Faculty of Mathematics and Natural Sciences
Universitas Negeri Makassar

Prof. Dr. Abdul Rahman, M.Pd.

Forewords from Rector of UNM

Bismillahirrahmanirrahim

Assalamu'alaikum Warahmatullahi Wabarakatuh

Your respectable, the high officials of State University of Makassar, the committee, the speakers, and the participants of conference.

It gives me great pleasure to extend to you all a very warm welcome, especially to our keynote and invited speakers who have accepted our invitation to convene the conference. ICSMTR is one of our educational activities that covers a wide range of very interesting items relating to statistics, mathematics, teaching and research.

By taking participation of this conference, it is highly expected to all of us to share our research findings to society and continuously develop new ideas and knowledge. Those things are two significant steps in improving the quality of nations around the world, increasing our familiarity to each other, and even avoiding underdevelopment.

Furthermore, I would like to take this opportunity to express my heartfelt gratitude to all organizing committee for Faculty of Mathematics and Natural Sciences that primarily hosts this conference.

Finally, this is a great time for me to declare the official opening of the International Conference on Statistics, Mathematics, Teaching, and Research (ICSMTR) 2017.

I wish you a very enjoyable stay in Makassar

I warmly welcome you again, as in Makassar, we say "salamakki battu ri mangkasara"

Wassalamu'alaikum Warahmatullahi Wabarakatuh.

Prof. Dr. Husain Syam, M.TP

Rector of Universitas Negeri Makassar

Table of contents

Volume 1028

2018

[Previous issue](#) [Next issue](#)

**2nd International Conference on Statistics, Mathematics, Teaching, and Research 2017 9–10
October 2017, Makassar, Indonesia**

Accepted papers received: 09 May 2018

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Preface

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[2nd International Conference on Statistics, Mathematics,
Teaching, and Research 2017](#)

011001

[Open abstract](#)

[View article](#)

[PDF](#)

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[Peer review statement](#)

011002

[Open abstract](#)

[View article](#)

[PDF](#)

Papers

Applied Mathematics

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[Knowledge and Attitudes with Family Role in Prevention
of Pulmonary Tuberculosis in Maros, Indonesia](#)

012001

Yermi, Muhammad Ardi, Lahming, Suradi Tahmir and Nurlita Pertiwi

[Open abstract](#)

[View article](#)

[PDF](#)

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The Roles of Family in Preventing Dengue Fever in Regency of Maros, South Sulawesi, Indonesia

012002

Musdalifah Syamsul, Sapto Haryoko, Lahming and Nurlita Pertiwi

[Open abstract](#)

[View article](#)

[PDF](#)

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Group Decision Making With Unbalanced-Expertise

012003

Shahryar Sorooshian

[Open abstract](#)

[View article](#)

[PDF](#)

OPEN ACCESS

Response Surface Methodology to Optimize Microwave Sterilization of Palm Fruit

012004

Maya Sarah, Isti Madinah and Siti Salamah

[Open abstract](#)

[View article](#)

[PDF](#)

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Support Vector Machines for Classifying Policyholders Satisfactorily in Automobile Insurance

012005

Zuherman Rustam and Ni Putu Ayu Audia Ariantari

[Open abstract](#)

[View article](#)

[PDF](#)

OPEN ACCESS

Using K-Means Clustering to Cluster Provinces in Indonesia

012006

Ansari Saleh Ahmar, Darmawan Napitupulu, Robbi Rahim, Rahmat Hidayat, Yance Sonatha and Meri Azmi

[Open abstract](#)

[View article](#)

[PDF](#)

OPEN ACCESS

Mapping of Poverty Characteristics, based on the quality of Fisherman's House, Bajo Tribe, South Halmahera, Indonesia

012007

Rosmini Maru, Ramli Umar, Syukri Nyompa, Takdir Ismail, Amal Arfan, Sulaiman Zhiddiq and Uca Sideng

[Open abstract](#)[View article](#)[PDF](#)

Biology

OPEN ACCESS

012008

Histological study of the circulatory system of Sulawesi Medaka fish (*Oryzias celebensis*) for animal model research

Dwi Kesuma Sari, Irma Andriani and Khusnul Yaqin

[Open abstract](#)[View article](#)[PDF](#)**OPEN ACCESS**

012009

In vitro cytotoxicity of *Artocarpus lakoocha* aqueous extract and oxyresveratrol in SH-SY5Y cells

Hasriadi and Nanteetip Limpeanchob

[Open abstract](#)[View article](#)[PDF](#)**OPEN ACCESS**

012010

The Potency Of Livestock Waste Into Renewable Energy (Biogas) In Palipu District Tana Toraja Regency

Frederik Palallo, Muhammad Ardi and Guntur Yusuf

[Open abstract](#)[View article](#)[PDF](#)**OPEN ACCESS**

012011

Response Surfaces of Linoleic Acid of *Swietenia Mahagoni* in Supercritical Carbon Dioxide

Hartati, Liza Md Salleh, Halifah Pagarra and Rachmawaty

[Open abstract](#)[View article](#)[PDF](#)**OPEN ACCESS**

012012

The Development of Students' Nature of Science Views in Cellular Respiration Context

