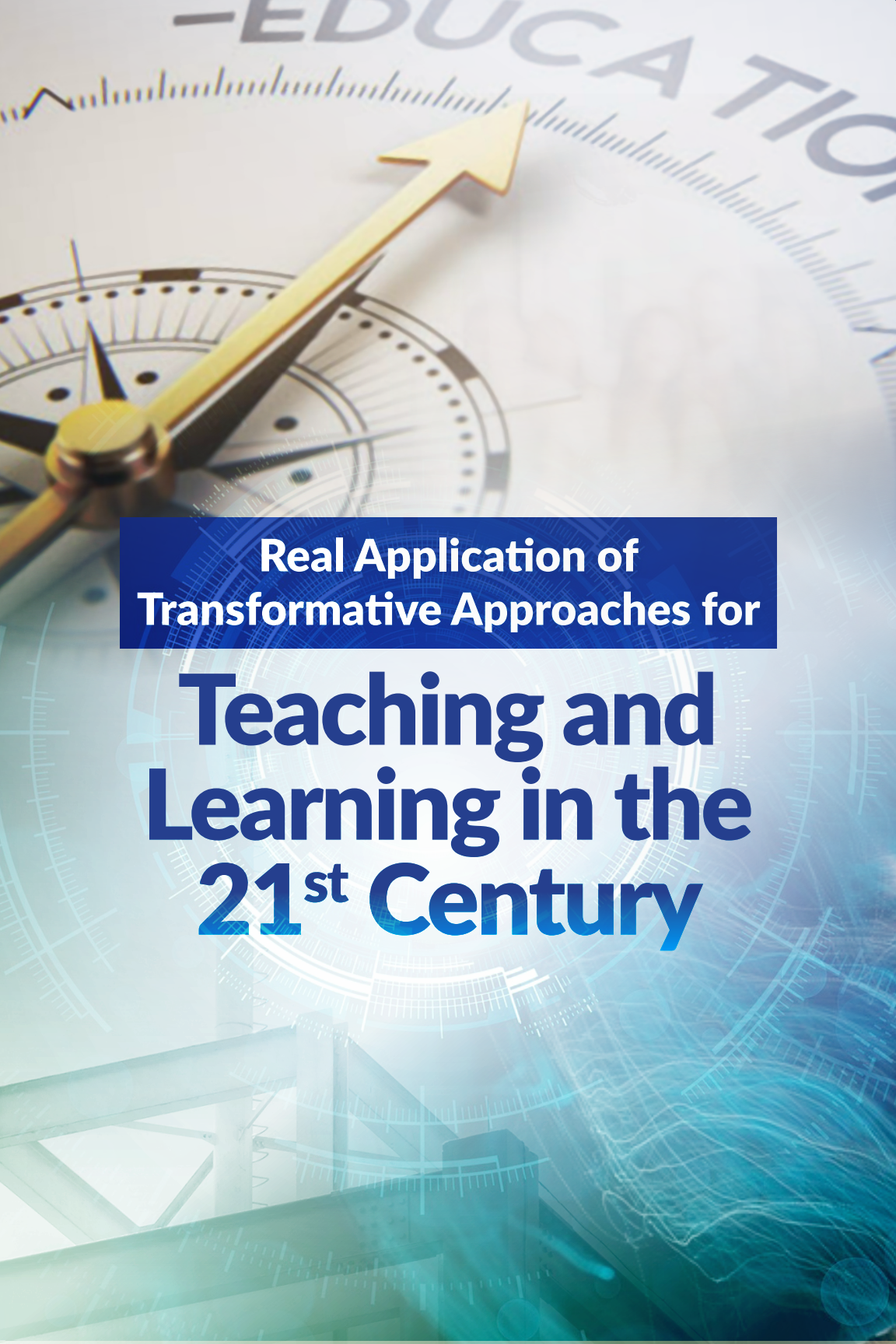

Real Application of Transformative Approaches for

Teaching and Learning in the 21st Century

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Special Dedication

This book is dedicated to UNIMAS academicians who work hard in conducting the best teaching and learning experience. This book is hoped to be an inspiration to educators on how to implement the teaching and learning process more effectively.

