



**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.

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Thanks to all award recipients who have contributed to the chapters of the book. They are Associate Professor Dr Cheah Whye Lian, Dr Kuryati binti Kipli, Dr Melody Kimi, Mohamad Faizuan bin Mat, Abdul Halim bin Hashim, Dr Chung Hung Hui, Dr Norazlina binti Bateni, Ahmad Alif bin Kamal, Dr Yvonne Michelle Campbell, Nor Hayati binti Jaya, Dr Rafeah Wahi, Professor Dr Zainab binti Ngaini, Norhunaini binti Mohd Shaifullah, Rohaiza binti Daud, Associate Professor Dr Afzan binti Ahmad Zaini, and Dr Nurashikin binti Suhaili. Not to forget to everyone who have been involved directly or indirectly in producing this book, our deepest appreciation goes to all of you.



An Alternative Assessment Approach Towards Learning Natural Sciences Communication

Chung Hung Hui

Summary/Synopsis of Project/Initiative

In STF2083 Scientific Communication, traditional written examinations were reduced to 30% using various types of alternative assessments which include (i) forums writing and online quizzes, (ii) mock research proposal presentation, (iii) mock research proposal writing and (iv) poster presentation . Instructions as well as rubrics were given to students prior to commencing of the assessments. Referring to the theme ‘Justify the basic principles in executing research’ as stated in CLO2 and ‘Display writing skills and presenting scientific reports’ in CLO3, the assessment of this course highlighted four (4) main sections; (a) identification of major/important need to conduct research (Problem statement identification), (b) the means to understand/solve the arising problems (hypothesis deduction), (c) the measurable target within the scope of this intended research (objectives determination) and (d) steps involved in achieving the outlined objectives (experimental design). In this course, all four types of assessments (i.e. mock research proposal writing, mock research proposal presentation, poster presentation and online forums)

are individual-based assessment. The reason for such course design is to ensure individual performance is aligned with the intended assessment (authentic assessment).

Project Rationale

In previous years, when group-based assessment was conducted for this course, frequent feedbacks and critiques were channelled to the facilitators on the poor scientific writing skills of WS47 students during their final year projects. One of the main reasons for various alternative assessments conducted for this course is that scientific communication is a critical 21st century skill which evolves around the 4C's core ie. critical thinking, creativity, collaboration and communication. Another key motivation into shifting this course towards alternative assessments is to align our students to the UNIMAS Strategic Focus 1, which is to develop future ready graduates capable of using various IR4.0 tools in science communication.

Students who had enrolled in this course had very few experiences in hard-core scientific writing although most of their prior writing skills came from shared-written laboratory report where each student have nominal exposure in proper scientific writing. Hence, one of the key aspects was aimed to familiarize students the understanding of fundamental research concepts. The assessments planned for this course aim to help students to look at research problems in a new way, linking learning across subjects and disciplines. The students of WS47 programme have prior knowledge on laboratory report writing from courses such as microbiology, biochemistry, plant biotechnology etc. However, none of these courses provide an intensive wholesome coverage on critical research concepts and values in itself. Therefore, this course aims to provide powerful connections between theoretical approach and real research scenario. To weather the students to be accustomed to the proposed changes, both instructions and rubrics have been provided with clear explanation on the purpose and learning objectives of each assessment.

It is believed that through the shift from traditional approach that solely evaluate on the students' performance to such alternative assessment, it encourages students to be more responsible for their own learning and allows the relationship between instructor/facilitator and students to be more collaborative as compared to the spoon-feeding approach. For instance, a portfolio assessment in this course emphasizes and shows the learning process as an active demonstration of knowledge. These portfolios help in the showcase on metacognition and reflection from the students and it is believed that by allowing constant reflections and feedbacks from facilitators, personal growth and achievement on the body of the particular knowledge can be properly documented. The poster pitch session and mock research proposal presentation session were introduced to encourage a positive atmosphere of scientific discussion among students and to expose them to various online learning tools such as Loom, Screencast, Camstudio and etc. to increase their confidence and creativity in their future scientific/research presentation.

Approach

All four assessments conducted in this course are adapted from various best assessment tools that are used to measure students' learning progress, not solely depending on the final assessment.

