Conference Proceedings 2018

THE ICBTS.

Research Conference Proceedings 2018

Proceeding of

INTERNATIONAL BUSINESS ECONOMIC TOURISM SCIENCES TECHNOLOGY
HUMANITIES SOCIAL SCIENCES AND EDUCATION RESEARCH CONFERENCE

Helsinki, Finland
9 – 11 August, 2018

THE 2018 ICBTS

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Conference Three Themes

The International Business Tourism and Applied Sciences Research Conference

The International Education Social Sciences and Humanities Research Conference

Conference Proceedings

INTERNATIONAL BUSINESS ECONOMIC TOURISM SCIENCES TECHNOLOGY HUMANITIES SOCIAL SCIENCES AND EDUCATION RESEARCH CONFERENCE
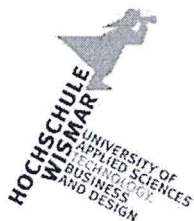
Helsinki, Finland
9 – 11 August, 2018

THE 2018 ICBTS

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In Academic Scholars Cooperation with

Wismar University   Lincoln University   Hamdan Bin Smart Universisty   Suan Sunandha Rajabhat University

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INTRODUCTION

We would like to welcome our colleagues to the International Business Education Social Sciences Humanities Tourism Transport Technology Research Conference. It is the nine series in 2018 of Conference on Business Tourism and Apply Sciences was held in Paris. As always many members of the ICBTS 2018 community look forward to meeting, sharing and exchanging their research ideas and results in both a formal and informal setting which the conference provides. Likewise, the concept of alternating the international conference every one month on April to October between Europe and the rest of the world is now well established. This year's event in Vienna (Austria) London (UK) Las Vegas (USA) Amsterdam (Netherlands) Zurich (Switzerland) Oslo (Norway) Helsinki (Finland) Berlin (Germany) Rome (Italy) Lisbon (Portugal) Lucerne (Switzerland) and another continues with the cultural following the very successful and productive event held in London in February 2018 in the field of various types for international academic research conference on Business Education Social Sciences Humanities and Technology. As usual The ICBTS 2018 brings together leading academics, researchers and practitioners to exchange ideas, views and the latest research in the field of Business Tourism and Apply Sciences.

The theme of this event The 2018 ICBTS International Business Tourism Social Sciences Humanities and Education Research Conference is "Opportunities and Development of Global Business Economics Social Sciences Humanities and Education" It is also represents an emerging and highly challenging area of research and practice for both academics and practitioners a like, The current industrial context is characterized by increasing global competition, decreasing product life cycles, Global Business, Tourism Development, Social Sciences Humanities Education Apply Sciences and Technology collaborative networked organizations, higher levels of uncertainties and, above all, and customers. In our view holding this event in Paris represents a timely opportunity for academics and researchers to explore pertinent issues surrounding Business Economics Tourism Social Sciences Humanities Education Sciences and Technology.

Potential authors were invited to submit an abstract to the International Conference Session Chairs. All abstracts were reviewed by two experts from the International review committee and final papers were further reviewed by this volume with 30 contributing authors coming from 18 countries. This book of proceedings has been organized according to following categories:

- Business
- Management
- Marketing
- Accounting
- Financial
- Banking
- Economic
- Education
- Marketing
- Logistics Management
- Social Sciences
- Supply Chain management
- Industrial Management
- Information Technology
- Sciences Technology
- Transport and Traffic
- Tourism Strategic
- Tourism Management
- Tourism Marketing
- Tourism Development Policy and Planning
- Technology Application
- Communication and Sciences
- Humanities
- Health care Management
- Hospitality Management
- Hotel Management

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SPEAKER BACKGROUND

Professor Dr. Ebrahim Soltani

Prof. Dr. Ebrahim Soltani is a Professor of Business School at University of Kent Canterbury in England and he is Department Chair - Quality & Operations Management at Hamdan Bin Mohammed Smart University Dubai of United Arab Emirate. He was appointed associate professor in business management, total quality management, and operation management in 1989 at the University of Kent, he continued his research in the field of operation management, business management. He has published over 50 papers and reports in such journals as International Journal of Technology and Production Research. He supervised a considerable number of PhD theses and is a consultant on industrial and production industry in England and United Arab Emirate.

SPEAKER BACKGROUND

Professor Dr. Kai Heuer

Prof. Dr. Kai Heuer is full professor for business administration at the Business Faculty of Wismar University in Germany. Before, he served as a full professor at the Environmental Campus of Trier University of Applied Sciences. He studied business administration in Germany and the U.S.A. and holds an MBA and a doctoral degree. He has management experience from leading positions in different companies and as business consultant. His research areas are management accounting, organizational development, and international management where he has published numerous papers, reports and textbooks. He is the head of Master Program in Business at Wismar University and a member of the Schmalenbach-Society for Business Economics, Cologne; managing director of the Institute of Health-, Senior- and Social Management; and a former member of the board of the Centre for Aviation Law and Management.

