IUCEL2018
INTERNATIONAL UNIVERSITY CARNIVAL ON E-LEARNING

ID NO. UMP 003	TOPIC: LEARNING SPACE QUALITY MONITORING : SENSING THE UNSEEN FACTOR

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Abstract: Providing the best infrastructure for learning in university is the most important job. Administrator tends to look after the physical infrastructure rather than unseen matters. Recently, no device or scheme available to detect and prevent with monitoring the learning space quality. 150 students from multiple courses had participated in the learning investigations. The sites for investigations are the lecture hall, computer laboratory, and library. In the same investigations, we activate the HeDoo devices which detecting air particles which theoretically affect the quality of learning. Even though the site looks cozy and breathable, it showed students have a problem, especially in knowledge understanding, memorizing, and focusing. The three unseen major factors influencing the learning quality are humidity (95%), temperature (93%), and carbon dioxide (92%). This finding is beneficial to educational infrastructure planning and may provide a good outcome on students' performance. Further analysis will be run especially on minor factors.

Key words: *learning quality, learning infrastructure, indoor air quality, internet of things, sensors*

Introduction

World of education enormously changes from face to face method to online learning (self-paced). Even the method evolved through time, instructor or teacher still can't solve behavioral of students (Ridza, 2017). They tend to act anonymously and don't reflect towards the learning context. This situation worsens as the online learning introduced in early 2000. The instructor can't reflect on real-time (Divine, 2018), resulting in a failure in understanding of knowledge (Murdoch-Kinch, 2017).

On the other hand, the infrastructure of education advances faster. From chalk and talk to self-paced online learning. Students are tending to complete the online learning session in designated place, such as library and residential college (Sanusi, 2017). However, based on these research findings using a cross-sectional study (Rehman et. al., 2017), the student's facing a problem on focusing on the subjects. More than 60% of students feel sleepy while studying, and more than 75% didn't understand what they're studying.

This innovation tries to cater the unseen factors by evaluating and analyzing the environmental particles and deduce what should be done by administrator and instructor.

Objectives

We have identified several objectives in conducting the study.

i.   To seek relevancy between unseen factors and learning quality

Based on the questionnaire given to learners and the automated environmental detector particle, we analyze the coefficient between these two criteria.

ii. To determine the wellness factors in learning space

This is based on Cornell Learning Space Guidelines which cater to which factors will be cover by SBS questionnaire to determine the quality of learning space.

iii. To evaluate the solutions using questionnaire and real-time environmental data analysis

After all, factors are determined through analysis, the outcome of the innovation translated into usable learning space quality advisor

Innovation Process

Distribution of questionnaire distributes to the students' sample to various learning spaces. These works are to make sure common e-learning (self-paced study) are covered. Students are needed to answer four sets of questionnaire: - before and after learning in normal and adjustment environment.

After all the questionnaire had been analysed we will have a set of rules, which could assist the system to determine the best environment for study. These rules are an active guideline which is the administrator could monitor over time.

Lastly, a monitoring system developed, interfacing the rules and guidelines with the end user.

Result

The investigation had shown, three major factors: humidity (95%), temperature (93%), and carbon dioxide (92%) affect heavily on learning quality. These factors should be monitor frequently to make sure the quality of learning at a high pace.

In the other hands, the method on environment quality shows a fruitful result. We have developed an interface to make sure it is easy for learning space manager to monitor.
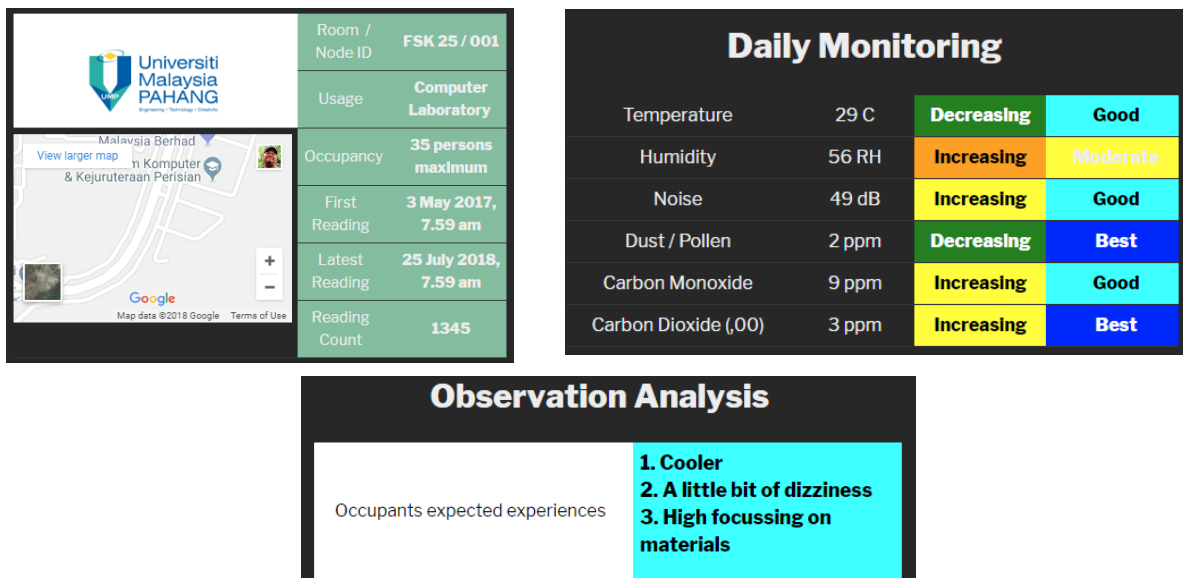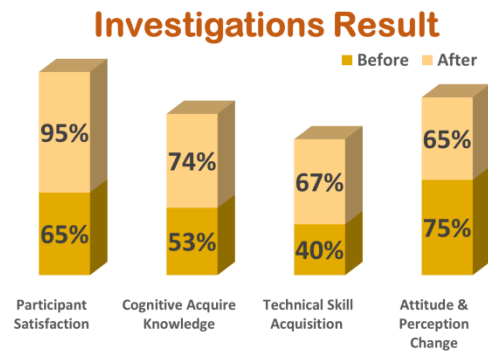

Figure 1 : User Interface for Learning Space Monitoring

After we gather all the data, the comparison between learning perception and acceptance are analyzed. The result in **Figure 2** shows, four major learning perception affect directly with the learning environment.

Figure 2 : Investigation Result

Conclusions

We have found the problem arises between the learning space environment and its relation with quality of learning. The result showed this assessment could help the educational institution upgrading their learning space to be a better place. This innovation also applicable to all country with a similar climate to Malaysia. Recently, Indonesia university had shown a good intent to implement this innovation.

Acknowledgement

We would like to thank the students who participated as software testers and volunteer participating this innovation. Also to CIREL UMP for sponsorship of our participation in the exhibition.

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