

**Antiplasmodial Alkaloids from the Bark of *Cryptocarya nigra* (Lauraceae)**

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A dichloromethane extract of the stem bark of *Cryptocarya nigra* showed strong *in vitro* inhibition of *Plasmodium falciparum* growth, with an IC<sub>50</sub> value of 2.82 µg/mL. The phytochemical study of this extract has led to the isolation and characterization of four known alkaloids: (+)-*N*-methylisococlaurine (**1**), atherosperminine (**2**), 2-hydroxytherosperminine (**3**), and northerosperminine (**4**). Structural elucidation of all alkaloids was accomplished by means of high field 1D- and 2D-NMR, IR, UV and LCMS spectral data. The isolated extract constituents (+)-*N*-methylisococlaurine (**1**), atherosperminine (**2**) and 2-hydroxy-therosperminine (**3**) showed strong antiplasmodial activity, with IC<sub>50</sub> values of 5.40, 5.80 and 0.75 µM, respectively. In addition, (+)-*N*-methylisococlaurine (**1**) and atherosperminine (**2**) showed high antioxidant activity in a DPPH assay with IC<sub>50</sub> values of 29.56 µg/mL and 54.53 µg/mL respectively. Compounds **1** and **2** also both showed high antioxidant activity in the FRAP assay, with percentages of 78.54 and 70.66 respectively and in the metal chelating assay, with IC<sub>50</sub> values of 50.08 µg/mL and 42.87 µg/mL, respectively.

Keywords: *Plasmodium falciparum*; *Cryptocarya nigra*; Lauraceae; antioxidant; antiplasmodial; activity

**Antibacterials and Phytochemicals Investigations of *Chromolaena odorata* King and Robison from Sabah, Malaysia**

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Antimicrobial properties and phytochemical constituents in leaf extract of *Chromolaena odorata* was evaluated in this study. *C. odorata* leaves were subjected to liquid-liquid extraction by using methanol, hexane, ethyl acetate, chloroform, butanol and water. All extract partitions were tested for antibacterial activity against five Gram positive and Gram negative bacteria by using disc diffusion method. Crude methanolic extract (CME), ethyl acetate extract (EAE) and chloroform extract (CE) showed good antibacterial properties against the tested bacterial strains. However, only the CE was further separated using silica column chromatography. About 10 semi purified fractions was obtained and fraction 2 (F2) showed consistent inhibitory zones against all bacterial tested. Phytochemical investigations on the extract partitions and fractions showed the presence of alkaloids, flavonoids, tannins, polyphenols, saponins and triterpenoids. Fraction F2 was subjected to GC-MS analysis to characterised the bioactive compounds. The GC-MS spectral data has identified 10 major compounds which are hexachloro-ethane,

n-nonylaldehyde, methyl-4-oxooctanoate, longiverbenone, 2-butenal, 2-methyl-4-(2,6,6-trimethyl-1-cyclohexen-1-yl), neophytadiene, phytol, dihydro-neoclovene, 2,6-ditert-butylquinone and aromadendrene

Keywords: Chromolaenaodorata; antibacterial; GC-MS analysis; medicinal plants; phytochemicals

**Elnetthra Folly Eldy**

**2013**

### **Integrated PBL Approach: Preliminary Findings towards Physics Students' Critical Thinking and Creative-Critical Thinking**

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The main purpose of this study was to report the findings on physics students' critical thinking of early implementation of an integrated problem-based learning (PBL) approach. This study was performed on a cohort of 28 Physics with Electronics students from School of Science and Technology at University Malaysia Sabah. The sample was trained by the integrated PBL method for 1 semester (i.e., 14 weeks). Participants' critical thinking was evaluated using a previously validated instrument, the Watson Glaser Critical Thinking Appraisal (WGCTA) (i.e., inference; assumption; deduction; interpretation; evaluation arguments) and their creative-critical thinking (i.e., superior creative thinking style; creative thinking style; balanced thinking style; critical thinking style; and superior critical thinking style) was using the YanPiaw Creative-Critical Thinking. Both tests administered before (pre-test, Form A) and (post-test, Form B) the teaching and learning process. The result shows that there is significant different in two criterions that from WGCTA test: inference (sig 2-tailed,  $t = -3.478$ ,  $p = .001 < .05$ ) and interpretation (sig 2-tailed,  $t = -5.53$ ,  $p = .00 < .05$ ). As for the creative-critical thinking skills, the YCreative-Critical Thinking Test shows almost 32% of the students thinking style fall on balanced thinking style.

