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ICMSTEA 2014

INTERNATIONAL CONFERENCE ON MATHEMATICS, SCIENCES, TECHNOLOGY, EDUCATION AND THEIR APPLICATIONS

Makassar, August 20-21, 2014

State University of Makassar

INTERNATIONAL CONFERENCE ON MATHEMATICS, SCIENCES, TECHNOLOGY, EDUCATION AND THEIR APPLICATIONS

"Recent Research and Issues in Mathematics, Sciences, Technology, Education and their Applications"

PROCEEDINGS ICMSTEA 2014

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53rd ICOM ICMSTEA 2014

Conference Proceeding

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Mathematics and Science Faculty

Makassar State University

ICMSTEA 2014 : RECENT RESEARCH AND ISSUES ON MATHEMATICS, SCIENCE, TECHNOLOGY, EDUCATION AND THEIR APPLICATIONS

WELCOME SPEECH

Forewords from the Head of Committee

Assalamu'alaikum wa Rahmatullahi wa Barakatuh
First, I want to give our welcome to all the delegates, speakers, and participants coming today. Welcome to State University of Makassar, UNM.
This conference titled International Conference on Recent Research and issues in Mathematics, Sciences, Technology, Education and Their Applications (ICMSTEA) 2014 is assigned to the 53rd Dies Natalies of UNM. It is primarily organized by Faculty of Mathematics and Natural Science in conjuction with several committee members from other faculties within State University of Makassar.
This conference is conducted in two days from 20th of August to 21st of August in Theater Room, Pinisi Building, State University of Makassar. It involves eleven keynote speakers, ten invited speakers, and approximately 150 parallel speakers.
Ladies and gentlemen, as I previously said, the conference proudly invites twelve keynote speakers coming from several countries. Therefore, on behalf of the committee members, I would like to express my sincere thanks to the keynote speakers, specifically:

1. Professor Max Warxhauwer (Texas State University, USA)
2. Professor Naoki Sato (Kyoto Prefecture University, Japan)
3. Professor Peter Hubber (Deakin University, Australia)
4. Professor Susie Groves (Deakin University, Australia)
5. Dr. Frans Van Galen (Utrecht University, the Netherlands)
6. Assistant Professor Duangjai Nacapricha (Mahidol University, Thailand)
7. Dr. Siti Nuramaliati Prijono (the Indonesian Institute of Sciences)
8. Professor Baharuddin Aris (Universiti Teknologi Malaysia)
9. Professor Ismail bin Kailani (Universiti Teknologi Malaysia)
10. Professor Muhammad Arif Tiro (Iowa State University & State University of Makassar)
11. Professor Suratman Woro Suprodjo (Gadjah Mada University, Indonesia)

Next, it is my privilege to thank all organizing committee members who have been showing good work and determination for the accomplishment of this conference. All of them have been 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 things during the implementation of this conference since we, the organizing committee, as just human being.

Finally, I would like to thank to the speakers and the participants listed in this conference. May I wish you all two fruitful days of interesting and beneficial conference and also that you have a very pleasant stay in Makassar.
Thank you very much for all the attention.
Assalamu'alaykum wa Rahmatullahi wa Barakatuh.

Head of Committee,

Suwardi Annas, Ph.D.

Forewords from the Dean of Mathematics and Natural Science Faculty, State University of Makassar

Bismillahirrahmanirrahim
Assalamu'alaykum Warahmatullah Wabarakatuh

First of all, let us praise to the Almighty, Allah SWT, because of his Blessings and Helps, we are able to gather here to attend International Conference on Recent Research and issues in Mathematics, Sciences, Technology, Education and Their Applications (ICMSTEA) 2014.

The development of education and technology in recent decades grows very rapidly. In addition, they have been specialized into many specific topics. Indeed, for researchers and lecturers, being qualified of a specific field as well as being aware of the contemporary development of other fields are two crucial things. One of the reasons why we undertake the conference is to fulfil those two things. By attending the conference, researchers and lecturers have a good opportunity to share their research findings and to obtain broader descriptions of the development of other general knowledge.

We convey our deep appreciation and gratitude to all of the committees that work from the beginning to support and organize the conference. We also strongly expect the participants of the conference to be continually productive, increase the capacity in conducting a research, and carry out both national and international scientific publications.

Finally, let me again recite thank you to the all participants of the conference who are receptive to spend their time to be present and entirely involved at this events. I wish the conference advantageous for all of us.
Billahi taufiq wal hidayah,

Wassalamu'alaykum Wr. Wb.

Dean of Faculty of Mathematics and Science
State University of Makassar

Prof. Dr. H. Hamzah Upu, M.Ed.

Forewords from Rector of UNM

Bismillahirrahmanirrahim
Assalamu'alaykum Warahmatullah Wabarakatuh

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

It gives me great pleasure to extend to you all a very warm welcome, especially to our keynote speakers who have accepted our invitation to convene the conference.
It is an apportune time to convey to you that UNM is celebrating the 53rd Dies Natalis and it commends the faculty of Mathematics and Natural Science (FMIPA) to be in charge of all activity sequences in the Dies Natalis. However, the support of other faculties is also really influential and gives valuable contribution to the success of the event.
In that celebration, we undertake several agendas including educational and sport activities. The conference, ICMSTEA, is one of our educational activities that covers a wide range of very interesting items relating to mathematics, sciences, education, technology and their applications.

