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International Conference on Southeast Asian Weather and Climate 2013 (ICSA-WC2013) "ASEAN Adapting to Climate Change" November 27 - 29, 2013 at Le Meridien Chiang Mai, Thailand

The International Conference on Southeast Asian Weather and Climate 2013 brought together scientists and practitioners working on adaptation to the impacts of climate change. The conference created an ASEAN forum with the aim of fostering a creative dialogue among policy makers and practitioners. The focus of this scientific conference was the assessment of the current research on climate change within the ASEAN community. The conference helped to identify the possible adaptation and mitigation options and strategies for policy makers based on research findings and experience.

The conference organized by an International Committee for Southeast Asia membership of which includes representatives from the Green Tree Foundation, Chiang Mai Rajabhat University, National Science Museum (NSM), the Institute for the Promotion of Teaching Science and Technology (IPST), the Royal Rainmaking and Agricultural Aviation Department, the Northern Meteorological Center, the Yunnan Province Meteorological Society of China, and Queensland University of Technology of Australia.

Major topics to be covered included:

Session 1. Study the Science of Weather and Climate

1.1 Physics of weather and climate models.
1.2 Activity characteristics of Asian monsoons in Southeast Asia.
1.3 Scientific issues on weather and climate in low-latitude plateau areas.
1.4 Study of the theoretical basis and new methods for extended forecasting.
1.5 Role of aerosol in climate change

Session 2. Natural Disaster Impacts of Climate Change

2.1 Weather factors that contribute to disasters
2.2 Cost-effectiveness of disaster risk reduction as an adaptation measure
2.3 Cultural response to climate change and natural disaster

Session 3. Agricultural Impacts of Climate Change

3.1 Analysis of the impacts of climate change on agriculture
3.2 Sustainability of agricultural production systems
3.3 Human Health and Food Security

Session 4. Adaptation to Climate Change

4.1 Economic
4.2 Social
4.3 Environment
4.4 Wisdom

Session 5. Climate Change Education

5.1 Curriculum and Content
5.2 Implementation in school
5.3 Research in Climate Change Education
5.4 Climate Change awareness and society

Climate Change Education

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Abstract

With the release of the latest IPCC report stating that "it is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century" there is need for a renewed emphasis on climate change education and to explore possible connections between education and mitigation. This presentation will highlight some of the education efforts underway and how international programs like GLOBE can be involved in this global endeavor.

GLOBE and STEM Workshop

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Abstract

Science, Technology, Engineering, and Mathematics (STEM) education is crucial to the development of future workforce as well as providing solutions to society with the many environmental problems it faces. This workshop will explore the intersection of The GLOBE Program with STEM. GLOBE brings together students, teachers and scientists through the GLOBE Schools Network in support of student learning and research. Parents, Scientists and GLOBE Alumni also support students' engagement in GLOBE. Examples will be given from GLOBE that illustrate connections with STEM and how this is integrated into classrooms around the world.

The Climate Education Workshop

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Abstract

The Climate Education Workshop aims to increase the knowledge and understanding of climate element as a system, climate change and its variability in local and world communities. The challenge of teaching climate change is the complexity of time, the concept and the abstract ideas. The workshop will focus on the key concepts, hands on activities and guiding questions to contextualize the understanding of climate system, energy budget and carbon cycles. The participants will practice the interpretation and analysis of climate system and exchange their knowledge about processes, effect and adaptation and mitigation strategies relate to climate variability and change.

Climate Change and its impact on Land Use and Soil resources in Thailand

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Abstract

Warming of the global climate system is recognized as a serious problem, which is affecting all systems on the earth. The higher temperatures lead to a high rate of evaporation and dry condition, result in soil moisture losses and droughts. These can cause suddenly dramatically changes such as the expansion of saline, acid sulphate, acid and lateritic soils from year of 2003 to 2006 are increase changed to 0.04, 1.11, 20.74 and 3.21 percentages respectively, and land use and farming system change, etc. These changes have contributed to land degradation. So, large-area and long-term field studies are required to evaluate observed impacts of climate change on land degradation and land use system. NASA-GLOBE Soil Protocols (i.e. soil temperature, soil moisture, and soil pH) with soil electric conductivity (EC) can be simply used to monitor such changes. Through the Students-Teacher-Scientist-Community Collaboration Research, this will not only enable improved understanding of where and when impacts become detectable, and where the hotspots or vulnerable areas lie, but also lead to the appropriate mitigation and adaptation preparations.