A C Pratiwi, S Kijkuakul and P Sangin

[Open abstract](#)[View article](#)[PDF](#)

OPEN ACCESS

012013

Active Compounds Extraction of Cocoa Pod Husk (*Thebroma Cacao* l.) and Potential as Fungicides

Rachmawaty, A. Mu'nisa, Hasri, Halifah Pagarra, Hartati and Zulkifli Maulana

[Open abstract](#)

[View article](#)

[PDF](#)

OPEN ACCESS

012014

Effectivity of Anatagonistic Bacteria in Controlling of Fusarium Wilt Diseases of Banana (*Musa paradisiaca*) by in Vitro

Hilda Karim, Hamka L, Nani Kurnia and Muhammad Junda

[Open abstract](#)

[View article](#)

[PDF](#)

OPEN ACCESS

012015

Characterization of Actinomycetes Antagonist *Fusarium oxysporum* f.sp. *passiflora* Isolated from Rhizosphere Soil of Purple Passion Fruit Plants, South Sulawesi, Indonesia

Alimuddin Ali, Muhammad Junda, Herlina Rante and Riska Nuramelia

[Open abstract](#)

[View article](#)

[PDF](#)

OPEN ACCESS

012016

The Effect of Education Level on Farmer's Behavior Eco-Friendly to Application in Gowa, Indonesia

Fatmawati, Lahming, Ahmad Rifqi Asrib, Nurlita Pertiwi and Gufran Darma Dirawan

[Open abstract](#)

[View article](#)

[PDF](#)

OPEN ACCESS

012017

Antibacterial Activity of Mold Isolate from "Wikau Maombo" Based on Incubation Period

Nurhayani H. Muhiddin, Nur Arfa Yanti and Nur Asni

[Open abstract](#)

[View article](#)

[PDF](#)

OPEN ACCESS

012018

Dielectric properties of carbon from cassava starch synthesized from hydrothermal process

Fendi and Akhiruddin Maddu

[Open abstract](#)

[View article](#)

[PDF](#)

OPEN ACCESS

012019

Menstrual Cycle Length in Women Ages 20-30 years in Makassar

Andi Asmawati Azis, N Kurnia, Hartati and Andi Bida Purnamasari

[Open abstract](#)

[View article](#)

[PDF](#)

OPEN ACCESS

012020

Development of Intensive Shrimp Farming, *Litopenaeus vannamei* In Land-Based Ponds: Production and Management

Muhammad Junda

[Open abstract](#)

[View article](#)

[PDF](#)

OPEN ACCESS

012021

Antioxidant Capacity of Snakehead Fish Extract (*Channa striata*) at Different Shelf Life and Temperatures

Dewi Hidayati, Amirotul Faizah, Endry Nugroho Prasetyo, Nurul Jadid and Nurlita Abdulgani

[Open abstract](#)

[View article](#)

[PDF](#)

OPEN ACCESS

012022

Identification of Secondary Metabolite Compounds in Kirinyuh (*Chloromelaena odorata*) Leaf as Organic Pesticides for Wide Leafy Vegetables

Rachmat S. Santoso

[Open abstract](#)

[View article](#)

[PDF](#)

OPEN ACCESS

012023

Bioactive compound and Antioxidant Activity Analysis of Some Medicinal Plants of Province of Western Sulawesi

A. Mu'nisa, Syamsia, Rachmawaty and A. Muflihunna

[Open abstract](#)

[View article](#)

[PDF](#)

OPEN ACCESS

012024

Vegetation structure of sapling plant at Bantimurung Bulusaraung National Park Balloci Resort South Sulawesi

Muhammad Wiharto, Lahming, Diyahwati, Muhammad Wijaya, Hamka Lodang and Fatma Hiola

[Open abstract](#)

[View article](#)

[PDF](#)

Biology Education

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012025

Identification of Misconceptions on Cell Concepts among Biology Teachers by Using CRI Method

Yusmina Hala, U A Syahdan, Halifah Pagarra and S Saenab

[Open abstract](#)

[View article](#)

[PDF](#)

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012026

Project-based Learning as the Atmosphere for Promoting Students' Communication Skills

Sitti Saenab, Sitti Rahma Yunus, Andi Rahmat Saleh, Andi Nurul Virinda, Hamka L and Nurul Arifah Sofyan

[Open abstract](#)

[View article](#)

[PDF](#)

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012027

Blended Learning Media in Biology Classroom

Nurhikmah H, Suradi Tahmir, Muhammad Junda and Baso Asrul N. Bena

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[View article](#)

[PDF](#)

OPEN ACCESS

012028

Development and Validation of Learning Strategy for Metacognitive Skills Empowerment: PBLRQA (PBL integrated with

Reading, Questioning, and Answering)

Arsad Bahri and Irma Suryani Idris

[Open abstract](#)

[View article](#)

[PDF](#)

OPEN ACCESS

012029

Enhancing Student's Learning Outcomes with Different Academic Level Using Metacognitive Strategies

Yusnaeni

[Open abstract](#)

[View article](#)

[PDF](#)

OPEN ACCESS

012030

Profile of Students' Metacognitive Skill Based on Their Learning Style

Muhiddin Palennari, Mushawwir Taiyeb and Siti Saenab

[Open abstract](#)