By taking participation of this seminar, 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.
On this good occation, let me quote what Obama said about the education related to this conference and I wish fruitful for all of us:
Every single one of you has something you're good at. Every single one of you has something to offer. And you have a responsibility to yourself to discover what that is. That's the opportunity an education can provide.
Therefore, through this conference, we are able to implement education.
Furthermore, I would like to take this opportunity to express my heartfelt gratitude to all organizing committee especially for Mathematics and Natural Science Faculty that primarily hosts this conference particularly and other Dies Natalis events generally.
Finally, this is a great time for me to declare the official opening of the International Conference on Recent Research and issues in Mathematics, Sciences, Technology, Education and Their Applications (ICMSTEA) 2014.

I wish you a very enjoyable stay in Makassar
I warmly welcome you again, as in Makassar, we say "salamakki battu ri mangkasara"
Assalamu'alaykum warahmatullah wabarakatuh.

Rector of State University of Makassar

Prof. Dr. H. Arismunandar, M.Pd.

TABLE OF CONTENTS

DESIGNING AND DESIGN RESEARCH

Frans van Galen
Freudenthal Institute, Utrecht University

Abstract

Students who want to work in education after their graduation, will benefit if there is ample room in their study for the design and the evaluation of educational activities. In 'design research' design and evaluation go hand in hand. A typical design research study consists of two to four cycles: designing, testing, retrospective analysis, redesign, testing and so further. A range of data is collected, amongst other things: tests to establish the preknowledge of children, classroom observations, video of classroom discussions, video of discussions in a 'focus group', one or more interviews with the teachers. The aim of design research is not to compare different approaches; there is no control group and as the group of subjects per cycle will often be just one class, statistical significance is not an issue. Instead the researchers strive for a presentation of the empirical data that allows other researchers and designers to evaluate the conclusions that the authors have drawn. Data triangulation is important.Design research is a core element in the study program for Indonesian students in Utrecht. In my contribution to the conference I want to explain what we mean by design research and how we deploy it in the curriculum of our master students. My examples will come mainly from mathematics education, but design research can also be used to improve education for other school topics.

MATHWORKS, MATH PROBLEMSAND MATH EDUCATION RESEARCH

Max
Texas State University, USA

Abstract

Inquiry-based teaching and learning approaches have In this talk, there are three inter-connected parts. First, we will describe Mathworks programs for students, teachers, and curriculum development. Second, we will provide some interesting problems that illustrate the kind of investigations that arise in our curriculum and math programs. Finally, we will discuss math education research, particularly focusing on ongoing and future projects connected to teaching, learning and Math works programs. This includes opportunities at Texas State for students and faculty, and collaborations with KPM and Makassar State University.

JOB ORIENTATION OF UNDERGRADUATE STATISTICS STUDENTS OF FMIPA UNIVERSITAS NEGERI MAKASSAR

Muhammad Arif Tiro
Graduated from Iowa State University, USA, Statistics professor at Faculty of Science and Mathematics, the State University of Makassar

Abstract

This study aimed to assess the job orientation and perspectives of statistics students of FMIPAUNM. This study is important because FMIPA UNM has opened undergraduate statistics program and receive the first batch of 2013 with this study, is expected to produce insight and orientation of students'thinking to prepare for theirfuture. Thus, students have to prepare for the learning process to gain knowledge, skills, and expertise to support these perspectives. This study was conducted by surveying the opinions and ideals of 40 students after completing education at statistics study at FMIPA UNM. The results showed that the 40 students who participated, most of them aspire to become civil servants (PNS) non-faculty (58%), and further studies to become lecturers (50%). Partly of them also choose to become professional statisticians (25%) as well as being a business and economy entrepreneurs (23%). Furthermore, the choice of such work based on the meaning of the work as the duties, responsibilities, and worship in the life (30%), work as a means to achieve happiness and the happiness of parents (25%), work as a struggle to achieve the goal of life (18%), work as a means to earn income to make ends meet (18%), and work as identity and pride (13%). The conclusion of this research report will be used as inputs for improving: (1) curriculum, and (2) the design of learning at Statistics Studies Program of FMIPA UNM.

Keywords: job orientation, meaning of the work, undergraduate

MEMBRANELESS VAPORIZATION DEVICES: EFFECTIVE ON-LINE TOOLS FOR SEPARATION OF VOLATILE COMPOUNDS IN FLOW-BASED ANALYSIS

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Abstract

Membraneless vaporization devices are apparatus developed for on-line separation of volatile compounds from liquid or solid samples. Our group was the first to introduce the technique of membraneless vaporization as well as 'membraneless vaporization unit' (MBL-VP unit) suitable for flow-based analysis. Conventional devices, such as 'gas-diffusion unit' and 'pervaporation unit' all employ membranes. Volatile compound vaporizes from the sample (donor) into a headspace partitioning between the sample section and a liquid section (acceptor). The volatile gas dissolves into the acceptor leading to the change in the physical property. This change in the physical property of liquid acceptor is used for constructing the calibration for quantitative analysis. In this talk, evolution of MBL-VP devices will be presented. Future trend in development of MBL-VP devices for simultaneous determination of volatile compounds will be discussed.

Keywords: Membraneless vaporization;Separation; Flow-based analysis;Volatile compound.