Keywords: Problem-based learning, critical thinking, creative-critical thinking

### **The Role of PBL in Improving Physics Students' Creative Thinking and Its Imprint on Gender**

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Creativity is one of the components in thinking skills that realized as one of a critical feature for a developing industrial country like Malaysia. The main objective of this paper is to provide details of students' score on several criteria's of creative thinking who was previously done from YanPiaw Creative-Critical test analysis and in addition of that also to present an evidence to support the previous study on the relationship between creativity and gender. The subjects of this study were 28 Physics with Electronics undergraduate students exposed to problem-based learning (PBL) for one semester (i.e., 14 weeks) during Semester 2, Session 2012/2013 academic year. The study took place at School of Science & Technology, University Malaysia Sabah. The results and comparison of the findings in this study with previous study was present, also accompanying by proper discussion.

Keyword: Problem-based learning, creative thinking, gender.

### **The Capability of Integrated Problem-Based Learning in Improving Students' Level of Creative-Critical Thinking**

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The purpose of this paper was to report and provide evidence of positive development on physics students' thinking style focally on their critical thinking at early implementation of an integrated problem-based learning (PBL) approach. This study was performed on a cohort of 28 Physics with Electronics students from School of Science and Technology at University Malaysia Sabah. The sample was trained by the integrated PBL method for 1 semester (i.e., 14 weeks) in a Physics course (i.e., Thermodynamics). The YanPiaw Creative-Critical Thinking (YCreative-Critical Thinking) Test developed by Chua (2004) was used to identify students' level of thinking style (i.e., balanced thinking, critical thinking etc.) before and after the early implementation. The results show positive development in students' thinking style before to after the implementation. Additionally the relations of these thinking styles with student's age were also analysed.

Keywords: Creative-critical thinking, critical thinking, problem-based learning.

**Jackson Chang Hian Wui**

**2013**

### **A Clamped Bar Model for the Sompoton Vibrator**

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The sompoton is one of famous traditional musical instruments in Sabah. This instrument consists of several parts with the vibrator being the most important one. In this paper, the vibrator is modeled as a clamped bar with a uniformly distributed mass. By means of this model, the fundamental frequency is analyzed with the use of an equivalent single degree of freedom system (SDOF) and exact analysis. The vibrator is made of aluminum in different sizes and is excited using a constant air jet to obtain its fundamental resonance frequency. The fundamental frequency obtained from the experimental measurement is compared with the theoretical values calculated based on the equivalent SDOF and exact analysis theories. It is found that the exact analysis gives a closer value to the experimental results as compared to the SDOF system. Although both the experimental and theoretical results exhibit the same trend, they are different in magnitude. To overcome the differences in both theories, a correction factor is added to account for the production errors.

Keywords: vibrator, clamped bar, single degree of freedom system, exact analysis, resonance frequency.

### **Analysis of vibrator for sompoton using cantilever beam model**

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One of the famous heritages in Sabah is the traditional musical instrument called sompoton. This instrument has several parts with the vibrator being the most important of all. In this paper, the vibrator is modeled as a cantilever beam with uniformly distributed mass. Using this model, the fundamental frequency is analyzed using Rayleigh's energy theory. The vibrator made from aluminum is fabricated at different dimensions and is excited using constant air jet to obtain its fundamental resonance frequency. The measured fundamental frequency is then compared with the theoretical values calculated based on cantilever beam model and Rayleigh's energy theories. It was found that the experimental and theoretical results exhibit the same trend but differ in magnitude. To overcome this, a correction factor is added to the theoretical formulation to account for fabrication error.

Keywords: Vibrator, cantilever beam, Rayleigh's energy theory, resonance frequency, single degree of freedom system.

