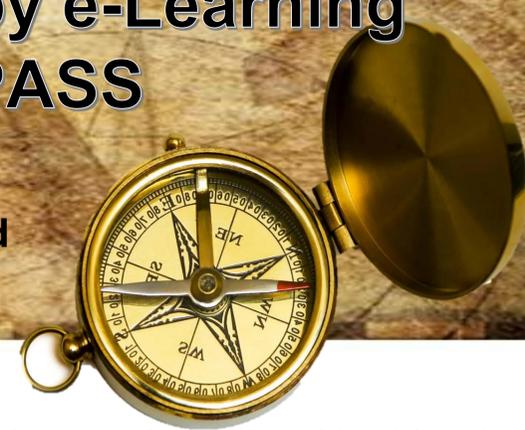USM UNIVERSITI SAINS MALAYSIA | APEX

Molecular Spectroscopy e-Learning Adventure using CoMPASS Interactive Activities

(Category: Innovations in Teaching and Learning Material)

ABSTRACT

KAT345 Spectroscopic Methods course requires students to understand various theories, instrumentation, and applications of spectroscopic equipment in Analytical Chemistry. Due to too much content in this course, it is challenging for students to learn it. To overcome this problem, CoMPaSS interactive activity has been developed using combination of e-learning tools including augmented reality, MOOC, elearn@USM, online games and other learning apps to enhance student's understanding and provide a fun e-learning environment. CoMPaSS activities, which are a combination of CollactiFNote, MOOC, physical model-augmented reality, sharing mind map and simulation, are conducted in a hybrid manner that involves learning specific topics in this course to achieve three course learning outcomes: (CLO1) explaining the basic principles and main components of spectroscopic equipment; (CLO2) interpreting problems that involve the use of spectroscopic equipment; (CLO3) exhibiting effective communication based on problems that involve the use of spectroscopic equipment. The e-learning materials designed in the CoMPaSS activity are unique because they can be played on smartphones, involving a combination of quiz games, interactive videos in MOOC, mini models, augmented reality, and online mind map sharing approaches. Individual and group assessments are conducted after completing each activity, which includes individual exercise questions (CLO1 and CLO2), group assignments (CLO3) and peer assessment using a rubric (CLO3). The course assessment results from individual exercise questions show that the average achievement of CLO1 and CLO2 is 72.9% and 65.3%, respectively while for the communication skills in CLO3, more than 75% has been achieved. This indicates that the CoMPaSS activity designed provides a meaningful and effective e-learning experience for students in this course.

OBJECTIVES

The objectives of this project are as below:
1. to determine the efficiency of learning Molecular Spectroscopy through collaborative learning using interactive CoMPASS activities,
2. to enhance students' understanding in learning Molecular Spectroscopy through the use of e-learning media, and
3. to provide an effective and enjoyable e-learning environment in learning Molecular Spectroscopy.

Fig. 1 Combination of e-learning based activities in CoMPASS.

Fig. 2 ATR-FTIR simulation.

RECOGNITION

1. Anugerah Khas YB Menteri Pendidikan Malaysia (AKRI) 2022, Immersive Learning Experience (Face to Face) Category, Winner
2. Anugerah Khas YB Menteri Pendidikan Malaysia (AKRI) 2019, Transformative Teaching Category, Finalist

ADDED VALUES

The use of e-learning tools such as quiz games, mind mapping, mini models, and augmented reality (AR) technology in education is not a new concept. However, this project has transformed the existing learning tools in providing new forms of e-learning materials in CoMPASS activities that are more engaging, in order to achieve all course learning outcomes (CLOs) and are also relevant for today's digital generation. To date, no other project or study has incorporated e-learning elements such as augmented reality, MOOC, elearn@USM, online games, and other learning apps like Lucidspark, Google Form, and Quizizz to achieve all course learning outcomes and provide effective and engaging e-learning experience.

USEFULNESS

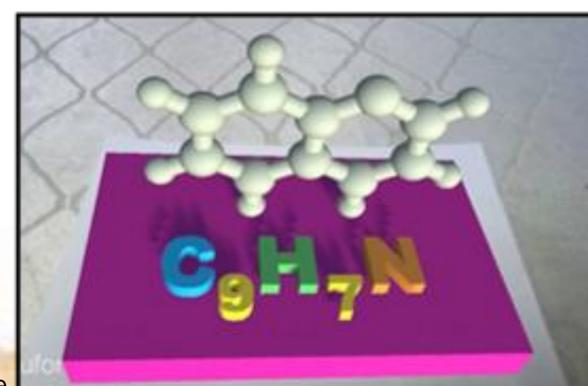| Activity	Usefulness
CollactiFNote	It contains videos, various types of exam-oriented questions, and important information on each topic
MOOC	It contains various videos, infographics, activities, and assessment questions for the topics learned
Physical Model-**A**ugmented Reality (SpectAR)	AR images contain the functions and features of each component as well as the molecular structure of organic compounds
Sharing Mind Map (SMM)	Simulation training for the sample analysis procedure using the ATR sample preparation method in ATR-FTIR instrumentation
Simulation	Preparing, sharing, and peer-reviewing mind maps using eLearn @USM for problem-based learning.

 SCAN ME

COMMERCIALIZATION POTENTIAL

The CoMPASS activity has the potential to be commercialized as a learning module for Molecular Spectroscopy courses or similar courses that incorporate e-learning elements for effective and engaging learning experience as well as relevant to today's digital generation. Additionally, activities such as CollactiFNote and simulations have the potential to be turned into learning apps that can be played anywhere using a smartphone.

Fig. 3 Example of exam-oriented question **in CollactiFNote**

Fig. 4 Augmented reality image of organic compound

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