CORRELATION BETWEEN STRUCTURES AND ELECTRONIC PROPERTIES OF ORGANIC SEMICONDUCTOR THIN FILMS

Naoki SATO
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Abstract

Our research is devoted to correlation studies on structures and properties of organic functional materials in the solid state. In particular, the electronic structure in the valence and unoccupied states of organic semiconductor thin films is studied using photoemission and inverse photoemission spectroscopies in connection with their electronic and photoelectric properties. Such results are applicable to create novel molecular systems with characteristic electronic functions.

Keywords: Organic semiconductor; Thin film; Electronic property; Electronic structure.

STEM AND OER TO STIMULATE STUDENT ENGAGEMENT

Baharuddin Aris
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Abstract

While STEM stands for Science, Technology, Engineering and Mathematics, OER stands for Open Educational Resources. One of the initiatives of Universiti Teknologi Malaysia (UTM) in alleviating problems related to STEM Education is Research and Development of UTM-MIT BLOSSOMS. BLOSSOMS stands for Blended Learning Open Source Science or Math Studies. This presentation will cover the why, how and when collaborative efforts between UTM and MIT as well the Malaysian Ministry of Education (MoE) evolved and how effective are these UTM-MIT BLOSSOMS. Collaborative efforts between MIT Professors, Malaysian teachers and UTM lecturers with respect to training and development of UTM-MIT BLOSSOMS that is applicable to Malaysian syllabus in secondary school and higher institution started in January 2013. This collaborative effort goes beyond the training and development of UTM-MIT BLOSSOMS embedded with higher order thinking skills (HOTS) and Malaysian culture in creative and contextual approach. It also involves researching the effectiveness of UTM-MIT BLOSSOMS through UTM research grants and PhD synergy project between MoE and UTM in 2013.

REPRESENTATION CONSTRUCTION: A RESEARCH DEVELOPED INQUIRY PEDAGOGY FOR SCIENCE EDUCATION

Peter Hubber
Deakin University

Abstract

Inquiry-based teaching and learning approaches have long been advocated as best practice in science classrooms (Anderson, 2002) but have yet been realised in terms of wide scale implementation (Minna, Levy & Century, 2010). This keynote address describes a successful research-developed representation construction approach to teaching and learning that links student learning and engagement with the epistemic practices of science. This approach involves challenging students to generate and negotiate the representations (text, graphs, models, diagrams) that constitute the discursive practices of science, rather than focusing on the text-based, definitional versions of concepts. The representation construction approach is based on sequences of representational challenges which involve students constructing representations to actively explore and make claims about phenomena. Inquiry in the science classroom becomes inquiry into ideas and how they are represented, and the selective and partial nature of such representations. The key principles of the representation construction approach, considered a form of directed inquiry, are outlined with illustrations from video ethnographic studies of whole topics such as forces, astronomy and ideas about matter within middle years' science classrooms. The address will also outline the manner in which the representation construction approach has been translated into wider scale implementation through a large scale Professional Development (PD) workshop program and pre-service teacher curriculum courses. Issues associated with wider scale implementation of the approach are discussed such as ongoing support for in-service teachers implementing the approach and limited practicum experiences for pre-service teachers in enacting inquiry-based teaching approaches.

IMPROVING MATHEMATICS TEACHING THROUGH LESSON STUDY

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Abstract

Lesson study first came to world-wide attention as a vehicle for professional learning through Yoshida's (1999) doctoral dissertation and Stigler and Hiebert's (1999) accounts of Japanese structured problem-solving lessons based on the *Third International Mathematics and Science Study* (TIMSS). Since then, there has been phenomenal growth of lesson study as a vehicle for professional learning. For example, Suratno (2012, p. 212) describes Lesson Study as "spreading like wildfire across Indonesia". However, as Stigler and Hiebert (1999) point out, efforts at improving teaching often ignore the fact that teaching is a cultural activity, which implies gradual change and the need to take into account the cultural assumptions underpinning teaching and learning. Thus questions about the extent to which lesson study can be replicated elsewhere remain (Perry &Lewis, 2009), as do questions about the extent to which teachers can adopt structured problem-solving as the basis for research lessons. This presentation will describe essential features of Japanese Lesson Study that can contribute to bringing about improvement in mathematics teaching. It will aslo discuss some affordances and constraints encountered in its adoption and adaptation in other countries, with particular reference to a research project, *Implementing structured problem-solving mathematics lessons through lesson study,* being carried out in a small number of Melbourne schools.

Keywords: Lesson study; mathematics teaching; teacher professional learning; problem solving

INTRODUCTION TO MODELLING FOR GEOGRAPHICAL RESOURCES MANAGEMENT

Suratman
Faculty of Geography Gadjah Mada University

Abstract

Geography focus on geosphere aspect of the earth in relationship with man and other living environments by using spatial, ecological and regional complex analysis.The geosphere consist of atmosphere, lithosphere, hydrosphere, biosphere, andanthrophosphere. Spatially, the characteristics of geosphere are heterogeneous from place to other place. Geosphere can be analyzed as a complex natural system.Ecologically, the interaction among the components of geosphere are favourable processes in the developing the system. By the geographical system approach, a model can be used in the determining the potential geographical resource in the context of planning. There are some types of model in geographical research for resources management. The geographical models are scale model, conceptual model and mathematical model. Geographer will search type, pattern, and distribution of geographical resources such as land, water, mineral, vegetation, land use, settlement, population, man made etc. By using models in geography (spatial, ecological model) and also mathematical model, the geographical resourcescan be determined. The spatial and numerical geographical resources can be as a basic for simulation in comprehensive in geographical resources planning and management.