Keywords: Climate Change, Land Use, Soil resources, NASA-GLOBE Soil protocol.

Climate Change Education and the GLOBE Program

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Abstract

Climate variability and change education are very coherent to the concept underlining the GLOBE program (www.globe.gov). By involving students, teachers and communities, using GLOBE process, protocols and resources, baseline data can be locally collected. And by building these baseline data for climate monitoring, GLOBE alumni is one of the best citizens to handle the issues of the effects of climate change including mitigation. Vast areas of climate related studies are being carried out by GLOBE students and scientists. Various examples are also discussed.

Keywords: GLOBE Program, Climate Change Education, Climate Change Monitoring, GLOBE Student, Scientist

Incorporation of Climate Change Issues into the Basic Education Curriculum

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Abstract

This research and development project was aimed as designing a curriculum framework and teaching guidelines on climate change modules for educators, supervisors and teachers to implement in teacher training institutes or schools. The project, supported by UNESCO Bangkok, Asia and Pacific Regional Bureau for Education, describes a curriculum framework comprised of the basic concepts of global warming, weather, climate, climate change and its effects. Several lesson plans were developed as guidelines to incorporate climate change issues into the teaching of Science and Social Studies in the form of teaching and learning modules and extra-curricular activities, including student worksheets and teachers' guides. The teaching and learning modules and learning activities on climate change have been offered through workshops to representatives of several countries in Asia and Pacific Region supported by UNESCO Bangkok under the project titled "Education for sustainable Development" since 2010. The results of implementation will be described.

Keywords: curriculum framework, climate change module, global warming, weather, climate, effects of climate change.

Climate Change Integrated Education Model: Building Adaptive Capacity for the Next Generation Projects in Thailand, Malaysia, Indonesia, Philippines and Lao PDR

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Abstract

Climate change issues would trigger more uncertainties for the future of the environment, economics and society if these trajectories continue unabated and humans continue to conduct business as usual. Our education systems have failed to provide learning platforms to holistically educate citizens on the current socio-scientific issues like climate change which will negatively affect everyone's everyday lives and even will experience beyond human's historical perspective. In response to the urgency of raising environmental literacy, adaptation and mitigation skills, the authors propose an integrated education model that may lead to sustainability. Five teachers representing different learning areas (science, mathematics, economics, history and language) have worked together in common issues in school-based learning projects which are planned in the classroom and conducted beyond its four walls. This approach includes involvement of the community as a learning resource for the young to learn, develop and construct the knowledge of sustainability. Sustainability science is a contextualized, systematic body of knowledge revolving around socio-scientific issues that aims at shifting from a fragmented model of learning to an integrated and contextual approach. This learning model emphasizes trans-disciplinary and interdisciplinary processes aimed at removing boundaries among disciplines for more holistic student learning outcomes. Results from 5 countries (Thailand, Malaysia, Indonesia, Philippines and Lao PDR) with more than 20 pilot schools disclosed positive impacts on shaping the perspective of learners in more vibrant manner. This further suggests that integrated learning systems being applied may yield meaningful learning outcomes not only for students but for the teachers who have been trained in traditional disciplines.

