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Competencies Developed by the Commission on Higher Education for the General Education: An Assessment for the Course Mathematics in the Modern World

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Abstract
Commission on Higher Education Memorandum Order Number 20 s-2013 specified the General Education (GE) outcomes which all Higher Education Institutions in the country should aim to realize through the implementation of Outcomes-Based Education (OBE). This research ascertained the degree to which the outcomes developed by the CHED for the new GE were realized in the course Mathematics in the Modern World (MATWRLD), and to formatively evaluate the teaching/learning of the course. It employed descriptive-evaluative design and utilized the Logic Model with data based on the perspectives of 1,572 students who voluntarily participated in the online survey. With the intellectual competencies and practical skills being realized to a great extent, and the personal and civic responsibilities realized to a moderate extent, it was concluded that the teachers of the subject HEI, "were doing it right". According to the logic model, "if the outcomes were realized, then the outputs were delivered, planned activities were accomplished, and inputs were properly utilized". The challenges that the students identified were grouped into six categories such as: the course itself, topics requiring memorization and too many formulas, delivery, requirements/workloads, classroom environment, and assessment/grading. Students seek for more collaborative activities and were looking for each topic's real-life application. Results further revealed that students from the School of Design and Arts had significantly lower mean perception that the outcomes developed by the CHED had been realized in the course, as compared with that of the students from the other three schools (SDG, SMIT, SHRIM). Recommendations were indicated to improve the teaching and learning of the MATWRLD.
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1. Introduction

Major reforms in the Philippine Educational System happened in 2013 when then President Benigno Aquino signed the Enhanced Basic Education Act of 2013. In the long-standing ten-year compulsory basic education in the Philippines, three years had been added. A one-year kindergarten is now mandatory prior to being accepted to the elementary program, and two additional years of high school education are to be completed before entry into higher education, technical/vocational training, or employment. In hindsight, the present system encompasses four sequential levels. The first year of basic education introduces universal kindergarten; the next six years comprise elementary education; the succeeding four years cover junior high school; and the last two years offer senior high school. This translates into a 13-year compulsory basic education regimen, which according to the Policy Brief of the Senate Planning Office (2011) is the global standard.

On the same year, the CHED made public the "General Education Curriculum: Holistic Understanding, Intellectual, and Civic Competencies", which specifies 19 GE outcomes and guided all colleges and universities in the country in crafting their respective General Education Program (GEP). In essence, CHED also released "A Handbook on Typology, OBE, and Institutional Sustainability Assessment", which provides enough information in guiding all HEIs to implement the outcomes-based education (CHED, 2014). Six years later, the new GE was in full swing in all colleges and universities in the country because the first batch of K-12 graduates entered college in school year 2018-2019. As HEIs have started implementing the new GEP, and as in any progressing program cycle or process, formative evaluation is vital to identify topics, activities and/or procedures that are needed to be subsequently modified or improved.

It is in this timely manner, that this research deemed significant not only for the Mathematics Area of the participating school, but also for all HEIs in the country, as well as for concerned CHED officials who are key implementers of the revised general education program. The results may be deemed of enormous importance to

the academic community especially to the faculty who prepared the materials, delivered instructions, carried out activities in the classrooms, as well as to students who are the main stakeholders in this curriculum shift. Consequently, this study adds to the current literature and research in educational program evaluation, as it will help illuminate the merits of formative evaluation for trouble shooting, the logic model in evaluating the learning outcomes, and using student comments and recommendations in improving the teaching and learning of the course.

1.1 Theoretical Framework

The development of the Revised General Education Curriculum was anchored on **Outcomes-Based Education**. This is clearly stipulated under Article III Section 14 of CMO No. 46, series 2012, which says, "CHED is committed to developing and implementing an **outcomes-based approach to quality assurance monitoring and evaluation** because it has the potential to greatly increase both the effectiveness of the quality assurance system, and the quality, efficiency, and effectiveness of higher education. Mature evaluation system is based upon **outcomes**, looking particularly into the **intended, implemented, and achieved learning outcomes"**. According to Spady and Uy (2014) Outcomes-Based Education (OBE) means clearly focusing and organizing everything in an educational system around what is essential for all students to be able to do successfully at the end of their learning experiences. This means starting with a clear picture of what is important for students to be able to do, then organizing curriculum, instructions, and assessments to make sure learning ultimately happens. Furthermore, in the OBE paradigm, there is a shift in the focus of education from an inputs-based, teacher-centered "instruction" paradigm to an outcomes-based, learner-centered educational paradigm (CHED, 2014).