Keywords : Geography, geographical resources, system, models, resources management

ROLE OF BIOLOGICAL SCIENCES IN DEVELOPING THE SCIENTIFIC BASIS FOR SUSTAINABLE DEVELOPMENT

Siti Nuramaliati Prijono
The Indonesian Institute of Sciences (LIPI)

Abstract

The 21st Century has been called a "Biology Century" because of the many advances in humankind's understanding of the basic processes and components of life. Biology offers great scope in developing the scientific basis for sustainable Development, especially in the assurance of food security, and in the use of biology to meet the needs for more fuel, fiber and animal feed . Indonesia's strategic longterm development plan (2005-2025) aims to achieve a "green and ever-lasting Indonesia." Indonesia believe that sustainable development is the process to integrate economic development and natural resources and its ecosystem in order to meets human needs while preserving the environment so that these needs can be met in the present and the future. Achieving sustainable development is made more difficult as biodiversity and the ecosystem services that underpin all life on earth are degraded. For sustainable use of biodiversity, require creativity and new advances in scientific knowledge. Biology is a pivotal knowledge component to meeting humankind's requirements and thereby contributing to sustainable development.

Keywords: Biological Sciences, sustainable development, Indonesia.

MATHEMATICS LEADERSHIP

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Abstract

Improvement in mathematics education requires new kinds of leadership. There is an urgent and growing need for mathematics teacher – leaders – specialists positioned between classroom teachers and administrators who can assist with the improvement of mathematics education. We need to develop the knowledge, skills and disposition, sensibilities, long-term capacities of leaders working with teachers to take leadership for improving mathematics education. The leader takes on the roles of active observer, participant, professional development provider, and instructional leader. This site-based leaders will be integral in sustaining and furthering all aspects of the components of a comprehensive mathematics program. These mathematics leaders must know how to support teachers to improve mathematics teaching practices; to design and implement mathematics professional development to achieve specific goals and objectives; to deepen mathematical knowledge needed for teaching mathematics, which is also a key to high level mathematics professional development. Leaders who are responsible for improving mathematics achievement face tremendous challenges. There are several leadership principles such as equity leadership, teaching and learning leadership, curriculum leadership, and assessment leadership, that will help leaders implement a high-quality mathematics program. . There are variety of leadership positions in mathematics education such as school and central office leaders, supervisors, team leader, coach, peer coach, new teachers mentor, curriculum and instructional materials developer, and inquiry team member, etc.

TEMPERATURE TREND ANALISIS IN JAKARTA CITY: 1981-2010

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Abstract

The phenomenon of the increase in temperature is one object of study microclimate. This phenomenon occurs, in almost all major cities in the world, including in the city of Jakarta. The study was conducted in Jakarta by using secondary data for 30 years (1981-2010) at three stations namely Kemayoran, Pondok Betung, and Serang. The results showed a highly significant increase in temperature, especially in Kemayoran stations with R^2= 0975, and the Pondok Betung station with R^2= 0.972 at confidence level of 0.01. Meanwhile, the Serang station value is R^2= 0324. Significant temperature increase mainly occurred on minimum temperature impact on decreasing the temperature of max-min especially at Kemayoran Station with R^2= 0394 on the confidence level of 0.01. Meanwhile, the station is Pondok Betung and Serang less significant with each value of R^2 = 0.06 and 0.055 at 0.05 level. Significant temperature increase primarily in downtown and the suburbs, indicating the need for mitigation efforts both by the government or the local community. This is done to reduce the rate of increase in temperature in the city of Jakarta.

Keywords: Temperature Trend, Microclimate, Jakarta City, UHI.

1. Introduction

Climate change is a phenomenon that is always discussed. in various countries in the world. One element of climate a lot has changed is the temperature. Based on various previous studies known to increase the surface temperature of 0.6°C (Nicholls et al., 1996). In addition, sea surface temperature at night experienced an increase of 0.7°C was detected between 1900 and the 1990s (Zheng et al., 1997). The theme of the temperature increase was also studied by Salinger et al. (1992) showed increased average annual temperature between the decades 1941-1950 and 1981-1990 for the North Island of 0.8°C and 0.7°C for the South Island. Thus, the trend of rising temperatures occurred since 1900 is dominated by the changes since the 1940s in New Zeland.

Temperature increase that occurred in different parts of the earth, especially in urban areas mainly due to increased anthropogenic activities such as the growth of various industries to meet the needs of households in urban areas or rural areas. Increased anthropogenic activities impact the development of the city as fast as a supermarket building, roads, and offices without caring environmental sustainability. Therefore, this can harm the community particular aspects of thermal

comfort, health and energy consumption (Tursilowati 2005).