The 2018 ICBTS International Multidiscipline Research Conference

9 August 18 8.30 – 09.10 (TH)	REGISTRATION & WELCOME Welcome meeting at The Radisson Blu Seaside Helsinki, Finland
9 August 18 09.00 –10.45	**Session A1** **Paper 1 (1)** The Result of Oral Medication Education Program for Preventing Complication in DM. Patient Ponpun Vorasiha and Tipapan Sungkapong **Paper 2 (2)** Lifestyles and Health Perception in the Retired Elderly Karuhadej P. and Dangthongdee S. and Cherwanitchakorn S. and Shuaytong **Paper 3 (3)** Characteristic Needs of New Registered Nurses from College of Nursing and Health, Suan Sunandha Rajabhat University by Head Nurse Perspectives Kanya Napapongsa and Dr. Muntanavadee Maytapattana **Paper 4 (4)** Ethical Practice Behaviors of the 4th year Undergraduate Nursing Students, College of Nursing and Health, Suan Sunandha Rajabhat University Muntanavadee Maytapattana and Sumala Sawangjid and Kwanrutai Sempoon **Paper 5 (5)** The Pilot Study: Adaptation of Lecturers after Retirement Sujitra Uratanamanee and Premwadee Karuhadej and Ponpun Vorasiha and Udomporn Yingpaibulsuk **Paper 6 (6)** Ability to Communicate with Customers in Basic English: A Case Study of Guest Houses Employees in Thailand Dr. Natnaporn Aeknarajindawat **Paper 7 (27)** Coping with Recession: The Croatian Experience Borozan Djula
	Morning Break in the room
10.46 – 12.30	**Session A 2** **Paper 1 (22)** Adaptive Leadership for School Excellence amid Policy Change Wanwisa Suebnusorn **Paper 2 (7)** Strengthen Program of the moral and basic goodness for the first year nursing students in College of Nursing and Health, Suan Sunandha Rajabhat University ChantanaChangchenvate and Dr. ponpun Vorasiha **Paper 3 (8)** The Research Evaluation of Heroes Project by CIPP Model Thitavan Hongkittiyanon and Boonlegan Thomtong and LakanaYodkoldij and Jiraporn rakkarn **Paper 4 (9)** The effect of the Program of Practical skills preparation in Maternal and Newborn Nursing on achievement of nursing students Napissara Dhiranatara and Petcharat Techathawewon **Paper 5 (10)** The effect of preparedness program before clinical practice on achievement of nursing students in the subject of Maternal and Newborn Nursing and Midwifery practicum PetcharatTechathawewon **Paper 6 (11)** Effects of Empowerment Program on Dementia Preventive Behavior in Elderly Monrudee Popijan **Paper 7 (19)** Whether the adult attachment styles would affect leader-subordinate relational identity ? Sung-Chun Tsai and Ching-Fung Chan
12.31-13.30	Lunch
13.31-15.00	**Session A 3** **Paper 1 (39)** Influence of Moringa (Moringa Oleifera) Leaf and Seed Extracts on α-AMYLASE AND α-GLUCOSIDASE inhibitory Properties of Acarbose Akintemi Abimbola O and 2Ganiyu Oboh and Ibukun Emmanuel O **Paper 2 (50)** Cirque du Soleil - KA in Vegas Associate Professor Dr. Hilary Becker **Paper 3 (31)** The Reality of the Economics of Retirement Securities for Moderate-Income Families Dr. Ruby Beale **Paper 4 (48)** Sustaining independent Language Learning Via Mobile Tagging: The Use of Quick Response Code to Enhance Students Motivation in an Algerian University EFL Classroom