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Preface

"It's not just learning that's important. It's learning what to do with what you learn and learning why you learn things that matter." -Norton Juster

The Real Application of Transformative Approaches for Teaching and Learning in the 21st Century book was produced to appreciate the transformative work of lecturers in teaching and learning. This book is expected to serve as a guide to other lecturers in helping them to improve their teaching approach, delivery, and assessment of their courses. Lecturers can also use this book to develop their ideas and creativity in designing teaching and learning according to current needs and align with the learning outcomes of the course.

Global changes in the twenty-first century have altered the landscape of teaching and learning, particularly in delivery methods, approaches, and assessments. This is due to the fact that the student body is made up of generation Z, who have different styles of learning than that of the lecturers. Conventional methods used by lecturers are no longer an option for today's students. Therefore, lecturers must transform their teaching and learning in order to be relevant to today's students.

The combination of transformative approaches introduced becomes the strength of this book's content. Authors combine diverse approaches, delivery, and assessment in teaching to ensure the effectiveness of teaching to students. Moreover, the collaborative approach used provides an alternative for lecturers to minimize the burden on students for courses taken. This approach has the potential to have a greater impact, particularly in terms of student understanding of learning.

The element of creativity incorporated is also a strength of this book. Authors explain some terms and concepts using diagrams and figures to help the reader understand. The steps and procedures for carrying out teaching and transformative approaches are stated in a systematic manner to help the reader understand what is being conveyed.

The book also includes writers from various backgrounds. This distinguishes it as a unique and comprehensive manuscript. Readers are guided through conceptual and practical understanding of teaching and learning methods. The author's presentation of basic concepts and applications can help the reader understand knowledge more deeply and broadly.

Crafting a learning environment where students are able to explore and understand how the physical world works, and to connect complex scientific concepts to their daily lives is vital. It also includes building students' confidence in their ability to solve challenging problems and empowering them to build a better future for themselves and others. CTS is one of a better way of learning that will prepare students towards focusing on being very collaborative, self-motivated and self-directed all the time staying true to the lifelong learning values, which are imperative to carve a better future for the students in their field of choice.

The next project is related to the environmental issues relating to solid waste, wastewater, and hazardous waste viewed in the context of their treatments. This course has been implementing service learning (SULAM) as a part of an immersive learning approach since Semester 2, 2017/2018. In the previous years, i.e. 2017/2018, and 2018/2019, the

course assessment included either a final examination (40%, session 2017/2018), or a mid-term examination (30%, session 2018/2019). Although SULAM implementation in this course has generally improved the CLO achievement since 2017/2018, the pen and paper examination has resulted in some students not achieving the intended CLOs. Instructors were not sure on the effectiveness of examination in creating a deep learning experience for students.

Therefore, in semester 2, 2019/2020, mid-term examination was replaced with case-study analysis to (1) encourage higher order thinking skills among students and (2) cultivate the sense of commitment and responsibility among students to find innovative solutions towards waste management issues. In addition, students' e- SULAM projects as well as group discussion and engagement with target community were implemented on online platforms. Students' reflection on their e-SULAM projects was recorded on their e-portfolio. Implementation of immersive learning through blended learning in this course has resulted in improved CLO achievement as compared to the past two years. Students' reflection on their learning experience in this course implied the effectiveness of immersive learning (blended learning) approach in this course.

Besides that, the project involved transforming the typical class lecture into an interactive scientific communication environment. Students were exposed to the real scientific communication via workshop-style delivery, project-oriented problem-based learning (PoPBL) on proposal writing projects, and brainstorming/discussion activities during weekly meetings. The initiative eliminated the traditional lecture and end-of-semester assignment practices.

Another project is MATHX Project, a new project-based learning instrument that allows digital students to work collaboratively, purposely implemented to develop teamwork and student's management skills. Students translated acquired knowledge to applications and STEM projects. The integration of digital technology used in this project helps students create meaningful and enjoyable learning experiences in Mathematics.

The following project is related to the assessment in learning. In order to improve learning via assessment conduct, assessment must be objective, significant, and magnitude. OSPE has/have been adapted and implemented for Biology students in Centre for Pre-University Studies to assess know-what and know-how practical competencies following the objective and structured manner with direct observation of the students' performance. The assessment provides meaningful learning experience to the students as it can assess all three domains (cognitive, affective, and psychomotor).