[View article](#)

[PDF](#)

Chemistry

OPEN ACCESS

012031

Nutrition Literacy Program for Improving Public Wellness

Chaerul Rochman, Dindin Nasrudin, Imelda Helsy, Neni Hermita, Wahyudin Darmalaksana and Nasrullah

[Open abstract](#)

[View article](#)

[PDF](#)

OPEN ACCESS

012032

Purification of Palm Biodiesel Using Deep Eutectic Solvent (DES) Based Choline Chloride (ChCl) and 1,2-Propanediol (C₃H₈O₂)

R Manurung, A Syahputra and M A Alhamdi

[Open abstract](#)

[View article](#)

[PDF](#)

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012033

Fabrication and Characterization of Activated Carbon from Charcoal Coconut Shell Minahasa, Indonesia

Meytij Jeanne Rampe and Vistarani Arini Tiwow

[Open abstract](#)

[View article](#)

[PDF](#)

OPEN ACCESS

012034

Syntheses of Chitosan Macropore and Application as Procion Red Dyes Adsorben

Abu Masykur, Atmanto Heru Wibowo, Tri Martini and Khofifah Cyntia Laras

[Open abstract](#)

[View article](#)

[PDF](#)

OPEN ACCESS

012035

Particular variety of tobacco (*Nicotiana tabacum*) exhibits distinct morphological and physiological responses against periodic waterlogging stress

Tutik Nurhidayati, R. Yuvita Rahman, Hery Purnobasuki, Sucipto Hariyanto and Nurul Jadid

[Open abstract](#)

[View article](#)

[PDF](#)

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012036

Risks Assessment due to the Exposure of Copper and Nitrogen Dioxide in the Goldsmith in Malimongan Makassar

Anwar Mallongi, Muhammad Nadjib Bustan, Nur Juliana and Herawati

[Open abstract](#)

[View article](#)

[PDF](#)

OPEN ACCESS

012037

The Content of Polycyclic Aromatic Hydrocarbons (PAH) in The Green Mussels (*Perna Viridis* L) Around The Coast of Makassar

Muhammad Syahrir, Hasri and Maryono

[Open abstract](#)

[View article](#)

[PDF](#)

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012038

Invisible Ink from ZnO Waste Batteries

Susilo Sudarman Desa, Hasri and Suriati Eka Putri

[Open abstract](#)[View article](#)[PDF](#)

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012039

Performance Test of Gelcasted Porous Ceramic as Adsorbent of Azo Dyes

Suriati Eka Putri, Diana Eka Pratiwi, Rachmat Triandi, Diah Mardiana and Sumiati Side

[Open abstract](#)[View article](#)[PDF](#)

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012040

Microalgae Growth and Morphology of *Skeletonema costatum* On Physiological Stress Nutrient Silicon (Si)

Endang Purwanti Setyaningsi, Tutik Nurhidayati, Syam Pratiwi, Sri Nurhatika, Dini Ermavitalini, Anton Muhibuddin, Kristanti I

[Open abstract](#)[View article](#)[PDF](#)

Chemistry Education

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012041

Development of Chemistry Instructional Tools and Its Effect on Critical Thinking Skills, Metacognition, and Concept Mastery of Students

Muhammad Danial, Muhammad Sawal and Nurlaela

[Open abstract](#)[View article](#)[PDF](#)

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012042

Indonesian Teachers' Perceptions on Green Chemistry Principles: a Case Study of a Chemical Analyst Vocational School

Army Auliah, Muharram and Mulyadi

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012043

The Analysis of Basic Chemistry Mastery of Students of Prospective Chemistry Teacher of State University Makassar (Study on Chemical Bonding)

Muhammad Anwar, Ramdani and Ahmad Fudhail Majid

[Open abstract](#)

[View article](#)

[PDF](#)

Computer

OPEN ACCESS

012044

eConf: an Information System to Manage the Conference

Ansari Saleh Ahmar, Rahmat Hidayat, Darmawan Napitupulu, Robbi Rahim, Yance Sonatha and Meri Azmi

[Open abstract](#)

[View article](#)

[PDF](#)

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012045

Implementation of Information Technology System Innovation Strategy Application of Premarital Course Based on Android

Herlinah, Baso Habibi and Rachman Suwandaru

[Open abstract](#)

[View article](#)

[PDF](#)

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012046

Harmonic Oscillation Characteristic using Visual Basic Application

Zakaria Victor Kareth, Khaeriah Dahlan, Muhammad Akbar and Octolia Togibasa

[Open abstract](#)

[View article](#)

[PDF](#)

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012047

The development of information system of IT-Based scientific works to improve the quality of the students' final project publication

Ansari Saleh Ahmar and Riny Jefri

[Open abstract](#)

[View article](#)

[PDF](#)

OPEN ACCESS

012048

Classification of Epileptiform Waves Based on Frequency by Using Backpropagation Neural Network

A.I Jaya, Gifarini Soemarno and J.W. Puspita

[Open abstract](#)

[View article](#)

[PDF](#)