### **Development of Perez-Du Mortier Calibration Algorithm for Ground-Based Aerosol Optical Depth Measurement with Validation using SMARTS Model**

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Aerosols are small particles suspended in air that have wide varying spatial and temporal distributions. The concentration of aerosol in total columnar atmosphere is normally measured using aerosol optical depth (AOD). In long-term monitoring stations, accurate AOD retrieval is often difficult due to the lack of frequent calibration. To overcome this problem, a near-sea-level Langley calibration algorithm is developed using the combination of clear-sky detection model and statistical filter. It attempts to produce a dataset that consists of only homogenous and stable atmospheric condition for the Langley calibration purposes. In this paper, a radiance-based validation method is performed to further investigate the feasibility and consistency of the proposed algorithm at different location, day, and time. The algorithm is validated using SMARTS model based on DNI value. The overall results confirmed that the proposed calibration algorithm feasible and consistent for measurements taken at different sites and weather conditions.

Keywords: Aerosol optical depth, direct normal irradiance, Langley calibration, radiance-based validation, SMARTS.

### **Diurnal evolution of solar radiation in UV, PAR and NIR bands in high air masses**

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Solar surface insolation appears constant from an everyday's point of view but this quantity has been found to be changing in small scale that may lead to climate change over an extended period of time. However, the factors impacting this variance are always a subject of much debate. In long term observations for low air masses, the variation is governed by cloud cover, aerosol loading, relative humidity as well as water vapor content. Parallel observations in high air masses for the variation of received solar radiation are rather lacking. To fill up the existing gap, this paper aims to investigate the diurnal evolution of solar radiation spectrum in UV, PAR and NIR bands in high air masses. In the current work, a total of 25 days of global and diffuse solar spectrum ranges from air mass 2 to 6 were collected using shadowband technique. It is found that the evolution pattern for all spectral components follows a high coefficient of determination with respect to global radiation. The result analysis also shows that variation of solar radiation is the least in UV fraction, followed by PAR and the most in NIR fraction. It is deduced that the broader amplitude of fraction in PAR and NIR because they incorporate variation of aerosol and water vapor. Decreasing trend in NIR fraction for constant UV fraction is likely associated to the increase of water vapor content. While reduction of PAR fraction for specific air mass interval is due to the increase in aerosol loading.

### **Investigation of Short Time Scale Variation of Solar Radiation Spectrum in UV, PAR, and NIR Bands due to Atmospheric Aerosol and Water Vapor**

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Long terms variation of solar insolation had been widely studied. However, its parallel observations in short time scale is rather lacking. This paper aims to investigate the short time scale evolution of solar radiation spectrum (UV, PAR, and NIR bands) due to atmospheric aerosols and water vapors. A total of 25 days of global and diffused solar spectrum ranges from air mass 2 to 6 were collected using ground-based spectrometer with shadowband technique. The result shows that variation of solar radiation is the least in UV fraction, followed by PAR and the most in NIR. Broader variations in PAR and NIR are associated with the short time scale fluctuations of aerosol and water vapors. The corresponding daily evolution of UV, PAR, and NIR fractions implies that aerosol and water vapors variation could also be responsible for the deviation pattern in the Langley-plot analysis.

Keywords: Aerosol, short time scale variation, solar radiation, water vapor.

**Che Haziqah Che Hussin**

**2013**

### **Solving System of Linear Differential Equations by Using Differential Transformation Method**

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Nowadays, the Differential Transformation Method (DTM) is widely used in ordinary differential equations, partial differential equations and integral equations. Basically, the DTM is a numerical method based on the Taylor series expansion. Via this method, the analytical solutions are constructed in the form of a polynomial. Instead of evaluating the derivatives symbolically, this method calculates the relative derivatives by an iteration procedure describe by the transformed equations. Previous studies show that the differential transformation method is a powerful method having high accuracy to solve lower order boundary value problem and higher order boundary value problems for linear and nonlinear differential equations. In the present study, we solve system of linear differential equations by using DTM. To illustrate the accuracy of the method we provide several numerical examples and compare the results with their exact solutions.

Keywords: Ordinary differential equations, approximations and expansions, numerical simulation, solution of equations

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### **A New Efficient Analytically Proven Lossless Data Compression for Data Transmission Technique**

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A new lossless data compression method for data transmission is proposed. This new compression mechanism does not face the problem of mapping elements from a domain which is much larger than its range. Our new algorithm sides steps this problem via a pre-defined code word list. The algorithm has fast encoding and decoding mechanism and is also proven analytically to be a lossless data compression technique.

Keywords: lossless data compression method, pre-defined code word list, coding techniques.