The relationship between the process of urbanization with increasing temperature was also studied by Kruger and Shongwe (2004) in South Africa. Findings show that there has been a significant increase in temperature in the city center. Furthermore, explained that this phenomenon occurs due to the urbanization of the area. The same is also studied by Hughes and Balling (1996) in several places in South Africa, using annual data (1885-1993). Findings indicate that there has been an increase in temperature in several places in South Africa in three decade. Half of the study showed temperature increase, especially in the urban areas both in the daytime or at the night. However, the temperature increase in rural areas are not significant. Furthermore, Hughes and Balling explain that temperature increase that occurred in this area contribute to the occurrence of climate change in the southern hemisphere, and the more specific impact on the formation of Urban Heat Island phenomenon (UHI) in this area. According Tursilowati et al. (2004); and Shaharuddin & Noorazuan (2010) the temperature change in urban areas, in contrast to the surrounding region forming a "heat island". One of the urban heat effect is increased thereby increasing the temperature of the city (Shaharuddin 2012).

Environmental quality less good every year (Wong et al., 2007). This is also true in the city of Jakarta as the impact of increasing anthropogenic activities. According to Lubis (2010) in the 1970s the population of Jakarta amounting to four million people. But at the end of 1980 this number increased to 7.5 million people or increased by more than 60 percent. This situation continues until the year 2010, the total population of Jakarta reached 10 million people, so the City of Jakarta as a city with the second highest population after New York (Central Bureau of Statistics 2010). Basically, an increasing number of people in a city, will increase the need for novelty, or urban facilities such as housing, roads, services, etc. (Marcus & Detwyler 1985).

Urbanization is occurring rapidly since 1990 in the city of Jakarta have an impact on existing land use pattern changes. This is especially true in the city and surrounding areas, even in the suburbs. Changes in land use patterns is one of the factors that affect the formation of UHI phenomenon in urban areas (Rosmini et.al.

2011; Shaharuddin & Noorazuan 2006a; Shaharuddin et.al. 2006b; Shaharuddin et.al. 2008; and Shaharuddin et.al. 2010). Therefore, this paper describes the changes in temperature trends and their implications for urban thermal comfort.

In general, temperature changes have occurred in the city of Jakarta is very significant since the 1990s. It is shown by the increase in the average temperature of 0.124°C per year (Avia, 2010). In this context, one of the main focus of the study is to review the existence trend of temperature change phenomenon in Jakarta.

2. Area of Study and Method

This study uses data from three measurement stations, namely Kemayoran station in the city center, Pondok Betung station in the suburbs, and the Serang stations outside Jakarta City as the assistant. Jakarta City was the center of government, residential, trade, services, industry and tourism city.

Areas of study aids is Tanggerang and Banten. Both of these areas directly adjacent to the City of Jakarta, then in geomorphology both regions have similarities with the City of Jakarta as the main study area. South of Jakarta City bordered by Bogor (West Java), but the area is not used as an area of study aids because the geomorphology of the area is mountainous. Therefore, geomorphological conditions. and different topography causes the temperature difference exists between the two regions. Administration map of Jakarta City shown in Figure 1.

This study uses secondary data for 30 years (1981-2010) taken at the three measurement stations namely Kemayoran, Pondok Betung, and Serang (Figure 1). Next, to see how big the effect of variable X to Y then used one-way model of simple regression equation presented by Haan (1979) is as follows:

$$Y=f(X. \varepsilon i)$$

Where:

Y is the temperature, as the response variable, X is the year (time), the function of the independent variables, and εi are the residuals.

3. Results and Discussion

Based on the findings of the three stations namely Kemayoran, Pondok Betung and Serang to show that there has been an increase in temperature in the city of Jakarta. A very significant increase, especially in urban centers with the R^2 = 0.975 in Kemayoran stations, R^2 = 0.972 Pondok Betung station. However, in Serang station is located in rural areas is

less significant with R^2 = 0.324. R^2 = 0.975 means that the relationship between changes in temperature and time occurs at 97.5 per cent in Kemayoran stations and 97.2 percent in Pondok Betung, and 32.4 percent in Serang. In addition, the derived value of Y = 0.034x-40.28 in Kemayoran stations.

