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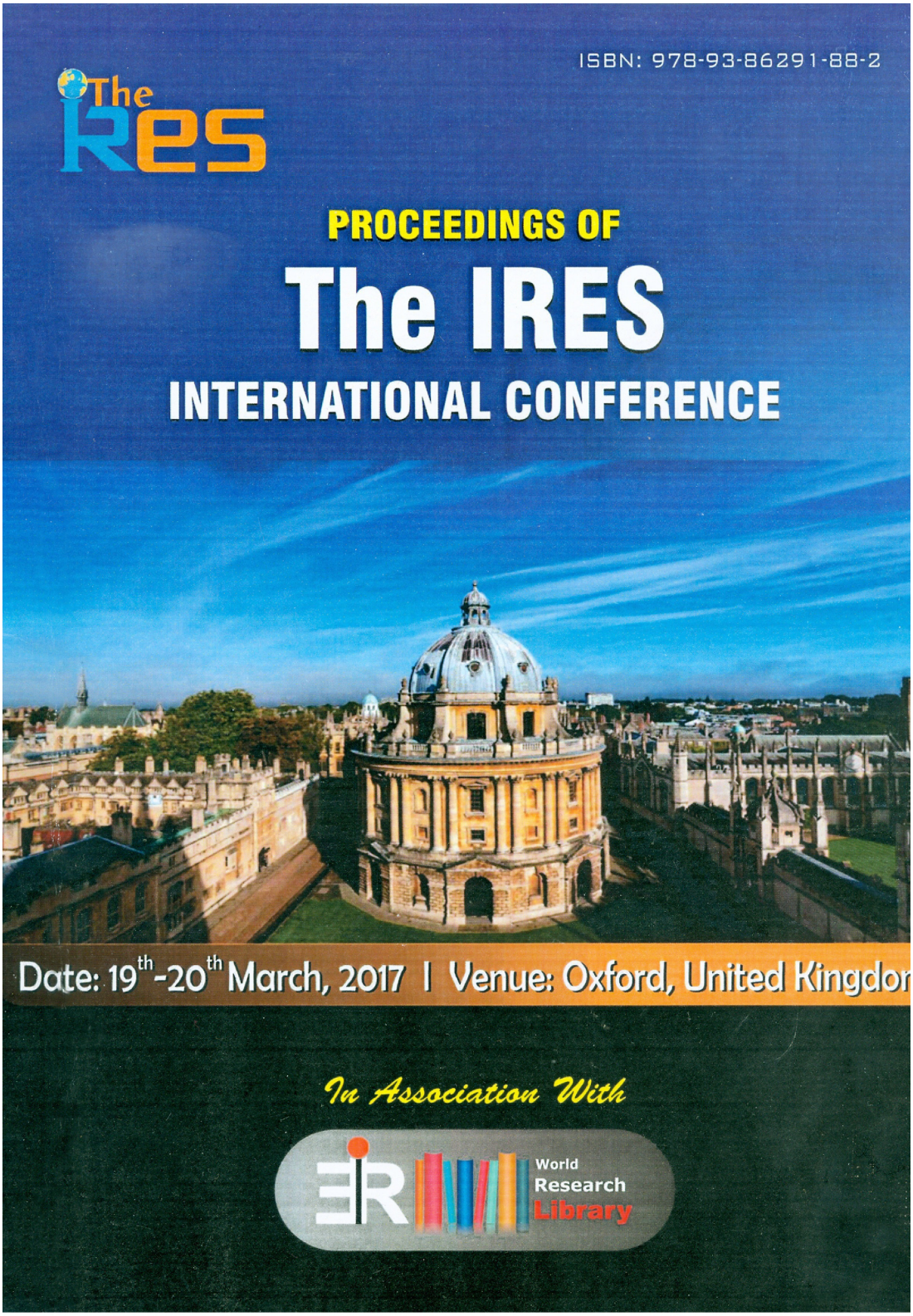

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EDITORIAL

It is my proud privilege to welcome you all to the TheIRES International Conference at Oxford, United Kingdom. I am happy to see the papers from all part of the world and some of the best paper published in this proceedings. This proceeding brings out the various Research papers from diverse areas of Science, Engineering, Technology and Management. This platform is intended to provide a platform for researchers, educators and professionals to present their discoveries and innovative practice and to explore future trends and applications in the field Science and Engineering. However, this conference will also provide a forum for dissemination of knowledge on both theoretical and applied research on the above said area with an ultimate aim to bridge the gap between these coherent disciplines of knowledge. Thus the forum accelerates the trend of development of technology for next generation. Our goal is to make the Conference proceedings useful and interesting to audiences involved in research in these areas, as well as to those involved in design, implementation and operation, to achieve the goal.