Furthermore, the enriching immersive learning experience during movement control order (MCO) was possible through blended learning substitution method. Finally, one project is related to social media and animation software offering several attractive features that may overcome the limitations of the existing educational portals. The team introduced the use of YouTube, Instagram, and Doodly as supplementary platforms for teaching Environmental Biotechnology in Semester 2 2019/2020 which resulted in excellent academic performance and positive feedbacks from the students.

Finally, this book discussed also describe the course MDP30609 Community Medicine and Public Health posting, the assessment has been modified by adopting the Alternative Assessment method. The Alternative Assessment is regarded as comprehensive, where it assesses the candidates' ability to integrate writing task and performance, divergent thinking in solving problems and enhancement of meaning skills.

Acknowledgement

First of all, we are very grateful to the Deputy Chancellor Prof Datuk Dr Mohamad Kadim bin Suaidi and Deputy Vice Chancellor (Academic and International) Professor Dr Ahmad Hata bin Rasit for their support and opportunity in producing this book. This gratitude also goes to the Director of CALM, Dr Kartini binti Abd Ghani for her encouragement throughout the journey of realizing this book. We would also like to extend our acknowledgments to the Deputy Directors (Teaching Advancement), (Learning Technology), Coordinators and all administrative staffs in CALM for the support.

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Research based Learning through Immersive Face to Face Interaction

Melody Kimi, Wan Roslina Wan Yusof, Dhana Jay Raja Gopal, Sharifah Mona Abdul Aziz Abdullah, Abdul Al-Hafiz Ismail, Wan Sharifatun Handayani Wan Zullkiplee, Iswan Nur Ariff Ismail, Mardhiah Mohd Shahabuddin

Summary/Synopsis of Project/Initiative

Group project for PRK1026 Chemistry II was implemented as research-based learning through immersive face to face interaction among students and facilitator. The main activities include planning by writing proposal, conducting laboratory activities, interpretation of scientific data, followed by producing a scientific article. All pre-university students are required to complete this project as a team which cover topics related to Chemistry Learning Units in Semester Two.

This initiative is designed to focus on face to face inquiry-based activities in which the lecturer act as a facilitator instead of solely the knowledge giver. Students learn in an active manner as these effective strategies influences their interpretation and organization of new knowledge as well as the retrieval of previous knowledge by literature search and laboratory observation. The aim of this project is that students are set to become self-directed learners by completing the tasks and adjusting their learning approaches through integrating proper planning of proposal writing, acquiring laboratory skills, applying feedback from fellow team

members and active supervision. The outcome of these contexts is to produce quality scientific article. The learning impact through this experience is broadly applicable across domains as student develops interaction through intellectual and emotional climate throughout the course of face-to-face research-based learning.

Project Rationale

The limitation of passive and less engaging lecture-based and guided laboratory had prompted the initiative of the group project. This holistic approach in which a broad topic is given by the facilitator provides students with freedom to choose a more focused subtopic of interest. In the process, they proposed the methodology that is subjected to the availability of instrumentation and reagents. This encourages co-operative learning through comprehension and clarification of the task by critical-thinking and problem-solving skills. The different learning styles and greater resources of each member in the team encourage this to happen. To overcome obstacles faced in collaborative learning, the facilitator plays a critical role in developing a clear expectation of the project, plan of action by establishing timeline and assigning roles, prompting constant updates of progress from each team, providing constructive feedback and rationale of evaluation during the task completion process. These expectations are conceptualized and conveyed through grading rubrics and peer assessment.

Cognitivism learning theory is adapted throughout this project through mental processes such as thinking, interpreting, reasoning and problem solving. To be able to properly guide the students in their experiment, relating the problem related to chemistry with the existing knowledge that is embedded in students' minds is essential, so that their cognitive function is activated. This is to ensure that students can relate their theoretical understanding with their group project findings. By conducting the group project experiment in a group, connectivism learning theory is also applied whereby learning is an activity that students do together, collaboratively. Connectivism highlights the principle of self-directed learning in shifting the role of the lecturer to student to conduct the

experiment and gather the data. Students collaborate among peers to acquire knowledge in completing the learning activities, especially the group project experiment.