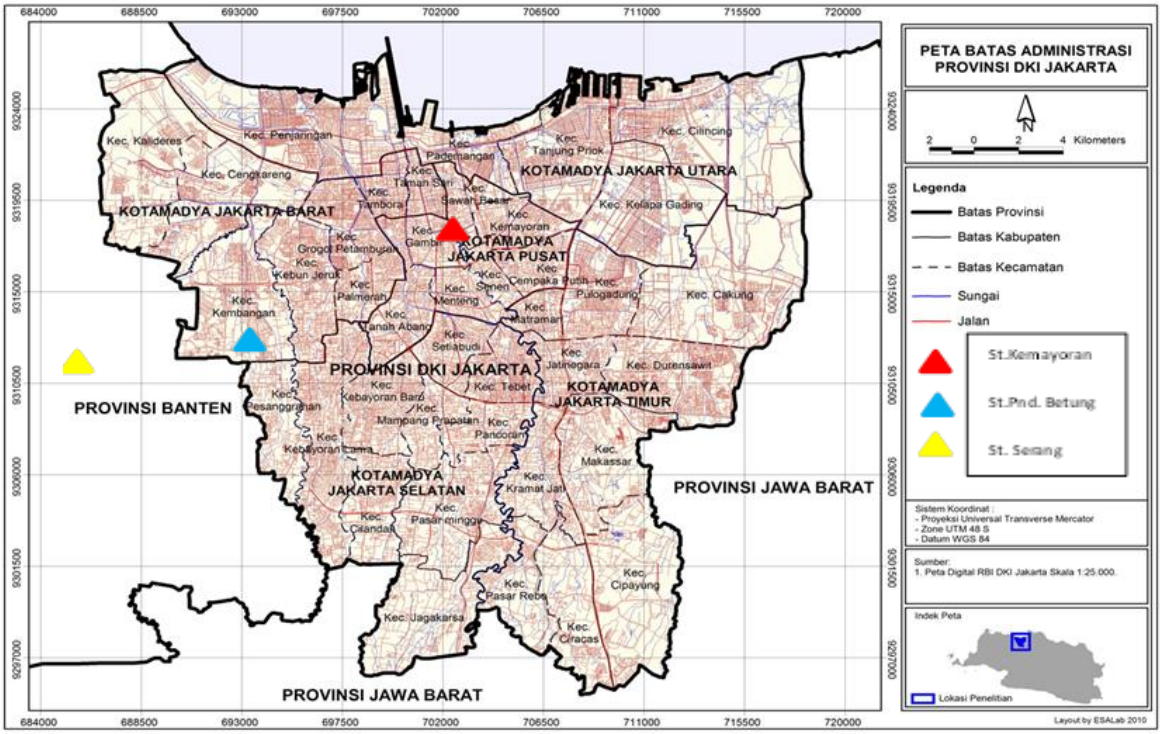

Figure 1. Administration Map of Jakarta City

This means that an increase in temperature in this area are 0.03°C per year. This relationship is significant at the confidence level 0.01. Then, the obtained value of Y = 0.045x-63.86 Pondok Betung station, which means an increase in temperature in the area of 0.05°C per year. While in Serang obtained Y = 0.008x + 9.435, which means an increase in temperature in the area Serang station by 0.01°C per year. The relationship is shown in Figure 2.

Figure 2 shows the trend of temperature changes in the study area significant at a confidence level of 0.01 with the R^2 is 97.5 percent of the stations Kemayoran and 97.2 for Pondok Betung station, while the station Serang not significant with the R^2 is 32.4 percent. This occurs because at that time the two areas, namely Kamayoran station and Pondok Betung experiencing rapid urbanization, while the station Serang insignificant.

Moreover, the impact of changes in land use patterns in the two stations namely Kemayoran and Pondok Betung very significant. It also explains the existence of other factors such as the number of vehicles that emit CO2, lack of green spaces that can absorb CO2, and the growing population breathe O2 thus producing CO2 into the atmosphere. Although the effect of these factors is only 2.5 percent of the station Kemayoran and 2.8 percent for Pondok Betung station, but it can cause an increase in temperature and UHI phenomenon in the study area.

Instead, different conditions occur in Serang station that the effect of changes of land use pattern is not significant, that is 32.4 percent. The remaining 67.6 percent are derived from other factors. However, it doesn't mean there isn't development in Serang, but the impact of development activities on the environment temperature increase, reduced by the amount of green areas and water bodies. Both of them can raise the relative humidity in the air.
Thus, the increase in relative humidity can reduce the temperature rise.

Furthermore, the trend of rising temperatures in the city of Jakarta, is shown by using "5 years running mean" shown in Figure 3. Figure 3 shows the trend of a significant increase in temperature from the beginning of the study (1981) until the end of the study (2010), particularly its second phase (1991-2000). Meanwhile, the middle of the second phase (2001-2010) until the end of the study appear to be constant. Therefore, the increase in temperature is greatly influenced by the urbanization that occurred since the early 1990s. At that time, a lot of land-use change patterns of the natural land use and to the built-up and concrete (Lubis 2010).

Furthermore, the max-min temperature trends at the three stations are shown in Figure 4. In general, the results showed the trend of max-min temperature the highest in PondokBetung station with a peak in 1983, then dropped sharply in 1986 and subsequently experienced fluctuations since 1987 to 2010. The same trend also occurred in Serang stations except the temperature of max-min of the lowest in the region corresponding to the occurrence of peak Pondok Betung station which is also recorded in 1983. Meanwhile, max-min temperature trends that occurred in Kamayoran station is lower than both the previous station. It is happening since the beginning of the study (1981). Furthermore, it increased slowly until

reaching a peak in 1983 which coincided with the peak occurrence in Serang station. Then it undergoes fluctuations slowly until 2010.