	Dr. Mimouna ZITOUNI **Paper 5 (44)** Leadership Framework in Kindergarten Education Joanne Marie Igoy-Escalona **Paper 6 (29)** Pushover Analysis and Incremental Dynamic Analysis of Steel Braced Reinforced Concrete Frames Sangar Saud Hamad Amin
15.01– 15.15	Afternoon Break
15.16 – 16.30	**Session A 4** **Paper 1(17)** Bullying Incidents Experienced by Indigenous Students their Coping Mechanism and Parental involvement: Basis for a Child Protection Program of KNHS Reyselle Ann N. Teodosio **Paper 2 (18)** Strategic Heritage Tourism Development Framework Towards Global Competitiveness and Sustainability Shella Marie Ignacio **Paper 1 (6)** Poverty as the Bane of Street Children in Kano Metropolis, Northwestern, Nigeria, 1999-2016 Azeez Fatimo Moromoke **Paper 2 (22)** Illusion, Gender Bias and Conflict in Ancient Indian Literature: A Presentation / Interpretation of Episodes in Ramayana And Mahabharata Dr. Madan Mohan Beura **Paper 3 (16)** Disinfection without bromate formation in drinking water using high voltage impulse In-Soung Chang and Hye Ran Kim and June-Ho Lee
SESSION B
9 August 18 09.00 -10.45	**Session B 1** **Paper 1 (12)** The Royal Project: Case Study of Doi Bo, Chiangrai Province Dr. Niracharapa Tongdhamachart **Paper 2 (13)** Decision Making to select Elderly Nursing Home' services in Bangkok Sudpranorm Smuntavekin and Chotika Sulayapong and Boonsri Kittichottipanich **Paper 3 (14)** Self-prevent behaviors in osteoporosis of elderly at Amphawa district, Samut Songkhram Province Pimporn Thongmuang **Paper 4 (15)** The Happiness of Eldery in Urban Communnnity Oranuch Chaopreecha and Sudpranorm Smuntavekin and Kanjana Siricharoenwong **Paper 5 (16)** Need of Attention Care from Health Care Provider of High Risk Pregnant Women in Antenatal Clinic UdompornYingpaiboonsuk and BoonsriKittichottipanich and SuwanmaneeVudthi **Paper 6 (17)** Comparison of Stress Coping of Elderly in Community Nitaya Srijamnong and Anchalee Jantapo **Paper 7 (23)** International Higher Education in BUSINESS – 'PIGS MIGHT FLY'An approach for system review Konstantinos Tsontos
Morning Break in the room
10.45 – 12.30	**Session B 2** **Paper 1 1 (46)** Academic management strategies for vocational education colleges in Thailand according to the concept of entrepreneurial characteristics development of students Nijira Bumroonggit and Chayapim Usaho and Pruet Siribanpitak **Paper 2 (26)** Flipped Classroom and The Geometer's Sketchpad:Students' investigation - A Square Peg in a Round Hole Asst. Prof. Dr. Krongthong Khairiree **Paper 3 (27)** Construction of a small Vacuum Chamber for Studying a Gravity Janchai YINGPRAYOON **Paper 4 (28)** Muay Thai and it's Transition to International Level Mr. Mohamed Darma Khairiree **Paper 5 (29)** The Use of Smart Technology in Teaching and Learning: A Way to Enhance Achievement Ms. Rojanard Waramontri **Paper 6 (30)** In-flight Services Project: Creative Education from Airline Cabin Crew's Services Training Taksina Bunbut **Paper 7 (42)** The Effect of Participation Motivation to Volunteer Satisfaction

	Yi Hsin Lin and Shu- Hsien Lai
12.39 – 13.30	**Lunch**
13.31 – 15.00	**Session B 3** **Paper 1 (9)** The Loud Silence: Silent Role Play to Develop Effective Communication and Listening Skills Manas Moulic and Dr. Mojibur Rahman **Paper 2 (8)** Nexus Between Human Capital Development and Human Capital Investment in Nigeria Awe Isaac Tope **Paper 3 (5)** Effect of Traffic Volume, Vehicular Speed and Road Grades on Air Pollution in Amman Eman Anan Shehadeh **Paper 4 (14)** The objectives of Nigeria's foreign policy in relation to African states between 1960-2015. Aliyu Adamu Imam and Dr. Tindi Seje Nuru **Paper 5 (15)** Knowledge, Attitude and Perception of Parents on Maternity, Newborn and Child Health (MNCH): A Qualitative Assessment in some Selected Rural Areas in Kaduna State Gimba Victor Kyari **Paper 6 (40)** Effects of Globalisation on Education and Culture Assistant Professor Deepthi Kambala
15.01-15.15	**Afternoon Break**
15.16-16.30	**Session B 4** **Paper 1 (30)** Implementation of CSR Expenditure by Indian Corporate Sector and Profit Optimization—Reality for Environmental Concerns Dr. Kamlesh Pritwani **Paper 2 (41)** Financial Sustainability: Synergy in Revenue Generation for Public Universities in Uganda NEEMA-ABOOKI **Paper 3 (45)** Reshaping IT Manager Competencies: A Proposed IT Management Program for the Public IT Workforce in the Kingdom of Saudi Arabia Mohammed A. Gharawi **Paper 4 (7)** Administrative and Human-Health-Related Factors as Correlates of Antenatal Care Service Utilisation Among Pregnant Women in Ekiti State, Nigeria ALADE, Temitope. T. **Paper 5 (42)** Human and Nonhuman Challenges in an ESP Teaching Learning Context: Investigating Speaking Performance Deficiency Among Algerian Learners of Business English at University Level Mimouna ZITOUNI and Lahcen ADDI
	SESSION C
10 August 18 09.31 – 10.45	**Session C 1** **Paper 1 (1)** The Tradition of Protest Poetry in Northern Nigeria: A Comparative Study of the Poetry of Sa'adu Zungur and Idris Amali Dikko Muhammad **Paper 2 (7)** Niger-delta crisis: its causes and effects on the socio-economic life of the people of Ogoni, rivers state, Nigeria. Ibrahim Ghide Adamu **Paper 3 (29)** The Polemic of Online Transportations Existence that Challenge the Motorbike Pedicab 'Betor' as Tourism Icon of Medan In Search of Better Policy for the Government of Medan Syaravina Lubis, SH and Puput Astria, SH and Juli Sartika, Amd **Paper 4 (39)** War Destroys Business: A Reality Check Imran Naseem and Saeed Akbar **Paper 5 (60)** Israeli Hebrew Speaker Students' Grapples on Environmental Education with Arabic Speaker Pupils' Hen Firman and Yafa Sitbon and Ifaa Banner and Yulia Einav
10.45 – 11.00	Morning Break
11.01 - 12.30	**Session C2** **Paper 1 (20)** Criticism Towards Surveillance Society and Power in Turgay Nar's Theatre Plays Assoc. Prof. Dr. Nurullah ULUTAŞ **Paper 2 (23)** The impact of meanders on the river bottom topography and the formation of reverse slope and islands nuclei Asst. Prof. Dr. Osama Khazaal Al-Sherifi