While each academic degree program has a focus as described by the program outcomes, the General Education has no specific concentration, but it has its own outcomes developed by CHED which are categorized into (1) Intellectual competencies – Knowledge, (2) Practical Skills and (3) Personal and Civic Responsibilities – Values. CHED (2014) states that the purpose of higher education is not only to develop knowledgeable and competent graduates in a particular field, but also a well-rounded individuals who appreciate knowledge in a general sense, are open-minded because of it, secure in their identities as individual and as Filipinos, and cognizant of their role in the life of the nation and the larger community. Therefore GE lays the groundwork for the development of a professionally competent, humane and moral person (CMO No. 20, S-2013).

Thus, the formative evaluation done focus on how extent those GE competencies or outcomes had been realized during the first year of its implementation. Relative to this, the proponent is adopted the "Logic Model" for formatively evaluating if the intended GE learning outcomes developed by CHED had been realized in the MATWRLD. Just like OBE, Logic Model begins with the end in mind (Knowlton & Philips, 2009). Below is the graphic representation of the Logic Model.

The Logic Model

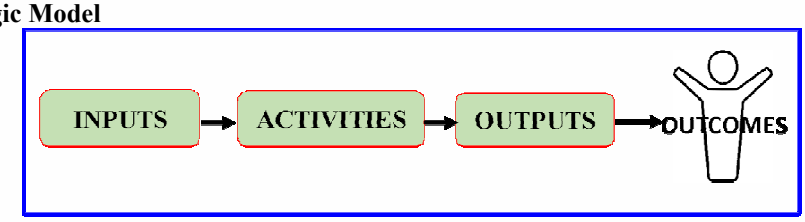

Figure 2 : The Logic Model for Evaluating the Learning Outcomes
[Adapted from United Way's Logic Model (Chen, 2015)

The Logic Model is simply a visual display of pathways from actions to results. Results consists of outcomes and impact; each appears in a sequence overtime. While impact is the ultimate end sought, sometimes synonymous with vision, outcomes are earlier indications of progress toward results (Knowlton & Philips, 2009). The influence of systems theory on the Logic Model approach to evaluation can be seen in its careful attention to the relationships between program components and the components' relationships to the program's context (Freching as cited in Frye and Hemmer, 2012). This model shares characteristics with Stufflebeam's CIPP evaluation model but this one focuses on change process and system within which the educational innovation is embedded. Though its structural simplicity makes it attractive to both novice and experienced educators, this approach is grounded in the assumption that the relationships between program's educational methods and desired outcomes are clearly understood (Frye & Hemmer, 2012).

The relationships among the components in the Logic Model are connected by a chain of **"if and then"** statements. Therefore the relationship between the inputs component and activities component is read as, "**If you have these resources as inputs, then you can use them to accomplish your planned activities**". Similarly, the relationship between activities component and outputs component is read as, "**If you accomplished your planned activities, then you will deliver these services or products**". Lastly, the

relationship between the outputs component and outcomes component is read as, "**If you accomplished your planned outputs, then your participants will experience these beneficial outcomes**" (Chen, 2015). **Thus, if the outcomes have been realized, then the outputs have been delivered, planned activities have been accomplished, and inputs have been properly utilized.**

Below are the program components such as inputs, activities, outputs and outcomes as defined in Chen (2015) and Frye and Hemmer (2012).

Inputs *are resources dedicated to or consumed by the program which comprise all relevant resources, both material and intellectual, expected to be or actually available to an educational project or program. Inputs may include funding sources, facilities, faculty skills, faculty time, staff time, staff skills, educational technology, and relevant elements of institutional culture (ex. department or Dean's support).*

Activities *are comprise services the program provides or work it perform to fulfill its mission. These are sets of treatments, strategies, innovations, or changes planned for the educational program. Activities are typically expected to occur in the order specified in the Model. The explicit ordering of activities acknowledges that a subsequent activity may be influenced by what happens after or during implementation of a preceding activity.*