Approach

The main approach used in this project is the inquiry and learner-centred approach using educational research which is relevant to the locality for pre-university students. In this face-to-face learning, the lecturer acts as a facilitator to provide support for students to inquire scientific knowledge and skills in conducting experiment as well as proper integration of data into scientific writing. The learning spaces are not confined to a classroom but includes group work in the field, laboratory settings and informal discussions among students and facilitator. Formative assessment is part of the process where each stage to the completion of task is closely monitored to ensure success of the research design.

There are basic learning principles that are crucial to the success of this implementation which are adapted from various Problem Based Learning (PBL) model published (Davies, 2011). The suitability of these principles includes cognitive level, content nature and social environment through collaboration among peers.

Group Project is conducted in group which consists of twelve students per group. Each group is required to choose one title from the list provided by the facilitator based on Chemistry Learning Units. Students are given full guidance by the facilitator on a specific task while adhering to the timeline of the project, in the order of (i) proposal writing (ii) conducting experiment and (iii) article writing. The expected outcomes projected by facilitator are translated in detailed marks allocation and rubrics. To overcome problems faced in group project, each student must carry a specific role in the group which are later evaluated using peer assessment. The production of quality scientific article is guided by template with plagiarism check through Turnitin in eLEAP.

Learning outcome achieved in the form of mastered skills are crucial part of the curriculum and they are highly anticipated by the industry. Students are exposed to several skills in completing this group project which encompasses cognitive, psychomotor and affective domain namely (i) literature search and plagiarism (ii) proposal writing (iii) research methodology (iv) laboratory skills (v) interpreting scientific data (vi) integrating scientific data to scientific writing (vii) citation and referencing learning resources and (vii) social skills in terms of collaborative teamwork.

The relevancy of these scientific skills and concepts could be applied interdisciplinary in solving real life problems. As student actively participate in this face-to-face learning with peers and facilitator interactions, they will gain meaningful learning experiences that could not be obtained merely from traditional lecture-based learning method.

Students' Engagement/Involvement

The cognitive abilities of students were developed through the adaptation of research-based learning approach. This approach provided knowledge acquisition through active learning as recorded in students' logbook. The Lecturer or facilitator provides relevance between the theoretical contents taught in classroom and the knowledge applied in the research activities as part of the student-centred approach. Meaningful learning process obtained by exposing student to inquiry-based learning starting from the research planning to report presentation. The dissemination of research projects by groups as well as literature search also implied the creation of knowledge.

In terms of psychomotor abilities, students were able to have hands-on experience in laboratory skills and used proper methodology in data collection. These experiences enhanced the sustainability of learning.

The affective abilities acquired from this approach are leadership attributes and collaborative teamwork in the teaching-learning process.

The engagement of students in scientifically based research gives an immersive learning experience which were evidenced from students' feedback. Through group project, research into learning experiences was translated with the guidance from lecturer as the facilitator. Group project is a student-centred activity where students gain deeper understanding of the topic as students need to fill the knowledge gap using the available learning resources, configuring action plan in conducting experiments while integrating the knowledge that was expanded through peer teaching. Another important aspect that was highlighted from the students' feedback is the mastery of laboratory skills from first-hand experience throughout the experiment process. Students also gave much emphasis on teamwork; they acknowledged the importance of co-operation and good leadership skills. This approach also gives exposure to students on basic knowledge of scientific writing, which will be useful as students engaged in life-long learning. The extent of students' engagement in active learning can be observed throughout the group project implementation.

Students are required to meet their facilitator to discuss the action plan from the topic selection until the final report submission. During these sessions, each student is required to participate by raising questions, giving opinion and deciding on a specific role in the group. Students need to apply critical thinking skills and take responsibility for their own learning. While filling in the knowledge gap, they need to search for resources and collaborate with team members. The role of facilitator is important as a motivator to ensure that the students understand why certain activities are needed for the task completion. As guidelines are given in the online portal (eLEAP), students are required to participate in the online activities by completing tasks such as proposal, final report submission and peer assessment in each given time frame.

Impact on Students' Learning

This project has been proven to increase the students' performance in terms of knowledge from the evidence throughout implementation of the group project which resulted in 100% achievement of CLO 3 and CLO4.