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012049

Security Device for Motorcycle Using Smartphone Android with Promini

Baihaqi Siregar, Chairul Saleh Nasution, Dani Gunawan, Sawaluddin Sawaluddin, Ulfi Andayani and Fahmi Fahmi

[Open abstract](#)

[View article](#)

[PDF](#)

OPEN ACCESS

012050

The Development of Research Management Information System Based on Web at Universitas Negeri Makassar

Rusli, Nurdin Noni, Nasrul Ihsan and Ansari Saleh Ahmar

[Open abstract](#)

[View article](#)

[PDF](#)

OPEN ACCESS

012051

Design of Android Base Fuzzy Wireles Sensor Network for mini Smart Green House

Diana Rahmawati, Miftachul Ulum and Heri Setiawan

[Open abstract](#)

[View article](#)

[PDF](#)

OPEN ACCESS

012052

TOPSIS Method Application for Decision Support System in Internal Control for Selecting Best Employees

Robbi Rahim, S Supiyandi, A P U Siahaan, Tri Listyorini, Andy Prasetyo Utomo, Wiwit Agus Triyanto, Yudie Irawan, Siti Aisyah
al

[Open abstract](#)

[View article](#)

[PDF](#)

OPEN ACCESS

012053

Secure a Transaction Activity with Base64 Algorithm and Word Auto Key Encryption Algorithm

Heri Nurdiyanto, Robbi Rahim, Ansari Saleh Ahmar, Muhammad Syahril, Muhammad Dahria and Herlina Ahmad

[Open abstract](#)

[View article](#)

[PDF](#)

OPEN ACCESS

012054

Web Based Application for Decision Support System with ELECTRE Method

Ahmad Yanie, Abdurrozaq Hasibuan, I Ishak, M Marsono, Syamsuddin Lubis, N Nurmalini, M Mesran, Surya Darma Nasution, I al

[Open abstract](#)

[View article](#)

[PDF](#)

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012055

Employee Recruitment Fraud Prevention with the Implementation of Decision Support System

Tulus Suryanto, Robbi Rahim and Ansari Saleh Ahmar

[Open abstract](#)

[View article](#)

[PDF](#)

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012056

Combination Base64 and Hashing Variable Length for Securing Data

M Mesran, Dahlan Abdullah, Dedy Hartama, R Roslina, A Asri, Robbi Rahim and Ansari Saleh Ahmar

[Open abstract](#)

[View article](#)

[PDF](#)

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012057

RC4 Algorithm Visualization for Cryptography Education

S Sriadhi, Robbi Rahim and Ansari Saleh Ahmar

[Open abstract](#)

[View article](#)

[PDF](#)

OPEN ACCESS

012058

Soil Moisture Monitoring System using Wireless Sensor Network

Baihaqi Siregar, AB Azmi Nasution, Lukman Adlin, Ulfi Andayani and Fahmi Fahmi

[Open abstract](#)

[View article](#)

[PDF](#)

Engineering

OPEN ACCESS

012059

Design of Web-based Lightweight Interactive Multimedia for Distance Learning

Didik Dwi Prasetya, Aji Prasetya Wibawa and Ansari Saleh Ahmar

[Open abstract](#)

[View article](#)

[PDF](#)

OPEN ACCESS

012060

The Effect of Gravitational Field on *Brachistochrone* Problem

Mohammad Lutfi

[Open abstract](#)

[View article](#)

[PDF](#)

OPEN ACCESS

012061

The Effect of Drying Temperature on Natural Rubber Latex (NRL) Films with Modification of Nanocrystal Cellulose (NCC) Filler

Hamidah Harahap, Hamda Eka Agustini, Taslim, Iriany, Halimatuddahlia and Yuni Aldriani Lubis

[Open abstract](#)

[View article](#)

[PDF](#)

OPEN ACCESS

012062

Performance of Asphalt Concrete with Chrome and Hot Rolled Sheet with Chrome Using Portland Cement Filler and Prevent Exfoliation by Empirical Mechanism

Sabib, Roesdiman Soegiarso, Adinus Saleh, M. Ikhsan Setiawan and Ansari Saleh Ahmar

[Open abstract](#)

[View article](#)

[PDF](#)

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012063

Designing Cost Production of Concrete

Yunan Hanun, Sofia W. Alisjahbana, Dadang M. Ma'soem, M. Ikhsan Setiawan and Ansari Saleh Ahmar

[Open abstract](#)

[View article](#)

[PDF](#)

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012064

Utilization Visualgo.net as a Data Structure Learning Media based on CDIO

Aji Prasetya Wibawa, Felix Andika Dwiyanto, Triyanna Widiyaningtiyas, I Made Wirawan, Wahyu Sakti Gunawan Iriyanto and /

[Open abstract](#)

[View article](#)

[PDF](#)

OPEN ACCESS

012065

Stand-Alone Data Logger for Solar Panel Energy System with RTC and SD Card

Mokh. Sholihul Hadi, Arif Nur Afandi, Aji Prasetya Wibawa, Ansari Saleh Ahmar and Kurniyawan Hardi Saputra

[Open abstract](#)

[View article](#)

[PDF](#)

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012066

A Study of VHS Culture of Quality through Improving the Role of ICT Center Management