Keywords: climate change, integrated education model, learning outcomes

Junior secondary schools students' learning about factors and impact of climate change using research methodology of GLOBE

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Abstract

Climate change is a major problem of concern nowadays. Young people, especially primary and secondary school students, should endeavor to learn and understand the process and impact of climate change. The focus on junior secondary school students' learning process is divided into two parts, lecture and experiment. The lecture part was done using the GLOBE Thailand Program while the experimental part was done using research methodology, including GLOBE protocols, which empower and nurture students to undertake scientific research and focus on the relationship between weather change and changes in the local environment. A research group was composed of 2-5 students. The process starts with students' observations of the local weather and its impacts and, combined with literature review, leads them to define the research questions, objectives and hypotheses about the factors that may influence the phenomenon. The project starts by a research proposal, conducting research and collecting data, using GLOBE protocols as standard criteria. The data analysis and report writing are the final steps. Undertaking a research project is an important tool in students' learning providing them with more insights and an appreciation of the impact of climate change both locally and globally.

Keywords: Climate change, Globe protocols, scientific methodology, junior secondary school, student, Thailand.

Mosquito Online Advanced Analytic Service (MOASS) for Climate change education in schools

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Abstract

Mosquito Online Advanced Analytic Service (MOAAS) provides an essential tool for climate change education for school research projects. MOAAS offers tools for querying, analyzing and visualizing patterns of *Aedes* mosquito larval distribution in Thailand. MOAAS was developed using Structured Query Language technology as a web-based tool for data entry and data access, web-based *Mathematica* technology for data analysis and data visualization, and Google Earth™ and Google Maps™ for Geographic Information System visualization. The MOAAS prototype has been available online at URL http://www.twibl.org/mosquito. Fifteen schools in Thailand were selected to provide test data for MOAAS. Users performed data entry using the web-service, data analysis and data visualization tools with web *Mathematica*, data visualization with bar charts, mosquito larval indices, and three-dimensional (3D) bar charts overlaying on the Google Earth™ and Google Maps™. The 3D bar charts of the number of mosquito larvae were displayed along with spatial information. The Google maps and mosquito larvae information should be useful to the dengue control and health service communities for their planning and operational activities.

Keywords: mosquito, web database, *Aedes* larvae, Google Earth™, Google Maps™

Budburst observation of *Cassia fistula* L. in 2005 and 2006 at Nakhon Ratchasima province

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Abstract

The common name of *C. fistula* L. is Golden shower, the national tree of Thailand. They produce their brighten yellow inflorescence flower in warm summer. Warm air temperature stimulate the occurrence of budburst. Budburst is tiny leaves emerging from inside the bud, and example of the phonological cycle. The timing of budburst is influenced by temperature. Its detection can be used to examine regional and global vegetation patterns and vegetation responses to climate change. Air temperature at urban areas tend to have warmer than those of the rural areas. Because of human activities such as domestic activities, vehicle, industry release heat energy to the environment. Nakhon Ratchsima province is the largest city in the North Eastern part of Thailand. The population reach up over 2.5 millions in 2005.

An objective of this research aims at observing budburst of *C. fistula* L, the selected native deciduous tree in urban area of Nakhon Ratchasima province in 2005 and 2006. The research methodology keeps following the budburst protocol of GUPY project, which comprise species selection, site selection, tree identification, labeling, tree location (GPS), budburst measurements (Record the date when budburst occurs in 3 separate branches of the tree).

Result of the study reveal that, In 2006, *C. fistula* L. start their budburst earlier than in the year of 2005. The mean air temperature during budburst period in 2005 was 35^{o}C. The period of budburst was 18 days. The mean air temperature in 2006 was 38^{o}C. The period of budburst was 11 days. *C. fistula* L. normally produce their flower-bud before leaf-bud. Which is in the period of low temperature than the period of producing leaf-bud. In 2006, *C. fistula* L. produced their flower bud and leaf bud in the same period.

Keywords: *C. fistula* L., Budburst, Heat Island Effect.