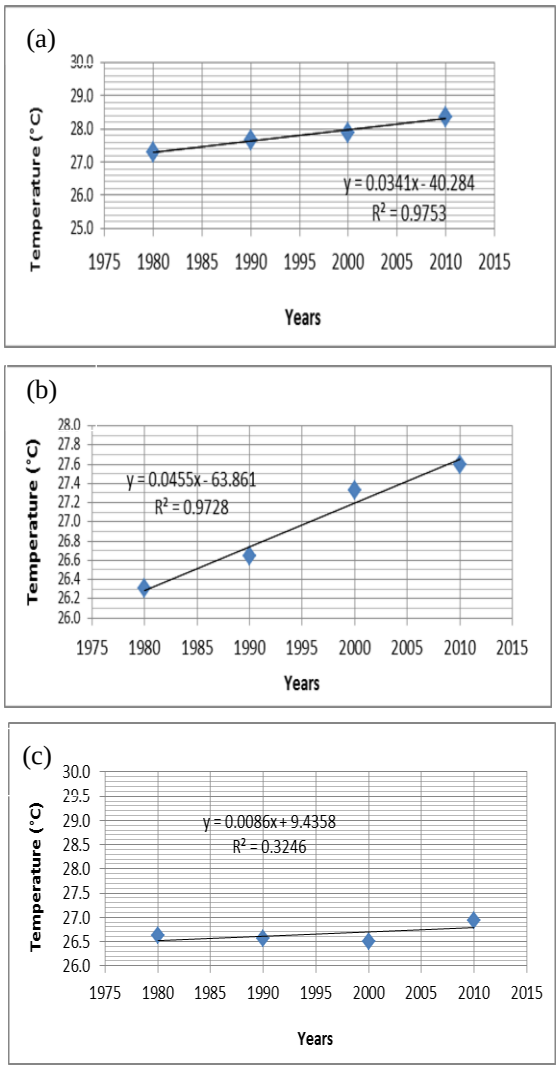

Figure 2. Average temperature time series at three meteorological stations around Jakarta (a) Kemayoran station, (b) Pondok Betung station, and (c) Serang station

In this context, described the difference between the maximum temperature. and a minimum of three stations namely Kemayoran stations, Pondok Betung, and Serang. Max-min average temperature is the highest at 8.9°C occurred in Pondok Betung station with a difference of 10.2°C was recorded in 1997 and the lowest was 7.1°C recorded in 1983. Further, the station Serang with max-min average temperature is 8.7°C, where the highest difference was 10.7°C recorded in 1983 and the lowest was 7.9°C recorded in 1988. While the average temperature of max-min the lowest is 7.4°C occurred in Kemayoran stations, with the highest difference is 8.3°C was recorded in 1983, but the lowest was 6.1°C recorded in 1996.

Although max-min temperature trends for the three stations namely Kemayoran, Pondok Betung, and Serang there are differences, but it has decreased since 2003 for Kemayoran

station, 2004 for Pondok Betung stations, and 2006 for the station Sserang until now. This means that there has been a significant increase in the minimum temperature in all three areas, particularly for Kemayoran stations located in the central city of Jakarta.

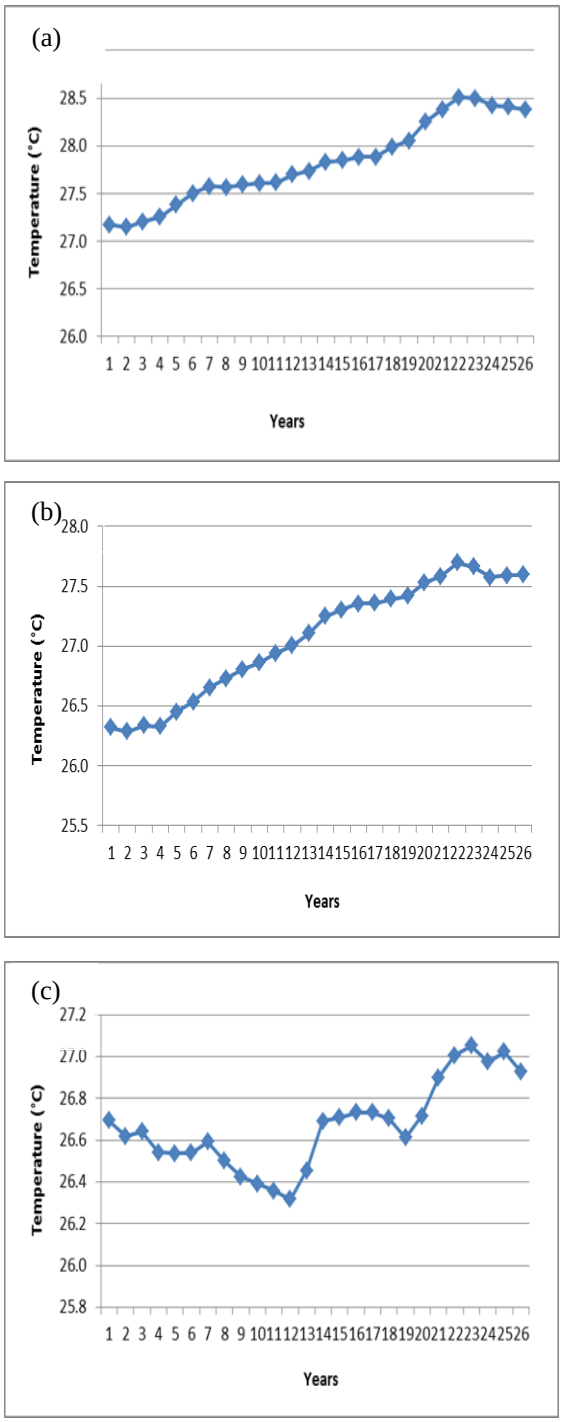

Figure 3. The average temperature trend for 30 years (1981-2010) of rule "5-years running mean" in (a) Kemayoran stations; (b) Pondok Betung station; (c) Serang station (1 = 1981 30 = 2010)