	Paper 3 (24) Modeling Digital Geographic Map for the border oil fields shared between Iraq and neighboring countries using GIS Prof. Makki Ghazi Abdullatif Al-Mohammadi **Paper 4 (25)** The Antagonistic nature of the United States-Iran Relations: A Constructivist Perspective Melly Masni **Paper 5 (31)** Terrestrial (3D) Laser Scanning for Pipeline Modeling Applications Mohammed Al-Tawary **Paper 6 (32)** Impact of Human Resources Management Practices on Lecturers' Job Performance in Nigerian Universities Yusuf Alhaji Hashim
SESSION D	
10 August 18 **09.31 – 10.45**	**Session D 1** **Paper 1 (35)** Intellectual Exile in Edward Said's Perspective Ahmed Saeed Otaiwi Joudarm **Paper 2 (10)** The Influence of SMS Marketing on Consumers' Purchase Intention through Consumer Attitude Umer Ramzan **Paper 3 (11)** The Influence of Social Media on the Development of the Cities Assistant Professor Dr. OSIAC DANIELA **Paper 4** Sustainable Tourism and the Behavior of the Algerian Tourist: By using a Model of Discriminants Functions Benbouziane Mohammed **Paper 5 (9)** Chilean uneven spaces: The extraction in the countryside and the accumulation in the metropolis Francisco Vergara-Perucich
10.45 – 11.00	Morning Break
11.01 - 12.30	**Session D 2** **Paper 1 (61)** Designing a Robust Non-Linear Automatic Controller for Very Large Crude Carriers in Harbor Maneuvers by applying Modified Decoupling Control Methodology Nguyen Thanh Hoa and Tran Van Hiep and Le Minh Duc and Luong Thi Hon **Paper 2 (63)** The Impact of Internal Auditing as a Veritable Tool Towards Organizational Growth Eneh Uchenna B. **Paper 3 (64)** Designing a new and Effective Speed Sensorless Controller for 3-Phase Induction Motors by Applying De-Coupling Methodology Luong Thi Hon and Le Minh Duc, **Paper 4 (29)** The Polemic of Online Transportations Existence that Challenge the Motorbike Pedicab 'Betor' as Tourism Icon of Medan In Search of Better Policy for the Government of Medan Syaravina Lubis, SH and Puput Astria, SH and Juli Sartika, Amd **Paper 5 (39)** War Destroys Business: A Reality Check Imran Naseem and Saeed Akbar **Paper 6 (5)** Towards Community Based Tourism (CBT) at Aida Refugee Camp Adel Adem
Conference Close	
11 Aug 2018	**Free day for Participants**