Implementation of the Earth System Science curriculum for pre-service education in Loei Rajabhat University, Thailand

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Abstract

The Earth System Science (ESS) curriculum has been promoted by the Institute for the Promotion of Teaching Science and Technology, Ministry of Education, Thailand, since 2007 to assist in the development of a free elective subject for primary and secondary schools in Thailand. It was designed to improve attitudes toward science as well as scientific skills. Implementation includes teacher training, student learning activities, student research competitions, and site visits. Loei Rajabhat University (LRU) is one of the universities cooperating with the GLOBE program that graduates science teachers with majors in Physics, Chemistry, Biology and General Science. The new ESS curriculum was developed and launched in 2012 for 3rd year university students and in order for them to implement GLOBE protocols and classroom activities for primary and secondary students when they became teachers. An average of 120 graduating students were involved in the pre-service teacher training program annually. Program descriptions and the results of surveys will be presented along with an analysis of the challenges that remain for successful implementation of the ESS curriculum.

Keywords: Earth Science System, primary and secondary schools, pre-service education

Collaborative Learning on School Research with Google Apps

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Abstract

School research on environment has been undertaken for quite some time, especially for the schools in the GLOBE (Global Learning and Observations to Benefit the Environment) program. GLOBE schools' research normally starts with an expedition in the vicinity of their schools to learn and observe their surroundings. Arising questions during the expedition become school projects. Achievement of scientific research, however, needs to have collaboration among students, teachers and scientists especially for local or specific issues that often cannot follow typical known protocols. Communication between schools and scientists is hindered due to distance and there is no single place for data to be entered, shared, and discussed. To overcome these challenges, Google apps would be a suitable tool to support both collaborative research among schools and real time data and graphical change during study. The implementation could follow the following steps: 1) Set up the Google site providing the information about the project, 2) Create the Google spreadsheet to cover the data for required environmental factors, 3) Train students and teachers on the background knowledge about specific research, protocols, and how to do data entry, 4) Do the research at schools which can be monitored by scientists, teachers, or students in parallel, 5) Learn, observe, and discuss, via online mode, the collected data among students, teachers, and scientists.

Keywords: collaborative, school research, Google Apps, GLOBE, Google spreadsheet

The application of Geoinformatics in climate change research in school: recent trends and future prospects

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Abstract

Thailand is one of the countries in Southeast Asia where the agricultural sector plays a vital role in supporting the Thai economy and peoples' well-being. According to future climate scenarios derived from various global climate models, Southeast Asia will probably face extreme climate events such as floods and drought varied across different geographical areas in the future. Geoinformatics is the science and the technology that uses spatial information about the real world through database management to process and analyze information to illustrate meaningful relationships. Geoinformatics consists of three core components: geographic information systems (GIS), remote sensing and global positioning systems. Recently, the GLOBE Thailand program has supported research related to the application of Geoinformatics for environmental management in secondary schools, in collaboration with universities, to assist teachers and students in the application of geoinformatics to climate change issues associated with floods and drought.

This paper describes hands-on engagement by students and teachers in water related research at the Ongkharak School by applying GIS for flood risk analysis in the Ongkharak area of Nakornnayok province. It was found that GIS is helpful in organizing data and modeling physical factors to help identify flood risk areas. This initial study was successful in demonstrating the effectiveness of GIS projects at the secondary school level and we are planning future efforts to integrate other climate factors, such as rainfall and temperature from global climate models, in order to investigate climate extreme events as part of the regular curriculum.

Keywords: Climate change, Flood, Extreme events, Nakornnayok

Climate Change and Environmental Education

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Abstract

On 9th August 2013, the climate change education was offered as a part of the workshop in Pibulsongkram Rajabhat University's academic service projects to 36 schools in Phitsanulok. This project focuses on curriculum development, teacher's professional development and classroom implementation. At each stage, there was ongoing evaluation to both inform the project and provide better understanding of the unique demands and requirements of climate change education.

The curriculum integrates concepts of Earth system science (ESS) help students understand the phenomena of climate change and why these phenomena are both scientifically and socially important. The goals of the curriculum are that by the time students have completed the lessons they will

1) be able to explain the earth system as affected by climate change, (2) be able to identify various sources of evidence used to chart climate and apply the evidence to determine the proximate and ultimate causes, (3) be able to analyze the impact of climate change on environmental and biological systems, (4) be able to compare climate change mitigation and adaptations strategies (5) use data and evidence to justify claims relating to climate change, and mitigation.