- i. **Poster presentation**
Poster is intended for temporary promotion of an idea or product to be displayed in a public space for mass attention. The poster presentation format is very much flexible and focusses into developing creativity in presenting science through both textual and graphical elements. It can be considered a very interactive type of tools because it provides the opportunity for viewers (facilitator and other students) to engage in discussion.
- ii. **Mock research proposal writing**
Mock research proposal writing is intended to highlight the originality or significance of conducting certain research. In this part of the assessment strategy, students are required to explain

how an interesting research problem can be developed and what are the existing challenges in the field of their study. It also helps students to build their confidence in demonstrating why they should be the best candidate to undertake such research project through persuasive writing. This is supported by Barkley et al. (2005), suggesting the implementation of case studies often help students to gain both theoretical and practical knowledge.

iii. Mock research proposal presentation

Most students and amateur researchers do not fully understand what a research proposal means, nor do they understand its importance. To put it bluntly, one's research is only as good as one's proposal (Krathwohl, 2005). A research proposal is intended to convince others that the researcher who is involved is worthwhile for the research project and that he/she has the competence and the work-plan to complete it. Hence, students were required to defend their own research proposals verbally in this section and show their competence in the intended research.

Transferable application/skills from this course: communication, problem solving and critical thinking are all examples of transferable skills that can be develop by fulfilling this course and they are crucial for any graduate in their future. In addition, students will need to apply their prior knowledge and experiences in previous courses to achieve a convincing presentation for both mock proposal and poster.

Scalable application from this course: a strong learning platform should be able to meet individual requirement for bothy learning and growth. Each students' specific needs will be catered to through constant communication and exchange of opinion to achieve optimal learning outcomes. Knowledge and skills that are acquired from this course will deliver experience to match the expectations of students' future job/career. The students' employability will be more desirable especially when they are

equipped with future oriented presentation tools that can be used to communicate their research in the natural science discipline.

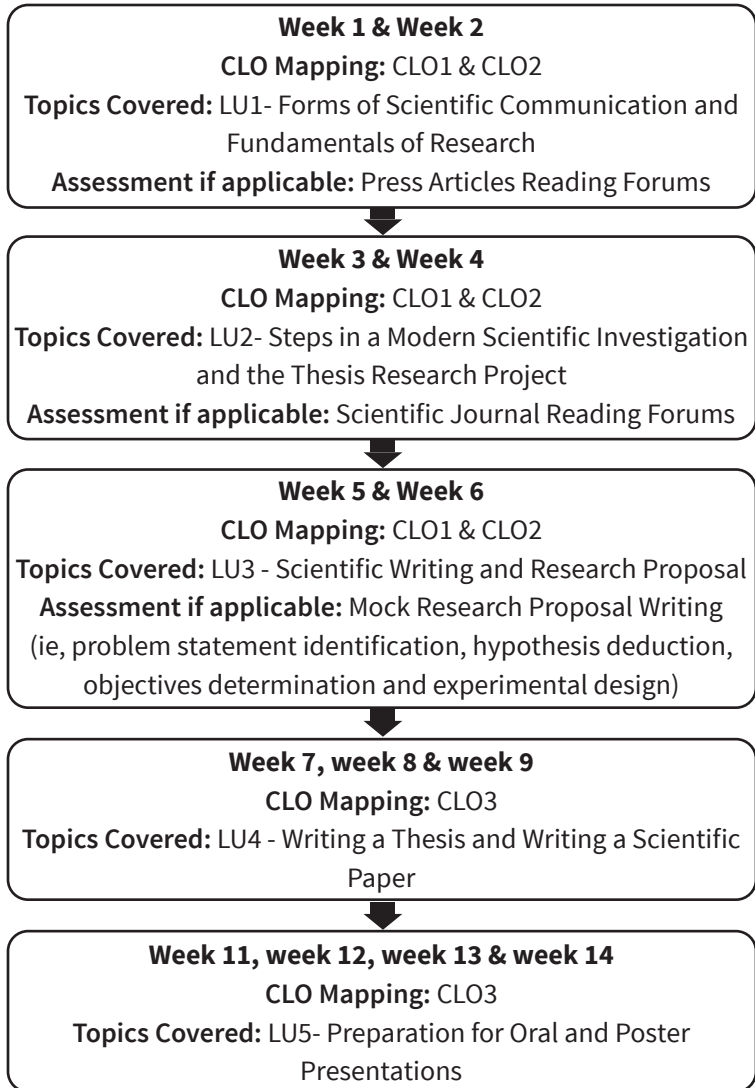


Figure 1 - STF 2083 Scientific Communication for Sem 2 2019/2020

Students' Engagement/Involvement

Cognitive skill development among learners improves significantly during the completion of each assessment. They evaluate and analyze real-life issues through journal article reading and press articles readings to gauge the most tangible current issues faced by the nation and at the global level. The process of problem statement identification has improved learners' knowledge, skills and reasoning as well as decision making abilities when they filter between relevant scientific issues and non-scientific issues. Every discussion/brainstorming among students has enhanced their cognitive development through continuous exposure of current issues realigning with proper fundamental research concepts.