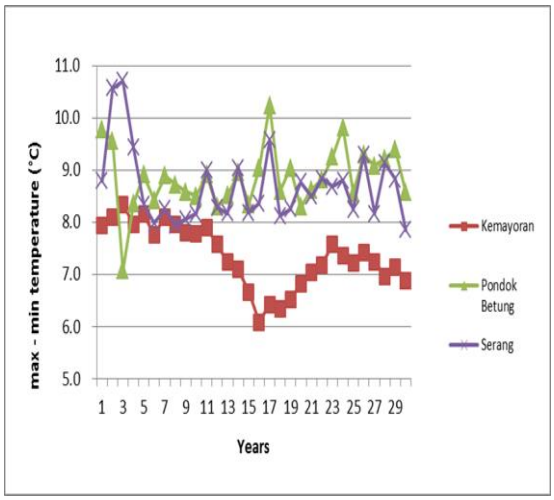

Figure 4. Trend maximum and minimum temperature difference over the years in (a) Kemayoran station; (b) Pondok Betung station; and (c) Serang station (1 = 1981 30 = 2010)

Related to this, in the study area showed a decrease in the temperature of max-min in Jakarta City except Pondok Betung station. Although there isn't a significant improvement and are assessed to be not significant at the 0.05 level with the R^2 = 0.060 for Pondok Betung stations, and R^2 = 0.055 for Serang station. However, the reduction of the temperature difference Kemayoran stations is significant at confidence level of 0.01 and the R^2 = 0.394. It means that the max-min temperature changes with time occurred in 39.4 percent of the stations Kemayoran, 6.0 percent for Pondok Betung stations, and 5.5 percent for Serang station.

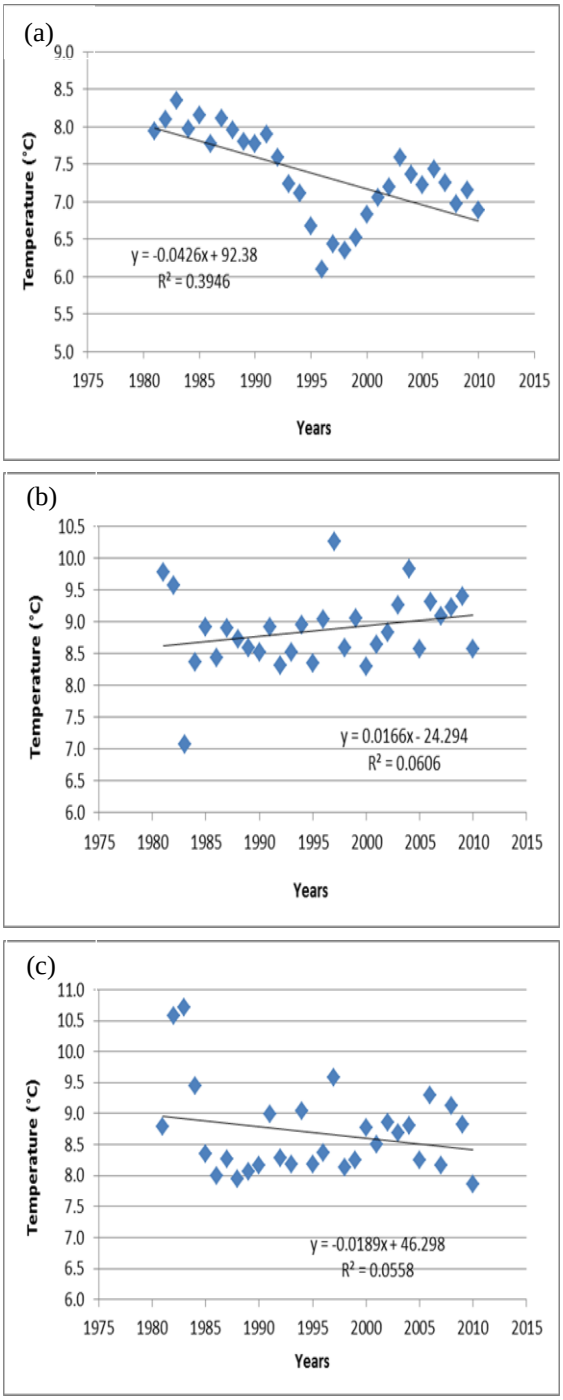

Figure 5. The difference of maximum and minimum temperatures over the years with the "5-years running mean" in (a) Kemayoran stations; (b) Pondok Betung station; and (c) Serang station

In addition, the derived value of Y = -0.042x + 8016 in Kemayoran station means a reduction of temperature in Kemayoran stations from 0.04°C per year. A derived value Y = 0.016x + 8.600 means that an increase in temperature at the station Pondok Betung of 12.02°C per year. Meanwhile, the obtained value of Y = 8.973 + -0.018x in Serang, means a reduction in temperature Serang station by 0.02°C per year (See Figure 5).

4. Conclusion

In general, the study illustrates that there has been an increase in temperature in the city of Jakarta since the early 1980s until the present. The temperature rise is caused by the process of urbanization as a result of the increase in the speed of the population at that time. Increase the number of people impacted to increase the amount of office building construction, housing, streets paved, and others. This impacts the retained heat in the daytime, while it can't be released at night.

The temperature rise in Jakarta City continues impact on thermal discomfort, particularly for the City of Jakarta. Thus, the required mitigation efforts, such as the addition of precise green open space, making the roof garden, on the roof your home or office, managing the home page

into a green garden, and the others. It is to be carried out by the authorities and the local community Jakarta.

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