The Schedule will be change to appropriate for participants

CONSTRUCTION OF A SMALL VACUUM CHAMBER FOR STUDYING A GRAVITY

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ABSTRACT

This work is to study and to construct a small vacuum chamber from a transparent plastic tube with a simple vacuum system using a big syringe. Further study is to do experiment of 2 falling objects with different weights, feather and metal ball, in the vacuum chamber. To hold these 2 objects, the magnetic system is designed to hold and release the objects at the same time. In order to pump the air out of the chamber, we used 3-way valves to let the air comes out and stop the air comes in. A low cost syringe is used to pump the air out of the chamber. In the vacuum, it is clear that a feather and a metal ball can fall in an equal way. The result of the experiment can be clearly seen by using a high speed camera. With this chamber, a value of gravity g can be measured by using a charging circuit of a capacitor. When an object is released from the top of the chamber, the charging circuit will be triggered to start charging a known-value capacitor. The voltage across the capacitor is increasing as the time passing. The charging voltage across the capacitor is increasing as a function of an exponential form of time. When the falling object reaches the floor of the chamber the micros-witch underneath is triggered to stop a charging process. By measuring a charging voltage across the capacitor, a time of a falling object can be calculated from a formula and hence the value of g can also be calculated. The measurement of this charging voltage and the time can be measured by a data logger and a hand-held calculator. The result of this method is accurate enough for the experiment in the classroom level.

Keywords: gravity, vacuum, free fall objects, air resistant, capacitor charging circuits, Newton's law of motion

INTRODUCTION

A free falling object is an object that is falling under the influence of gravity. Any object that is being acted upon only by the force of gravity is said to be in a state of free fall. A free-falling object has an acceleration of 9.8 m/s², downward (on Earth). This numerical value for the acceleration of a free-falling object is such an important value that it is given a special name. It is known as the acceleration of gravity - the acceleration for any object moving under the sole influence of gravity. A matter of fact, this quantity known as the acceleration of gravity is such an important quantity that physicists have a special symbol to denote it - the symbol **g**. The numerical value for the acceleration of gravity is most accurately known as 9.8 m/s². There are slight variations in this numerical value (to the second decimal place) that are dependent primarily upon on altitude. An object that **falls through a vacuum** is subjected to only one external force, the gravitational force, expressed as the weight of the object. The weight equation defines the weight **W** to be equal to the mass of the object **m** times the gravitational acceleration **g**:

$$W = m * g \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(1)$$

The gravitational acceleration **g** decreases with the square of the distance from the center of the earth. But for many practical problems, we can assume this factor to be a constant. An object that moves because of the action of gravity alone is said to be **free falling**. If the object falls through the atmosphere, there is an additional drag force acting on the object and the physics involved with the motion of the object is more complex.

The motion of any moving object is described by Newton's second law of motion, force **F** equals mass **m** times acceleration **a**:

$$F = m.a, \text{ in this case, } F = m.g \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(2)$$

The **acceleration** of the object equals the gravitational acceleration. The mass, size, and shape of the object are not a factor in describing the motion of the object. So all objects, regardless of size or shape or weight, free fall with the same acceleration. In a vacuum, a metal ball falls at the same rate as a feather.

The remarkable observation that all free falling objects fall with the same acceleration was first proposed by **Galileo Galilei** nearly 400 years ago. Galileo conducted experiments using a ball on an inclined plane to determine the relationship between the time and distance traveled. He found that the distance depended on the square of the time and that the velocity increased as the ball moved down the incline. The relationship was the same regardless of the mass of the ball used in the experiment. The experiment was successful because he was using a ball for the falling object and the friction between the ball and the plane was much smaller than the gravitational force. He also used a very shallow incline, so the velocity was small and the drag on the ball was very small compared to the gravitational force.

A position versus time graph for a free-falling object is shown below.
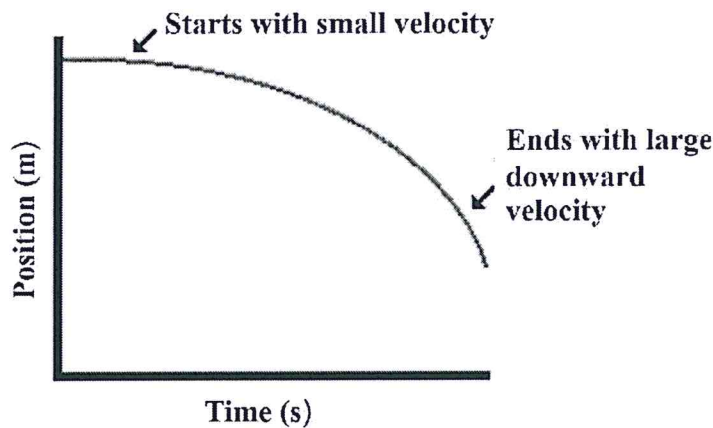

Fig. 1. A graph position versus time **Time (s)** *showing for a free-falling object*

Observe that the line on the graph curves. A curved line on a position versus time graph signifies an accelerated motion. Since a free-falling object (without air resistance or drag force) is undergoing an acceleration (g = 9.8 m/s^2), it would be expected that its position-time graph would be in a quadratic form. A further look at the position-time graph reveals that the object starts with a small velocity (slow) and finishes with a large velocity (fast). Since the slope of any position vs. time graph is the velocity of the object, the small initial slope indicates a small initial velocity and the large final slope indicates a large final velocity. Finally, the negative slope of the line indicates a negative (i.e., downward) velocity.