Through the completion of every assessment, psychomotor development is achieved through real practice of hands-on activities when constructing hypothesis, designing an appropriate experiment and aligning them to achieve the targeted objectives. For instance, research-based data acquisition requires learners to be involved in information extraction from various websites, library resources, past thesis, journal articles, mainstream medias and newspaper articles.

In the context of acquiring affective skills, learners experience learning through the reflection of doing, especially during the preparation of poster presentations and mock research presentations. Reflections were articulated in forums and throughout the constant interaction with the facilitators. In this course, individual reflection was prompt by few sets of questions asked during forum reflective exercise.

All assessments in this course were planned to develop competencies in the areas of scientific communication knowledge, fundamental research concepts and approaches, practice-based learning, professionalism (as a natural science researcher), as well as other soft-skills (i.e. critical thinking, communication). At the end of the completion of this course, students are expected to expand their critical thinking, problem-solving, and decision-making skills.

For example, students have participated in an immersive learning setting through the mock research proposal. Mock research titles that were used in this course were all initiated by the students themselves through empirical inquiries or investigations of authentic, real-world research setting. The preparation and presentation of the mock research proposal help students of the programme to evaluate and apply all critical thinking skills that were achieved previously during their first and second year (first-half).

In addition, one of the activities within the mock research proposal presentation was having to justify and defend their own proposed research titles to their classmates. Indirectly students were groomed in their confidence level and cultivated a sense of ownership for their own future research projects.

Impact on Students' Learning

Overall, 97.30% of the students (N=34/37) achieved all the CLOs.

Only three students did not achieve CLO1: Distinguish the forms of scientific communication and the fundamentals of research [C4]. Assessment for CLO1 is solely on the final Examination which justify further the need for alternative assessment to be implemented in future strategy for this course, which may totally remove exam-based assessment.

Nonetheless, majority of the students acknowledge that the intensive and clear instructions of each assessment helped them to enhance their knowledge and complete all tasks given:

‘The class is fun and I love how lecturer gives example and clear guide to do my assignments.’

‘Very good learning experience, very informative and educational.’

‘Course instructor helps a lot in understanding the subject.’

‘He was friendly and approachable whenever we need help or have some questions regarding the Scientific Communication.’

‘The willingness lecturer to approach students during pandemic is really admirable.’ ‘

‘Excellent way of teaching and the class is very interesting.’

Other than that, students expressed mix reactions on the alternative assessments conducted to replacing final examinations in this course:

‘A very good instructor. Some of the parts of the lecture were quite confusing. The workload was a lot.’

‘I suggest, variety example of fyp are given. Eg. do’s and don’t in fyp. Well scored vs not well scored fyp.’

Most of the learners identified that the success of completing the mock research proposal was instrumental to them becoming highly equipped with multiple skills (i.e. soft-skills, technical skills):

‘One of the great course that teaches me all about FYP. I still remember before how worried I was during my second year because people around always talk about FYP and still I don’t have any exposure towards it. I’m very grateful to Dr Chung because not only he focused on syllabus but he loves to give examples from past seniors so that we can have more clear understanding.’

‘The lecturer has been very helpful in this course even though the pandemic has taken a huge toll on everyone’s daily activities. He would try his best to be available to help his students. I appreciate him taking his time to assess and give feedbacks to his students individually especially on the fyp proposal assignment. It gave me a clearer view on how to properly write one.’

'Initially it would be great to have class conducted face to face for us to ask questions. But thankfully Dr.Chung is always available for consultation, and it really helps me a lot. Plus whenever I ask, Dr will try to explain it as detail as possible and that helps. Through this course, I have gotten the picture of how to prepare a proposal, presentation and poster and it will definitely help in my fyp later. And by doing everything individually helps even more, I cannot imagine doing this in a group.'

'I personally hate writing long report so the course may be a little bit bored for me. I feel worry about the assignments during the first few weeks of the class as I totally have no idea what is going on, what are we going to do for the assignments, and what is the course about. Due to the COVID-19 pandemic, our presentation has changed to video presentation. It may be hard for some students who have no experience in editing or preparing video like me. It feels a little bit stressful during the submission week for slides, poster, and video presentation. Luckily, Dr.Chung is so kind that he would like to explain everything patiently. We can seek helps from him whenever we faced problems. He even willing to help us check about our works before the submission. A big thumb up for him. Stay safe guys.'

Improvement Project/Initiative in Future

To devise strategy to improve the project in the future, the overall CLOs achievement must be reconsidered. Looking at a high percentage at 97.30% of the students (N=34/37) achieving all the CLOs, it is essential that any changes to the course should not affect the current high percentage. Instead, focus must be channeled to find out the reason why the remaining 2.7% face difficulty in achieving all CLOs.

Related Learning Outcome Clusters MQF 2.0

Cluster 2/3C/5

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Keywords

science communication, authentic assessment, collaborative learning, biology students

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