Outputs *are direct products of the program activities. These are indicators that the one or more of the program's activities or parts of an activity is underway or completed and that something (a product) happened. The Logic model structure dictates that each activity must have at least one output, though a single output may be linked to more than one activity. Outputs might include the number of students attending a planned educational events, the characteristics of faculty recruited recruited to continue to contribute to the program, or the number of modules created or tested, number of classes taught, etc.*

Outcomes *are the benefits resulting from the program activities which are either short-term, medium term, and long-term range changes intended as a result of the program's activities. Outcomes may include new knowledge, better skills, program participants' implementation of new knowledge or skills in practice, etc.*

1.2 Research Questions and Hypothesis

Student involvement in all teaching and learning decisions is a key component of Outcomes-Based Education. Increased student involvement allows them to feel responsible for their own learning (Spady & Uy, 2014). Thus, curriculum development/changes, teaching and learning activities, assessments and grading, and all other curriculum decisions should be interactive among all stakeholders especially between students and teachers. This is so, because as we improve teaching, we likewise improve learning (CHED Handbook, 2014). Thus, the role of students to improve teaching and learning is of great importance.

The goals of this paper are threefold. First, to find out the extent to which the Intended Learning Outcomes identified by CHED for the Revised General Education, have been realized in the Mathematics in the Modern World at the DLS-College of Saint Benilde as perceived by students. Second, to find out the challenges in the process of learning, and recommend solutions to such challenges; and third to improve the teaching and learning of the Mathematics in the Modern World.

Specifically, it tried to answer the following research questions:

1. What is the extent to which the Intended Learning Outcomes in the Revised General Education Curriculum have been realized in the MATWRLD as perceived by the students?
2. What are the challenges encountered by the students during the process of learning?
3. What are the solutions recommended by the students to overcome such challenges, which will be the basis to improve the teaching and learning of MATWRLD?
4. Is there a significant difference on the extent to which the Intended Learning Outcomes in the Revised General Education Curriculum have been realized in MATWRLD as perceived by the students of the four schools (SDA, SDG, SHRIM, and SMIT)?

The Hypothesis below is tested at 0.05 level of significance.

H_0 : There is no significant difference on the extent to which the Intended Learning Outcomes in the Revised General Education Curriculum have been realized in MATWRLD as perceived by the students of the four schools (SDA, SDG, SHRIM, and SMIT).

2. Methodology

This part presents the research design, participants and sampling methods, instrumentation, data gathering procedure and data analysis to be employed in the study.

2.1 Research Design

The aim of this research is to formatively evaluate the new General Education course Mathematics in the Modern World at DLS-College of Saint Benilde by finding out the extent to which the Intended Learning Outcomes identified by CHED for the new GE have been realized. This was achieved by employing the

descriptive-evaluative research design. It is descriptive because it does not intend to manipulate variables as in experimental research, nor to explain the cause and effect as in correlational research. Evaluative because the focus of the study is to evaluate the extent to which the learning outcomes developed by CHED had been realized in Mathematics in the Modern World course in Benilde. According to Hale (2011), one of the goals of science is description, which includes prediction and explanation. Descriptive research methods, as the term suggests, *describe* situations, explain conditions, and make reasonable predictions. Therefore, this research tried to empirically describe the extent to which the outcomes developed by CHED for the New GE, had been realized in the MATWRLD as perceived by the students.

2.2 Participants and Sampling Method

The participants in this research were all first year college students taking up the GE course Mathematics in the Modern World who were enrolled during the third term of SY2018-19 and the first term of SY2019-20. Sampling is purposive because it includes only students who were enrolled in the GE course MATWRLD during those two terms in the four schools such as SMIT, SDG, SDA, and SHRIM. The table below shows the number of MATWRLD offerings for the third term SY2018-19 and the first term of SY2019-20. This is based on the Mathematics Area plantilla.

Table 2.1:

MATWRLD for T3-SY2018-19 and T1-SY2019-20

School	**Term 3 SY2018-19**	**Term 1 SY2019-20**	**Term 3 SY2018-19**	Total Blocks	Number of Students	Percentage (%)
SDA	**9**	**16**	**9**	25	964	49%
SDG	**0**	**6**	**0**	6	230	12%
SHRIM	**2**	**1**	**2**	3	104	5%
SMIT	**1**	**20**	**1**	21	681	34%
Total	**12**	**43**	**12**	**55**	**1,979**	**100%**

Source: Math Area Plantilla for T3SY2018-19 and T1SY2019-20

The table shows that SDA has the biggest number of students enrolled in MATWRD for the two terms included in this research, while SHRIM has the lowest. This is so, because the bulk of the enrollment in MATWRLD for SHRIM is during the second term. This makes the population to be one thousand nine hundred and seventy-nine students.