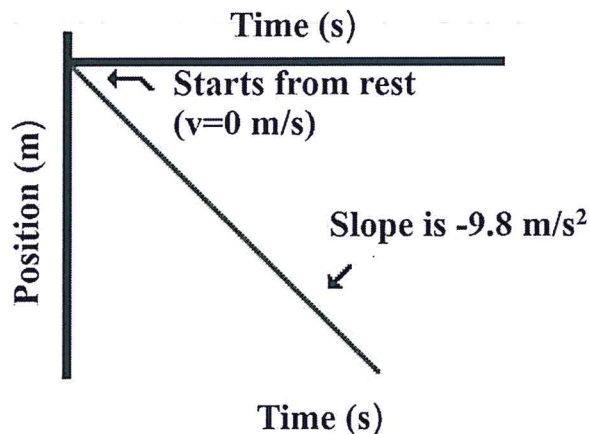A velocity versus time graph for a free-falling object is shown below.

Fig. 2. A graph showing a velocity versus time for a free-falling object

Observe that the line on the graph is a straight, diagonal line. A diagonal line on a velocity versus time graph signifies an accelerated motion. Since a free-falling object is undergoing an acceleration (g = 9,8 m/s², downward), it would be expected that its velocity-time graph would be diagonal. A further look at the velocity-time graph reveals that the object starts with a zero velocity (as read from the graph) and finishes with a large, negative velocity; that is, the object is moving in the negative direction and speeding up. An object that is moving in the negative direction and speeding up is said to have a negative acceleration. Since the slope of any velocity versus time graph is the acceleration of the object, the constant, negative slope indicates a constant, negative acceleration. This analysis of the slope on the graph is consistent with the motion of a free-falling object - an object moving with a constant acceleration of 9.8 m/s/s in the downward direction. [1], [2].

If the light free-falling object like a feather starts with zero velocity, the graph will not look like the above graph because of the air resistance or drag force. This study is to construct a simple and low-cost small vacuum chamber for doing experiment of 2 falling objects with different weights, feather and metal ball, in the vacuum chamber. This is to show that the mass, size, and shape of the object are not a factor in describing the motion of the object. So all objects, regardless of size or shape or weight, free fall with the same acceleration. In a vacuum, a metal ball falls at the same rate as a feather. Apart from this experiment, the second experiment is to the determine a gravitational acceleration "g" value by using an RC charging circuit

METHODOLOGY

1. Construction of a small Vacuum Chamber

The experiments showing the free-fall objects in the vacuum chamber have been done by many people. But the vacuum system for the experiment is expensive and cannot be performed in a normal classroom. In this study, we construct a low-cost and small vacuum chamber with a simple vacuum system using a big syringe.

The vacuum chamber is made from a transparent plastic tube. Both ends of the tube are close tightly. There is also outlet for air with a valve. A small piece of feather and an iron nut are used as falling objects. These two objects are hold on the top of the tube using magnetic holding lever.
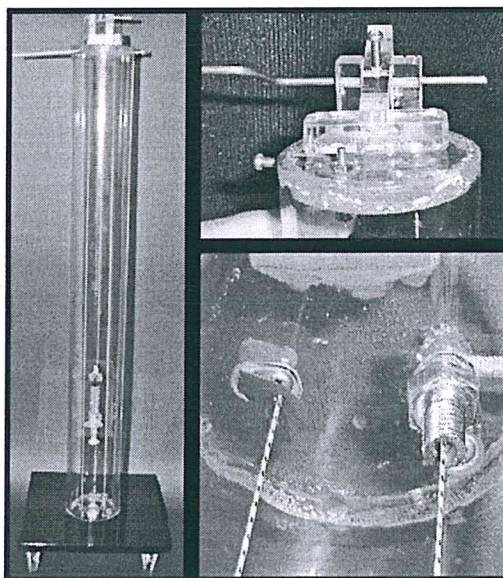

Fig. 3. Showing the vacuum chamber made from a transparent plastic tube with outlet for air with a valve and magnetic holding lever.