I once again give thanks to the Institute of Research and Journals, TheIIER, TheIRES & University of Management and Technology (Sialkot) for organizing this event in Oxford, United Kingdom. I am sure the contributions by the authors shall add value to the research community. I also thank all the International Advisory members and Reviewers for making this event a Successful one.

Editor-In-Chief

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■■■

THE STUDY OF 21ST CENTURY CLASSROOM REQUIREMENT TO ACCOMODATE WITH DESIGN LIGHTING IN STATE CLASSROOM WITH "RELUX"

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Abstract - This experimental research is to improve the lighting in the classrooms of state schools as the case study. As we have developing, in Thailand, the structuring of the classroom to accommodate as 21st century classroom. We start with the selection classroom where is most frequent booked. The physical survey to the luminance values then analyzed the luminosity compared to IES standards and compatible devices in the classroom. With simulation test model and 3D Perspective with RELUX*. Operating have done in the cloudy day. Classrooms are empty, the lights in the room were not enough as 487 lux comparing to 500 lux as the international standard (IES) and flare beyond the standard required in the some parts of the room and there is not enough light near the door. Some of the luminaire parts are damaged and no maintenance. The equipment in the classroom has yet encourage to support the 21st century classroom. The updated guidelines are: 1. Improve the quality of light available to standard. The natural light and artificial light used together in some areas to improve quality of light. 2. Saving electricity cost by increased define lighting zone of the luminaire, moreover the organizing the lamp direction in accordance with the closed window zones. 3. Improve the quality of the components in the classroom to 21st century classroom to accommodate future technology by adding IT devices to facilitate communication of information, IoT, with considering to design for supporting the 21st century classroom style seating in the future.

Keywords - 21st century classroom, classroom luminosity, RELUX, IoT : Internet of Things

I. INTRODUCTION

CBL (Creativity-Based Learning) is a learning-centered teaching in the classroom of the 21st century in schools. The main elements that should be a model for studying seat location, lighting and Internet of Things (IoT) as the model has encourage sitting together as a group from brainstorming and learn how to work together with exchange information via technology tools eg., tablet computer, notebook, I-pads and books and can be easily reshaped the seat into the other type of segmentation. Space management in front of the classroom to let the class can go live or using sharing information in front of the classroom including the internet, WiFi technology involve into working plane such as computers and speakers controlled by remote. In regarding of working plane require from local law (The labor Protection Act, 2006) to have 600 Lux brightness for any areas where having computer while readings and writings activities require 400 lux. According to local regulation involved standard practice for the administration work and management by safety, health and environment at work on heating, lighting and sound commensurate with the promulgation in 2006 as part of The Thai Labour Protection Act BE 2008 contains certain provisions about restricting rights in working environment must be complied, definitely the teaching and studying in the classroom classified to be complied.

The objective to this research is to study one of the major element of 21st-century classrooms and the quality of lighting in the classrooms of the state school where generally has typical traditional seating size and numbers of lamp and classroom learning resources then designed to meet the classroom functional fitting to the 21st century learning activities for improvement efficiency from traditional learning activities to Creativity-based Learning in the future classroom.

II. DETAILS EXPERIMENTAL

2.1. Materials and Procedures

Operating Conditions and the luminance identify by Labor Protection Act BE 2008 environment, which appears in the work, here by learning and teaching activities, of the employee. This includes conditions In the vicinity of the buildings, heating, ventilation, lighting, sound and working conditions of workers in the group in the second is set of lights for using the computer and its peripherals. IES (Illuminating Engineering Society of North America Lighting) and the CIE (Commission Internationale De'Leclairage) define the specified brightness range in **Table1**, [2].