Hakkun Elmunsyah, Dwi Prihanto, Suwasono, Soenarto, Ansari Saleh Ahmar and Rusli

[Open abstract](#)

[View article](#)

[PDF](#)

OPEN ACCESS

012067

Analysis of Nitrogen and Carbon Content on Mangrove Forests in Tongke –Tongke, Sinjai

Ernawati Syahrudin Kaseng

[Open abstract](#)

[View article](#)

[PDF](#)

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012068

Optimize Performance of Cross Flow Turbine with Multi Nozzle

Corvis L Rantererung, Titus Tandisenso and Mika Mallisa

[Open abstract](#)

[View article](#)

[PDF](#)

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012069

Sensitivity Analysis with AHP Method: Selection of Foundation Design on Bridge Sei Muara Bulan Anak 2

Hendrik Sulistio, Mega Waty, Muhammad Ikhsan Setiawan, Nuning Kurniasih and Ansari Saleh Ahmar

[Open abstract](#)

[View article](#)

[PDF](#)

OPEN ACCESS

012070

Sound Absorption Type Single Reflex Bandpass from Rolled Kinds of Areca Nut with Polyurethane and Gypsum Matric

Hasbullah Panggabean, Selamat Triono, S Sukardi, Muhammad Iqbal Siregar, A Abdillah, W Warman, Dicky Nofriansyah, Ansar

[Open abstract](#)

[View article](#)

[PDF](#)

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012071

Dynamic Soil-Structure Interaction Using ITM-FEM Approach

Hidajat Lesmana, Roesdiman Soegiarso, Josia Irwan Rastandi, Cholil Hasyim, Muhammad Ikhsan Setiawan, Nuning Kurniasih a

[Open abstract](#)

[View article](#)

[PDF](#)

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012072

Development Model of Community College (CC) Curriculum Management Bases on Pre-Eminent Potency of District and Public Requirement

Andi Muhammad Irfan, Ahmad Sonhadji KH, Eddy Sutadji, Soetyono Iskandar and Sunardi

[Open abstract](#)

[View article](#)

[PDF](#)

OPEN ACCESS

012073

Employability Skill Development of Mechanical Engineering Students Through Project Based Learning in Vocational High School in South Sulawesi

Amiruddin, Abdul Muis Mappalotteng, Nurlaela and Sunardi

[Open abstract](#)

[View article](#)

[PDF](#)

OPEN ACCESS

012074

Dynamics of *Unit Kegiatan Mahasiswa* Organization in Makassar (Case Study at STIM Nitro and STMIK Handayani)

Rachman Suwandar and Herlinah

[Open abstract](#)

[View article](#)

[PDF](#)

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012075

Fitness and Learning Performance among Polytechnic Students

A. R. Shadiqin, Endang Sri Dewi and Sri Rahayu

[Open abstract](#)

[View article](#)

[PDF](#)

OPEN ACCESS

012076

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Developing Supporter Community of Makassar Football Association (PSM)

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The Development of The Model of Control of the Regional People's Legislative Assembly Based on Performance of Regional Regulation to Governance Accountability and Transparent Government in Barru Regency and Pangkajene Islands Regency of South Sulawesi Province

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Forecasting Infant Mortality Rate for China: A Comparison Between α -Sutte Indicator, ARIMA, and Holt-Winters

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012204

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012206

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Implementation of SM3T Alumni in Teacher Professional Education Program (Study of PPG SM3T Participants in The Universitas Negeri Makassar)

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[RcmdrPlugin.sutteForecastR : an RcmdrPlugin for Forecasting Data](#)

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[Value-at-Risk Modeling on Stock Return with Exogenous Variables using ARMAX-GARCHX Approach](#)

Dedy Dwi Prastyo, Iio Lionita Sudjati, Soo-Fen Fam, Setiawan, Suhartono and Ni Luh Putu Satyaning Pradnya Paramitaa

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[Total Idle Time Density Function of M/C₂/1 Systems under \(0,k\) Policy](#)

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[Comparison between Support Vector Machine and Fuzzy C-Means as Classifier for Intrusion Detection System](#)

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CONFERENCE SCHEDULE
The 2nd ICSMTR