When these two objects are released simultaneously from the top of the tube, it is obviously seen that the iron nut will fall faster than a feather. The air resistance has greater effect on a feather than on a metal nut because of the weight of the objects.
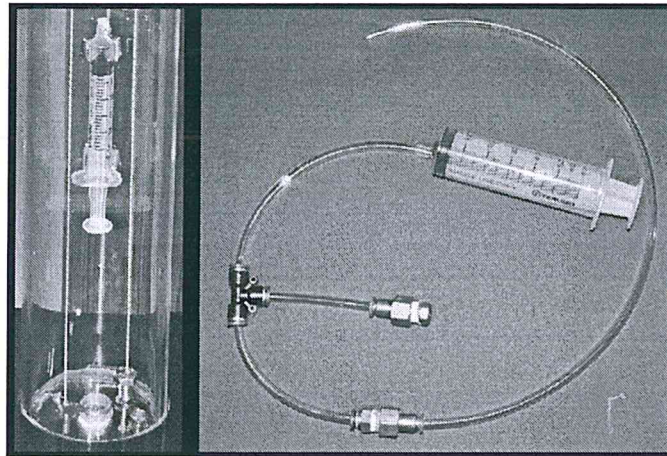

Fig. 4. Showing a simple vacuum system using a syringe to pump the air out of the chamber and an air-tight syringe for monitoring the vacuum inside the chamber.

In order to pump the air out of the chamber, we used 3-way valves to let the air comes out and stop the air comes in. A low cost syringe is used to pump the air out of the chamber. A vacuum condition inside the tube can be monitored by a small air-tight syringe placed in the plastic tube. The experiment can be performed by dropping the two objects from rest at the top point of the tube. The air resistance in the tube is reduced. The feather will fall faster than the result in the previous experiment. In order to measure the falling time of the objects for calculation of gravity g, a micro-key switch underneath is needed to trigger the electronic circuit of time measurement as shown in Fig. 5.
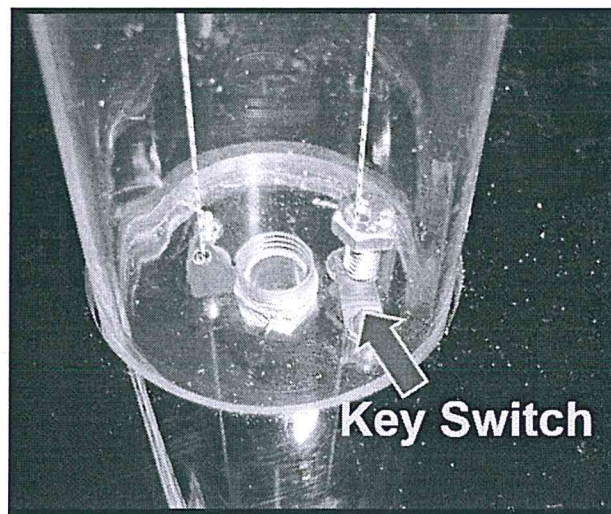

Fig. 5. Showing a micro-key switch in the chamber for triggering the electronic circuit of time measurement

2. Experiments

There are 2 experiments in this study. Observing of free-falling of metal object and a feather in vacuum chamber, and the determination of a gravitational acceleration "g" value by using an RC charging circuit

Observing of free-falling of metal object and a feather in vacuum chamber

A small piece of feather attached with a very small iron ring to be hold by a magnet and an iron nut are used as falling objects. They are big different in weights. These two objects are hold on the top of the tube using magnetic holding lever.

Firstly, these two objects were released simultaneously from the top of the tube in atmospheric pressure. The observation of the motion was done by a high speed video camera.

The second experiment was done the same way but the air in the chamber was pumped out as much as possible a big syringe. The vacuum inside the chamber was monitored by a small air-tight syringe placed in the chamber. And again, the observation of the motion in this case was also done by a high speed video camera. The video recordings from these 2 experiments were compared to confirm the effect of air resistance or drag for from air.

Determination of a gravitational acceleration "g" value by using an RC charging circuit

An object is falling from rest, the traveled distance S can be calculated from the following equation of motion:

$$S = \tfrac{1}{2}.gt^2 \quad \text{...(4)}$$

Where g is an acceleration due to gravity and t is a traveling time. Knowing the length of the chamber tube S and traveling time t, an acceleration due to gravity, g, can be calculated.

Direct measurement of time of a falling object is not accurate. The measurement of time using an RC-charging circuit is introduced.
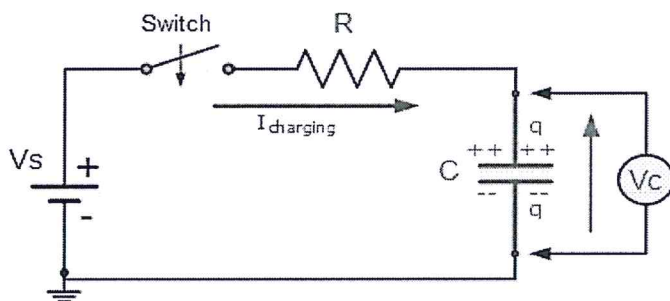