The conclusions reached from the workshop showed that many teachers were not familiar with this curriculum but they were interested in implementing ESS in their schools. Furthermore, the workshop found that teachers needed coaching and training to set up and run this curriculum and that a school network would be useful in problem solving and sharing information quickly.

Keywords: Climate Change, Environmental Education, ESS, Curriculum.

Earth System Science: A Tool for Climate Change Study at Thaksin University, Phatthalung Campus, Thailand

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Abstract

The Earth System Science (ESS) is a tool for the study of the interactions between and among events and Earth's spheres. Earth's spheres include the atmosphere, the hydrosphere, the lithosphere and the biosphere. It is important to understand the interactions among these components and their Global implications in order to help people predict outcomes, prepare for natural disasters and asses environmental impacts of human activities. In this study, we adapted the ESS program to create a General Educations class focusing on science and technology in our lives. This subject was required of all first year students at Thaksin University. We had 5 groups, each containing 300 students that were divided into smaller sub groups of 10 students each, for a total of 150 groups. We assigned data collection to a single group for a single day, resulting in 150 days of data collection. The ESS components of water and soil pH, water and soil temperature, water turbidity, and types and numbers of organisms around the sample site were monitored at 6 am, 12 am and 6 pm. The data were analyzed and resulting relationships among the variables were described and discussed in class in the context of climate change.

Keywords: Climate change, Earth System Science, Environmental factors, General education

Impact of plant variety on soil health using arbuscular mycorrhizal fungi as bioindicator in climate change

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Abstract

Arbuscular Mycorrhizal Fungi (AMF) is generally beneficial microorganism of terrestrial plant. The abundance of AMF in rhizosphere shows good soil and plant fitness. This research studied on the plant variety is impact to soil health using sweet sorghum (*Sorghum bicolor* (L.) Moench) as a plant model. Four varieties (KKU40, Suwan-sweet, Sugar-T and Urja) were planted in dry and wet seasons in experimental field. Wet sieving technique was used to obtain AMF spores, which were identified to genus according to spore morphology. *Acaulospora* is a dominant genus in all rhizosphere. The highest of spore number (131 spores per 100 g^{-1} soil) and soil phosphorus (136 ppm) was found in Sugar-T at dry season. Then, the highest of spore number (119 spores per 100 g^{-1} soil) and soil potassium (125 ppm) was found in Urja at wet season. Highest soil moisture was observed when spore density was highly abundance in both of dry and wet season. A variety of sweet sorghum affects to soil fertility depend on soil moisture in climate change.

Keywords: Arbuscular Mycorrhizal Fungi, bioindicator, seasonal change, sweet sorghum

Economic analysis of biogas production for household using a small biogas floating tank reactor

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Abstract

Methane is normally produced by aerobic digestion in natural ecosystems. It is one of greenhouse gases impacting global warming, so in order to reduce the natural emission of methane gas from the environment, it is proposed to utilize food scraps and pig slurry waste, normally discarded into the environment, in a closed bioreactor to generate methane for use as a household cooking fuel. The physical characteristics that were studied for mixtures of food scraps and pig slurry as the biogas ingredients included pH, chemical oxygen demand (COD),and temperature. A small biogas reactor was developed using a floating tank system with a capacity of 200 L. The payback period, the net present value, and the internal rate of return were analyzed under the various measured conditions. The biogas yields were approximately 180.6 L/day under the mesophilic process with a pH range of 5.2 – 6.5, COD loading of 22,350-36,100 mg/L-day and digestion temperature of 31-39^{o}C for a retention time of 20 days. The economic analysis for the optimal measurement conditions obtains the payback period of 4.1 year, the net present value of 5.75 USD (184 Baht) and the internal rate of return by 12.3% per year.

Keywords: Biogas, renewable energy, food scraps, floating tank, economic analysis