Faculty of Mathematics and Natural Sciences
Universitas Negeri Makassar

Clarion Hotel, Makassar, Indonesia, 9 – 10 October 2017

Day 1: Monday, 9 October 2017		
07.00 – 08.00	Registration	Jasmine Hall
08.00 – 09.00	Opening Ceremony Traditional Dance Doa National Anthem: Indonesia Raya Welcome speech: a. Head of Committee Prof. Dr. Syafruddin Side, M.Si. b. Dean of Math & Natural Sciences Faculty Prof. Dr. Abdul Rahman, M.Pd. c. Rector of Universitas Negeri Makassar Prof. Dr. Husain Syam, M.TP.	Jasmine Hall
09.00 – 09.45	Keynote Speaker Directorate General of Research and Development Strengthening, Ministry of Research, Technology, and Higher Education	Jasmine Hall
09.45 – 10.00	Coffee Break	Jasmine Hall
10.00 – 12.00	Invited Speakers 1. Prof. M. Shaheed Hartley, Ph.D. 2. Prof. Dr. Hamzah Upu, M.Ed. 3. Prof. Madya Dr. Ahmad Johari Bin Sihes	Jasmine Hall
12.00 – 13.00	Lunch & Pray	
13.00 – 15.30	Parallel Sesion 1	Parallel Rooms
15.30 – 16.00	Coffee Break	Parallel Rooms
16.00 – 18.00	Parallel Session 2	Parallel Rooms
Day 2: Tuesday, 10 October 2017		
08.00 – 10.00	Invited Speakers 1. Prof. Dr. Khairil Anwar Notodiputro, M.S 2. Prof. Ahmed A. Bahnassy, Ph.D. 3. Prof. Muhammad Arif Tiro, Ph.D. 4. Abbas Panakkal, Ph.D.	Jasmine Hall
10.00 – 10.10	Coffee Break	Jasmine Hall
10.10 – 11.30	Parallel Session 3	Parallel Rooms
11.30 – 12.00	Closing Ceremony	Jasmine Hall
12.00 – 13.00	Lunch & Pray	
13.00 – End	City Tour	

INVITED SPEAKER SESSION

Day 1: Monday, 9 October 2017		
10.00 – 12.00	Professor M.Shaheed Hartley, Ph.D. University of Western Cape, South Africa <i>Training, supervision and mentorship on a professional development journey from 2010 to 2017: A reflection by students and supervisors</i>	Jasmine Hall
	Professor Dr. Hamzah Upu, M.Ed. Universitas Negeri Makassar, Indonesia <i>The Effectiveness of Mathematics Learning Packages Based on Bilingual Approach.</i>	
	Professor Madya Dr. Ahmad Johari Bin Sihes Universiti Technology Malaysia, Malaysia <i>Transformation of Higher Education Curriculum to Meet the 4th Industrial Revolution Challenges</i>	
Day 2: Tuesday, 10 October 2017		
08.00 – 10.00	Professor Dr. Khairil Anwar Notodiputro, M.S Bogor Agricultural University, Indonesia	Jasmine Hall
	Professor Ahmed A. Bahnassy, Ph.D. King Fahd Medical City, Saudi Arabia	
	Professor Muh. Arif Tiro, Ph.D. Universitas Negeri Makassar, Indonesia <i>National Movement for Statistical Literacy in Indonesia: An idea.</i>	
	Abbas Panakkal, Ph.D. Ma'din Academy Research Center, India <i>Technological Trajectories and Epistemological Paradigms in Social Science Researches.</i>	

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The Development of Educational Game as Instructional Media to Facilitate Students' Capabilities in Mathematical Problem Solving

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The Development of Educational Game as Instructional Media to Facilitate Students' Capabilities in Mathematical Problem Solving

Risnawati, Zubaidah Amir, and Dini Wahyuningsih

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Abstract: This study aims to produce a valid and practical educational game that can facilitate students' mathematical problem solving ability. This study is a development research using Borg & Gall model which has been modified. Subjects were technology and subject matter experts as validators and 8th grade students of State Junior High School 21 Pekanbaru for practically test and the object of this study are educational game and students' mathematical problem solving ability. The data were obtained through a validation process by validators, practicalities by students, and effectivity by students' mathematical problem solving ability test in the form of post-test. Data collection instruments are in the forms of validation sheets, practicalities questionnaire sheets and post-test for mathematical problem solving ability. The data were analyzed with descriptive analysis techniques. The educational game development results have been tested with validity degree of 84.1% (very valid), practicality degree of 85.42% (very practical) and effectivity degree of 80% (effective). From these results, it was identified that the educational game that developed was very valid, very practical and effective to facilitate students' mathematical problem solving ability

1. Introduction

Mathematics learning has become one of the most researched fields in education. This is caused by so many strategies, methods, media, and learning sources that can be used in its practices. Mathematics has a wide variety of its contents so that different strategies and media are needed in its lessons. Mathematics also has many different abilities that needed for its learning, like understanding, communications, problem solving, and many more.

From those abilities, problem solving is one of the most important, because, as Halmos (1980) said, "I do believe that problems are the heart of mathematics[1]". It means that almost all mathematics learning is about to find and solve problems. Therefore, problem solving ability is very much needed by students in mathematics learning.

Problem solving also needed for a meaningful learning. Brownel (1953) said that learning happen trough meaningfulness and understanding[2]. Wertheimer (1959) further explained that the meaningfulness of learning can occur due to the discovery of various way of solving a problem[3].

Students also can be benefited from having this ability, as Hudoyo (2005) said that problem solving is an essential part in mathematics learning because (1) students become skilled at selecting relevant



information, then analyzing it and finally researching the results; (2) intellectual satisfaction that will arise from within is an intrinsic problem for students; and (3) students' intellectual potential increases and students learn how to make discovery through the process of discovery[4].

Problem solving itself, as the process of finding answers to problems, either in classes or situations in real life[5], has some steps. Polya summarizes those steps as understanding the problem, devising a plan, carrying out the plan, and looking back[6] while Anisa explains the four steps of solving problems in mathematics as (1) read and understand the language and the problem of the story; (2) presenting the problems in mathematical model; (3) planning the calculations of the mathematical models, and (4) solving the calculations of non-routine questions [7]-[10].