Fig. 5. Showing a circuit diagram for RC-charging

Instead of measuring the time, we can measure the voltage Vc as a function of time, t. Vs is a constant voltage source. If we know the values of a Resistor R and a Capacitor C, we can then find the falling time, t. The relation between Vc and charging time t is shown in the Fig. ..... We can use this t to find the g from equation ....
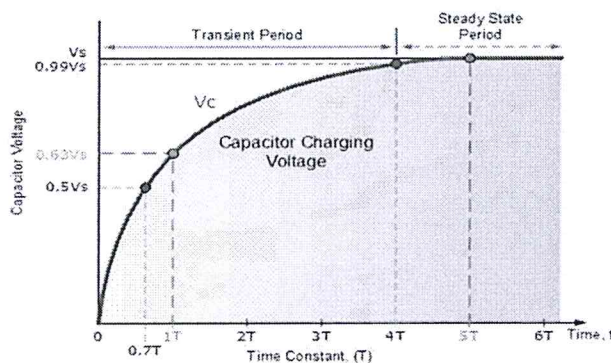
$$Vc = Vs \left(1 - e^{-t/RC}\right)$$

The variation of Vc as a function of time t for different R and C in the circuit can be seen by simulation using Geometer's Sketchpad [4].

The charging voltage Vc can be measured by a data logger CBL2 and displayed by a graphic calculator TI84 from Texas Instruments [3]. There is a stop key switch at the bottom of the tube. When a falling iron nut touches the switch, the voltage will drop, and the time can be measured.

RESULTS

Observing of free-falling of metal object and a feather in vacuum chamber

The video clips from 2 experiments clearly show that the feather and the metal nut fall almost at the same time in the vacuum. The feather falls much slower in the normal atmosphere. The big difference can be observed although the vacuum in the chamber is not a high vacuum.

Determination of a gravitational acceleration "g" value by using an RC charging circuit

The result of this experiment can be seen on the display screen of the data logger CBL2. The starting and stopping time can be obtained from the screen. Time difference is 0.30 s as shown in the Fig...... The distance S in this experiment is 0.45 m. We can them find the value of g from the equation. .....
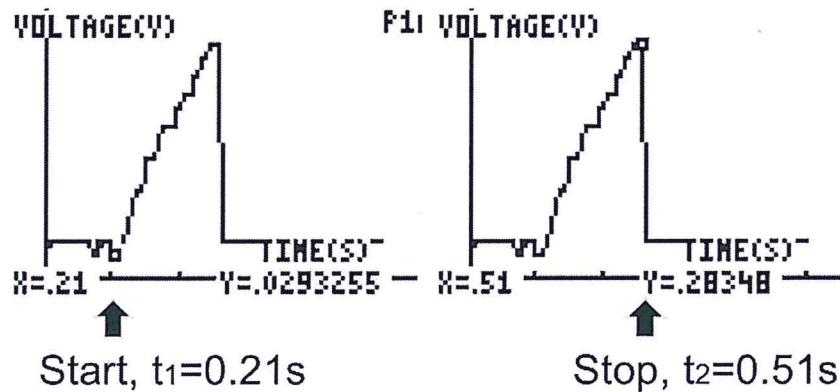

Fig. 7. Showing a charging voltage as a function of a time for a falling object.

$$S = \tfrac{1}{2}.gt^2$$

$$0.45 = 1/2g\,(0.30)^2$$
$$g = 10 \text{ m/s}^2$$

From all known values, we can calculate the value of an acceleration due to gravity, g. In this experiment, we get g = 10 m/s².

CONCLUSION

In order to study 2 free falling objects with different weights and shapes falling under the influence of gravity in a normal classroom is not that easy. A vacuum chamber is needed to see the effect. But the big chamber and vacuum system is expensive. By using this low cost vacuum chamber, the free falling experiment can be performed effectively. The effect of air resistance and clearly be seen. The value of an acceleration due to gravity, g, can be easily measured in a very short falling distance.

REFERENCES

[1] NASA Website, Motion of Free Falling Object,
https://www.grc.nasa.gov/WWW/k- 12/airplane/mofall.html

[2] The Physics Classroom,
http://www.physicsclassroom.com/class/1DKin/Lesson-5/Introduction

[3] Texas Instruments TI-84,
https://education.ti.com/en/products/calculators/graphing-calculators/ti-84-plus-se.

[4] Khairiree K. (2011). A Study of Constructivist in Mathematics in Virtual Class with Moodle and The Geometer's Sketchpad (GSP). In Wei-Chi Yang, Miroslaw Majewski, Tilak de Alwis and Erol Karakirk (Eds). *Proceeding of the Sixteenth Asian Technology Conference in Mathematics.* (pp. 97-106). ATCM Inc. Published, VA: USA.