Tools including Lux Meter, measuring tape, RELUX* application, date and time have been prepared and planned for survey the data collection. The physical survey to the luminance values then analyzed the luminosity compared to IES standards and compatible devices in the classroom. With simulation test model and 3D Perspective with RELUX*. Operating have done in the cloudy day. Classrooms are empty, the lights in the room were not enough as 487 lux comparing to 500 lux as the international standard (IES) and flare beyond the standard required in the some parts of the room and there is not enough light near the door opening zone.

Table1: The standard of brightness in building defined by CIE, IES. Unit: Lux

Area	CIE	IES
Meeting Room	300-500-750	200-300-500
Studio/Workshop	500-750-1000	500-750-1000
Office	300-500-750	200-300-500
Computer Room	300-500-750	200-300-500
Library	300-500-750	200-300-500
Information intake	200-300-500	200-300-500
Store	100-150-200	100-150-200
Lobby	100-150-201	100-150-200
Restroom	100-150-200	100-150-200

Source: Thailand Illustration & Lighting Association 2016,[1],[5]

2.2. Classrooms in the 21 century

With ref to Viriya, [6], 2016. CBL (Creativity-based Learning) is a learner-centered teaching approach works well in many countries and the theory of creativity. Creating a new teaching model called teaching active learning means teaching the learners with two way communication instead of traditional teaching class where normally one-way communication from the teacher. CBL tool comprised with devices such as notebooks, tablets, smart phones as tools for learning with flipping the room into a creative teachingclassroom. CBL have trial implement among learners in different state schools around Thailand, moreover has training for teachers, participants to experience. The result has shownlearners in several university enjoyed interactive learning. Increasing creativities skills thinking. The creativity, communication, teamwork, CBL, will increasing children and youth 's learning skills to learn in the 21st century effectively, [6].

2.3 Relux Suite

The free lighting planning software version 2016.1.1 is a program to design and calculate the electric light systems that can simulate the appearance of the rooms. Lamp location, furniture, including the assignment of material within the simulation in 3D. The program will calculate luminance from the values defined into program, and display the results of calculations from the configuration input as physical information, the characteristics of the rooms can be shown in different presentation such as ISO Line, color contour for better understanding, [4].

2.4 Primary & Secondary Data

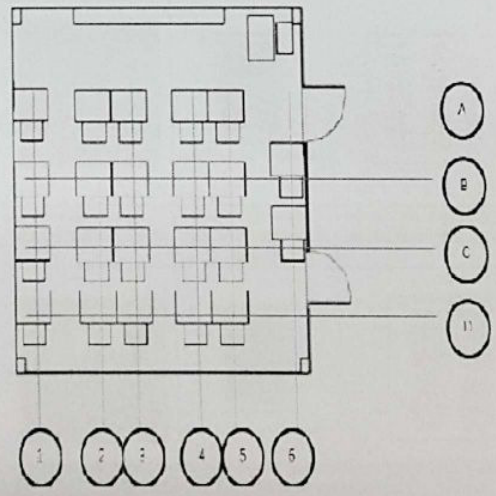
The researchers planned to gather data on both primary and secondary. There are two majors part for gathering information from the field survey. 1. Physical data collection, a literature review, legal theory, and research related to lighting design. Standards define the level of luminosity class standards and the 21st century classroom. 2. Testing quality and the luminance of the light with Lux Meter and perform accurate measurement principles with RELUX, the application for lighting. During the test period on June 21, 2016 at 2pm. weather is a cloudy sky partially covered (Partly Cloudy) defining openings facing West without influence from the environment outside of the building. In part of data analysis. The evaluation of classroom do simulated conditions in RELUX analysis conclusions and recommendations to improve classroom with colour contouring.

III. RESULTS AND DISCUSSION

3.1. Result

The brightness measuring result of the light in the classroom with Lux Meter samples in the defined time. Defined the study area mainly middle of the room and close to front area near the blackboard as "Working Plane"with 75 centimeters height as table top from ground. Condition values have entering into the RELUX application, the luminance values as shown in figure 1.The survey found that natural light and artificial light, lighting from fluorescent as considered, that shines through the buildings have an average luminance values has not reached the threshold. There has shown 497 Lux onto student desk in average and 455 Lux near the blackboard. This is considered insufficient and inadequate standards of technology in classroom teaching for the future which should beat least 500 Lux.