2.3 Instrumentation

Researcher-made instrument for students was used as the main data-gathering tool in this research. These are patterned after the nineteen competencies or outcomes developed by CHED for the Revised General Education. The questionnaire had been content and face validated by experts and tested for its validity and reliability. Validators are chairpersons of the School of Multidisciplinary Studies, and four English senior faculty members. Three blocks of students enrolled during the second term of SY2018-19 for a total of one hundred fourteen (114) students were requested to participate in validating the instrument. The questionnaire is in Likert scale form composed of nineteen statements with five under intellectual competencies, nine under personal and civic responsibilities, and five for practical skills. A scale of zero (0) to four (4), with the following choices were used: 4 (to a very great extent-VGE); 3 to a (to a great extent-GE); 2 (to a moderate extent-ME); 1 (to a slight extent-SE); and 0 (not applicable). The statements in the instruments are the nineteen competencies or outcomes developed by CHED as stipulated in CMO #20 s-2013; In addition to these statements, there are two open-ended questions asking about the challenges encountered in the process of learning the course, and the respondents' suggestions on how to improve the teaching/learning of the course. SPSS (Statistical Package for Social Sciences) was used for testing the reliability of the instrument. The table below shows the results, with the reliability coefficients Cronbach's alpha and their corresponding interpretation.

Table 2.2:

Reliability coefficients of the variables

Variable	**Number of items**	**Number of Items Removed**	**Cronbach's alpha**	**Interpretation**
Intellectual Competencies	5	0	0.749	Acceptable
Personal and Civic Responsibilities	9	0	0.894	Good
Practical Skills	5	0	0.823	Good
Overall	19	0	0.912	Excellent

According to Glien and Glien, as cited in Blay (2013), Cronbach's Alpha (α) is a test reliability technique that requires a test administration to provide a unique estimate of the reliability for a given test. It is the average value of the reliability coefficients one would obtain for all possible combinations of items. Cronbach's Alpha

reliability coefficient ranges between 0.0 to 1.0. The closer Cronbach's Alpha Coefficient to 1.0, the greater the internal consistency/reliability of the items in the scale. The table below shows the range of alpha and its interpretation.

Table 2.3:

Cronbach's Alpha Interpretation

Cronbach's Alpha (α)	Internal Consistency/ Reliability
$\alpha > 0.9$	Excellent
$0.8 \leq \alpha < 0.9$	Good
$0.7 \leq \alpha < 0.8$	Acceptable
$0.6 \leq \alpha < 0.7$	Questionable
$0.5 \leq \alpha < 0.6$	Poor
$\alpha < 0.5$	Unacceptable

All items in the instrument are acceptable to good, with an overall reliability coefficient (Cronbach's Alpha) of excellent. According to Glien and Glien, as cited in Blay (2013), if an item is poor, it should be removed or changed, while a questionable item can be revised or improved. After the revisions, have it tested again until one obtains all acceptable items.

2.4 Data Analysis

As regards analysis of data, the extent to which the course outcomes were assessed uses a scale of zero (0) to four (4), with the following choices: 4 (to a great extent-GE); 3 (to a moderate extent-ME); 2 (to a slight extent-SE); 1 (to a very slight extent-VSE); and 0 (not applicable-NA). Descriptive statistics such as the means and standard deviations were computed using Microsoft Excel Add Ins and VassarStats to process the data gathered. The means of the responses in the Likert scale items were interpreted using the scale shown in Table 2.4. The scale was used to analyze problem statement 1.

Table 2.4:

Scale for interpreting the mean

Scale	Interpretation	Int.
0.00-0.99	Not Applicable	NA
1.00-1.99	to a Very Slight Extent	VSE
2.00-2.99	to a Slight Extent	SE
3.01-3.29	to a Moderate Extent	ME
3.30-4.00	to a Great Extent	GE

For problem statement 2, and the hypothesis, F-test or ANOVA for independent samples was used using alpha of 0.05 level of significance. F-statistics was obtained using Microsoft Excel Add Ins and checked using VassarStats. Lastly, problem statements 3 and 4 were content analyzed and interpreted using frequency distribution, percentage and rank analyses.