As mentioned above, the ability to solve mathematical problems is very much needed by students, as most mathematics learning will be problem solving. However, based on interviews with one of the mathematics teachers at State Junior High School 21 Pekanbaru and the tests that have been done, most students still did not have the required skills for problem solving, such as identify the elements that are known, formulate mathematics' problems and apply strategies to solve problems from a story based problem.

Most students think that mathematics is a difficult and tedious lesson, so they are less interested in learn it that causes their low mathematical problem solving ability. Mathematics learning that held at State Junior High School 21 Pekanbaru is using supporting books from the library, teaching materials in the form of student worksheets, and has used instructional media in the form of power point, video, and interactive CD learning, but still cannot facilitate students' mathematical problem solving ability.

Teachers are required to always innovate in providing learning resources for students; one of them is instructional media. This means teachers should always develop the instructional media in accordance with the needs of students and the development of science and technology.

The instructional media developed not only must be in accordance with the needs of students, but also must be able to attract students so that the developed media can be applied to the fullest. Based on observation and interview to find what is liked by the students, authors found that most students really liked game.

Game, especially digital game is not a strange word in this world. Nowadays, people are stimulated by the use of game for entertainment and playing facility[10] that could become an extremely time consuming thing, especially to children, that can spend until 13 hours playing game in a week [11].

Based on students' interest of game, it can be used in education field as a media to help students to learn better. An educational and constructive aspect of the game is that individuals want to progress in the game and modify the way of playing. It seems that progress and desire to winning in game motivate the passive students to think [12], Nekah said. Cheng also stated that a very important reason why game has a positive effect on learning is because game provides live experience of user involvement[13].

The using of educational game is a form of Game Based Learning (GBL), a method of learning that use digital game as a medium to reach the learning objectives. In GBL, students are actively doing experiences, understanding the game, and resolving the problems that exist in it [14], Groff said. Based on that, game actually helping students to practice their problem solving ability, even when they did not realized it.

Game is a way to facilitate student's mathematical problem solving ability. Suherman stated that educational games containing mathematical values can improve their conceptual understanding, comprehension and consolidation skills, improve the ability to find and solve problems, and others[15].

McLaren support this with a research that stated that students become more enjoyable in learning and have better understanding, thus can solve problems better after using educational game[16].

This is also supported by Şimşek in his research that students' interests toward mathematics increased, they started to like mathematics, they would like to reserve more time for mathematics and they would like to have advanced level information about mathematics. Besides, an increase of

academic success regarding the objectives, which is a cognitive quality, has been noted thanks to the three dimensional Mathematics Robot they developed[17].

Moreover, Craig's research results stated that there was a positive impact on the students understanding of coordinates and translations after using the game that they developed[18] that also helped them to improve their problem solving ability.

Randel's research results on 1991 stated that the usage of game is very useful on subjects that related with mathematics, physics, and language ability[19]. It means that game, especially educational game, could help students to improve their mathematical problem solving ability. The link between meaningfulness of learning and various ways of solving that found by students is accommodated through various mathematical games.

Based on those, authors will conduct a research to develop an educational game that valid, practical, and effective to facilitate students' mathematical problem solving ability. The problem of this research is how are the validity, practicality, and effectivity of the educational game that developed to facilitate students' mathematical problem solving ability.

2. Methods

This research used research and development (*R & D*) method. Research and development is a process or steps to develop new products, or to improve the existing products. This research was conducted at State Junior High School 21 Pekanbaru for 8th grade students with purposive sampling. The study was developed using a modified Borg & Gall model (researching and gathering information, planning, developing initial product forms, initial field testing, major product revisions, primary field testing, product operating revisions, final product revisions). The procedures involved are needs analysis, product development, validity, revision 1, user-limited testing, revision 2, user group test, revision 3, and final products.

The data analyses used are the qualitative and quantitative descriptive questionnaires. The descriptive qualitative analysis is used to analyze data from technology experts and subject matter expert, and the comments of the revised educational game. The descriptive quantitative analyses are:

$$\text{Validity} = \frac{\sum \text{obtained score}}{\sum \text{score criteria}} \times 100\%$$

$$\text{Practicality} = \frac{\sum \text{obtained score}}{\sum \text{score criteria}} \times 100\%$$

The level of validity and practicality can be seen in the following table:

Table 1. Level of validity / practicality of educational games[19]

Ideal percentage (%)	Categories
0-20	Not Valid/ Not Practical
21-40	Less Valid / Less Practical
41-60	Enough Valid/ Enough Practical
61-80	Valid / Practical
81-100	Very Valid / Very Practical

As for effectivity, students' score are categorized based on Minimum Mastery Criteria (MMC), which

are 75 for mathematics at State Junior High School 21 Pekanbaru.

$$\text{Effectivity} = \frac{\sum \text{students who meet the MMC}}{\sum \text{students who take post test}} \times 100\%$$

The level of effectivity can be seen from the following table:

Table 2. Level of Effectivity of Educational Game to Facilitate Student Mathematical Problem Solving Ability[20]

Effectivity level	Categories
81% - 100%	Very Effective
61% - 80%	Effective
41% - 60%	Enough Effective
21% - 40%	Less Effective
< 20%	Not Effective

3. Result and Discussion

Development The procedures of educational game development begin with needs analysis, where we found that there are students with low ability to solve mathematical problems. The next step is product development that used Adobe Flash Professional CC 2015. In developing the product, the focuses are to make an interesting interface (opening, menu, exercise, key answer, and Score) and storyboard that can facilitate Mathematical problem solving ability of 8th grade students, especially in circle.