Table 2 shows result of luminance values in the classroom (Lux)



	Row 1	Row 2	Row 3	Row 4	Row 5	Row 6
Column A	805	605	406	400	503	-
ColumnB	830	513	395	379	422	375
ColumnC	817	602	388	368	399	356
ColumnD	810	607	416	401	403	-
Blackboard	455 Lux					
Teacher's desk	499 Lux					

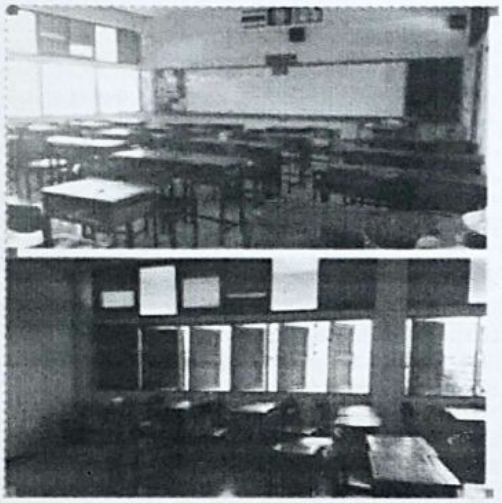


Fig. 1 Original classroom measuring luminance.

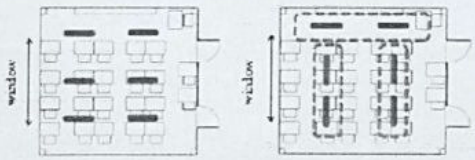


Fig 2. Window & door opening related to in-coming natural light source to educating plane

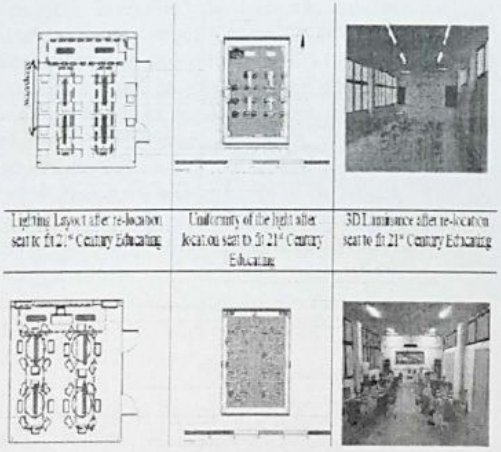


Fig. 3 ISO line for educating plane layout with new luminaire and location Seat by RELUX SUITE

3.2 Developing room for future

To increase the quality of lighting in the classrooms to support a classroom of the 21st century and CBL learning model. The legal standards and Labour Protection Act in 2008 launch the controlling of sufficient brightness to building standards. Modifications will be divided into two cases according to urgency and the budget as be able to mention as short-term improvement and long term improvement.

By short term improvement, the luminaire chart in the direction of opening for outside, zoning switch to turn on-off lighting. 1. Merging artificial light and natural lighting to reduces unnecessary power consumption. 2. Replace the conventional fluorescent with starter and ballast to modern fluorescent lamps TL5 HE Super 80 type and grille (louver) either with diagonal or parabolic pair reflector to reduce glare from lamps which suitable for computerize using areas whereas the long term improvement by develop each of learning elements by 1. Improve the style of the furniture such as round table and chairs to have more opportunity to exchange information. 2. Flexible-to-use technology for projection equipment, wide screen in front the classroom teaching style 3.Add more devices such as tablet computers, notebooks, camera and books, including the Internet for future conference of remote-learning system.

FUTURE RESEARCH

1) To maintain the quality of light to be uniform and getting constant to comply with using technology eg., camera conference.

2) Building owners always aware ofmaintenance plan to clean the grill and lamps to maintain reflection rate and having lighting reflect efficiently clean during school off during the semester. Study the feeling of color related to the room interior environment, furniture and supplies can have affects perception to attention and enhance learning.

3) Building owners can studied more in other room condition, time and the room types in other nearby areas. With using this approaching to other classrooms or other areas where different condition and element factors.

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