Using this approach, students are actively participating in their learning and facilitator is quick to decide on appropriate teaching strategies and intervention to assist the students while closely monitoring and evaluating the students' progress.

In terms of science-based learning, theoretical explanations supported by hands-on activity through experimental works are necessary to enhance understanding of topics in chemistry and knowledge retention. These will provide meaningful learning experiences. Several skills are introduced such as literature search, planning of experimental work, conducting experiment and observation, data handling and ethics for students to produce scientific writing.

Group project provides an authentic research experience to pre-university students. Based on the students' proposal and final report, students can formulate good project questions, design experiment with clear methodology and techniques, analyse their findings, interpret their data, produce a scientific report and assimilate their ideas with Chemistry Learning Topics. These skills are aligned with the requirement of CLOs which are interpreting data and information in scientific writing and performing laboratory experiments using proper scientific techniques. Simple experimental work provides a meaningful experience in chemistry laboratory. Most importantly, writing proposal and scientific report obligates the students to gather various information from reliable sources and exposed them to scientific writing skills.

From the facilitator's perspective, the students' attitude towards learning chemistry changes throughout the implementation of the project. Previously, students are only exposed to theoretical knowledge. Now, students can formulate their hypothesis and deduce their observation of experimental works to relate to their findings. They are competent to discuss and provide evidence-based conclusion.

In terms of communication, students are given clear guidance by the facilitator on their roles. These helped in terms of collaboration and teamwork skills between their peers. They learned how to discuss

constructively, generate and share their ideas and resolve conflicts while solving problems faced whilst completing the group project.

In terms of ethics, students are exposed to the skills of information searching, citation and referencing, plagiarism detection, data handling and deducing findings that are evidence-based upon literatures. They also become familiarized with scientific writing rules regarding requirements in following specific templates.

Improvement Project/Initiative in Future

In the future, improvement or initiative can be made by introducing students to more research techniques and instrumentation used to supplement the current methodologies used.

Although students are given a specific role in the group, the management of roles can be tailored and adapted to consider the improvement in planning, implementation of the project and validation of the research data. The challenges in working in groups should be dealt and standardized where students are monitored as the project runs. The validation of such implementation could be obtained by feedback during the monitoring process as compared to the current method of acquiring feedback only at the end of the project.

 # Related Learning Outcome Clusters MQF 2.0

Cluster 2: Cognitive

Cognitivism learning theory is adapted throughout this project. Mental processing such as thinking, interpreting, reasoning and problem solving are involved in the process of completing the research group project. As a guideline for students to conduct their research, intellectual skills in seeking and comprehending new knowledge and practices are required for them to relate with existing knowledge that is already embedded in their minds. The cognitive abilities of students were developed through the adaptation of research-based learning approach. Students are

exposed to cognitive skills such as (i) literature search and plagiarism (ii) proposal writing (iii) research methodology (iv) interpreting scientific data (v) integrating scientific data to scientific writing and (vi) citation and referencing learning resources.

Cluster 3A: Practical

The practical skills are shown in planning, organization of the methodology, selection of the right chemicals, reagents and apparatus during the experiment. The scientific skills and design were also implemented using specialized chemistry skills with the correct techniques. Students enhanced their competency to work in the laboratory in group settings where safety measure and correct disposal of chemical waste were practiced.

Cluster 3B: Interpersonal

Interpersonal skills were demonstrated in the group project in terms of interactive communications with the facilitator and students amongst themselves in the group. They gave and received feedback for their ideas in a collaborative manner. Relationship among members were managed by an effective group leader with good networking skills. As the students came from various background, social skills were practiced, and no major conflict was reported.

Cluster 3C: Communication

As the students need to get their ideas and workflow organized, effective communication was portrayed in terms of conveying information and delivering them in a professional manner.

The students communicate to solve problems faced during the group project through various medium in the planning stage, during the experimental work and when concluding the data for report writing.

Cluster 5: Ethics and professionalism

Students shown professionalism in conducting literature search, they adhere to plagiarism rules of the centre. They become aware of the

citation and referencing needed to avoid issues in the scientific article. Students showed integrity when they do not change the data obtained which is important in scientific learning.

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Keywords

engaging; learning styles; constructive feedback; group work; scientific skills; learner-centred

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