Furthermore, validation is done by technology and subject matter experts. The validation results from technology experts can be seen in the following table:

Table 3. Validation Results of Educational Game Developed from Technology Experts

Variables of validity	Validity score	Criteria
Feasibility of Appearance	81.83%	Very Valid
Feasibility of Presentation	72.88%	Very Valid
Language	82.9%	Valid
Average Score	79.2%	Valid

The results of data analysis showed that the educational game that developed is valid in technology side and can be used for practicality test after small revisions.

The validation results from subject matter experts can be seen in the following table:

Table 4. Validation Results of Educational Game Developed from Subject Matter Experts

Variables of validity	Validity score	Criteria
Feasibility of Contents	87%	Very Valid
Language	88%	Very Valid
Problem Solving	92%	Very Valid
Average Score	89%	Very Valid

The results of data analysis showed that the educational game that developed is very valid in subject matter side and can be used for practicality test after small revisions.

The next step is revision 1, which authors did based from comments by technology and subject matter experts. Then, practicality test phase I was conducted with small group tester consisting of seven students. The results are presented below.

Table 5. Practicality of Educational Game Developed from Small Group Tester.

Variables of practicality	Practicality score	Criteria
Feasibility of Performance	95.6%	Very Practical
Feasibility of Presentation	97.3%	Very Practical
Average Score	96.67%	Very Practical

From the data above, it showed that the educational game that developed is very practical for small group using and can be used for large group test after small revisions.

The next step is revision 2, which authors did based from comments by students from small group tester.

Then, practicality test phase II was conducted with large group tester consisting of 20 students. The results are presented below.

Table 6. Practicality of Educational Game Developed from Large Group Tester.

Variables of practicality	Practicality score	Criteria
Feasibility of Performance	88.6%	Very Practical
Feasibility of Presentation	82.24%	Very Practical
Average Score	85.42%	Very Practical

From the data above, it showed that the educational game that developed is very practical for large group using and based of the questionnaires, there is no need for revision 3. So the final product is the educational game that used for large group practicality test.

Finally, to know the effectivity of the educational game that developed to facilitate students' mathematical problem solving ability after using the developed educational game, post-test was conducted with problem solving based questions to large group tester.

The result of the post-test was 16 of 20 students that take the post-test meet the Minimum Mastery Criteria (MMC) or have scored at least 75. It means that the effectivity score of the educational game that developed is 80%, with effective criteria.

From the results above, it can be seen that each step in the educational game's development procedure is related to each other. From the need analysis where we found out the problem, the product development where the educational game was made based on the problem that found from need analysis, the validation process where the developed educational game are evaluated by the experts, revision 1 where the developed educational game are revised based on validation comments, practicality test using the revised educational game with small group tester, revision 2 where the developed educational game are revised based on small group students' comments, practicality test using the revised educational game with large group tester, and finally post-test to see students' mathematical problem solving ability after using the developed educational game that conducted to large group tester.

The developed educational game has a good grade, based on all the tests that conducted. It has 79.2% validity by technology experts (valid), 89% validity by subject matter experts (very valid), and 84.1% validity by average (very valid). It means that based on content and technology used, this game can be used for mathematics learning.

It also has 96.67% practicality by small group tester (very practical) and 85.42% practicality by large group tester (very practical) that also become the final practicality score. It means that this game is interesting and students can use it easily. It also means that the mathematical contents in it can be understood easily.

After the using of the developed educational game, 80% students' mathematical problem solving ability score can meet the Minimum Mastery Criteria (MMC). It means that most students can solve the mathematics problems given after using this game. It also means the developed educational game is effective to facilitate students' mathematical problem solving ability

4. Conclusion

Educational game is one of instructional media that can be used in mathematics learning. Its capacity to facilitate students' mathematical abilities has been questioned many times before. Based on this research, the educational game that developed with Adobe Flash Professional CC 2015 is very valid with 84.1% validity, very practical with 85.42% practicality, and effective with 80% effectivity to facilitate students' mathematical problem solving ability.

For future study, researchers could improve the game levels and problem solving based questions that used, so that students could play the game based on their ability without feeling overwhelmed or bored.

Acknowledgement

This work would not have been possible without the financial support of the State Islamic University of Sultan Syarif Kasim Riau. I am especially indebted to Dr. H. Mas'ud Zein, M.Pd., Dean of Teacher Training and Education Faculty who have been supportive of my career goals and who worked actively to provide me with the protected academic time to pursue those goals. I am grateful to all of those with whom I have had the pleasure to work during this and other related projects.

Nobody has been more important to me in the pursuit of this project than the members of my family. I would like to thank my parents, whose love and guidance are with me in whatever I pursue. They are the ultimate role models. Most importantly, I wish to thank my loving and supportive husband and son who provide unending inspiration.

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