2.5 Data Gathering Procedure

Data gathering was done towards the end of the third term SY2018-19 and after the midterm for first term of SY2019-20 to cover all courses and programs. Both qualitative and quantitative data were gathered online using Google Sheets/Forms. Permissions to conduct this research was sought by the researcher from the Vice Chancellor for Academics, the Deans of the different schools, the Chairperson of the Mathematics Area, and from the first year students enrolled during the third term of SY2018-19 and the first term of SY2019-20. Schedule of classes were obtained from the office of the School of Multidisciplinary Studies where MATWRLD is housed. The students were given by the teachers enough time to read the informed consent and let them decide whether or not to participate in the research. Following is the link to the questionnaire. https://docs.google.com/forms/d/e/1FAIpQLSetJuqcNQ4yWCbIMph00ral2AGVBtgNwm92HUAeOLIm71Iv-Q/viewform?vc=0&c=0&w=1

3. Results and Discussions

3.1 The Participants

There were 55 blocks/sections, with a total of 1,572 students who voluntarily participated in the online survey, which was equivalent to a 79% participation rate.

Research Problem 1: What is the extent to which the outcomes developed by CHED for the Revised General Education Curriculum have been realized in the MATWRLD as perceived by the students?

Respondents perceived that the 19 outcomes developed by CHED for the Revised General Education Curriculum

were realized in the MATWRLD to a moderate extent. However, it should be noted that both the intellectual competencies and practical skills were perceived to have been realized to a great extent while the personal and civic responsibilities were realized to a moderate extent. As regards the perception per school, except the SDA (moderate extent), respondents from the three schools (SDG, SMIT, SHRIM) believed the outcomes have been realized in MATWRLD to a great extent. With this result, it can be concluded that the teachers of MATWRLD in the participating HEI did the right thing. But what is noticeable was how all schools consistently rated the nine competencies under the personal and civic responsibilities with the seven being realized to a moderate extent, and the two to a slight extent. These two were "*become confident in knowing and being a Filipino" and "expand my understanding and respect to human rights".*

These findings served as reminders to teachers to improve ways of enhancing personal and civic competencies by incorporating interdisciplinary topics to MATWRLD which will give worthwhile impact to student's learning to eventually realize this outcome to a great extent, similar to intellectual competencies and practical skills. Furthermore, the CHED technical panel for the GE can cite the results to oblige all HEIs to implement CMO no. 1 and 2 s-2019: Integration of Peace and Indigenous People Studies/Education, because of the two competencies which were realized just to slight extent.

Discussions for research problems 2 and 3 were combined because for every category of challenges, solutions were proposed by the students.

Research Problem 2: What are the challenges encountered by the students during the process of learning MATWRLD?

Research Problem 3: What are the solutions recommended by the students to overcome the challenges they encountered during the process of learning MATWRLD?

The course itself: Math for them is a challenge because of their fear in it, aggravated by their belief that they are poor in Math. For the students they suggested to just listen, invest more time in the course, always take down notes, and to have better time management. Furthermore, they have to make sure they were able to master steps and rules because those are the secret in learning mathematics, knowing the rules and the right formulas to use. For the teachers, their advice was to help students build confidence right at the beginning of the course.

With the ongoing attempt to make MATWRLD relevant across programs, it is recommended that there should be assessment activities to aid in profiling students based on their senior high school track, and their present insights of math as a course, among others. It is expected that those who are under STEM have facility in Math, while others might encounter challenges. Results should be used in adjusting the topics, selecting materials, planning of delivery, and preparing assessment tasks.

Topic/performance task: A major challenge that some students experienced was recalling topics learned in high school and then simultaneously learning new ones. They particularly pointed out that it is unnecessary for a math course to talk about history, and to make the students remember the names of great mathematicians as well as their contributions to the discipline. There was simply too much memorization but less application. Topics which they found very challenging aside from history were: game theory, logic, social choice theory, amortization and banking stuff, ciphers, and product tagging.

As for the performance tasks which were challenging yet they thought did not contribute that much to the understanding of the course were: Mandalas, dodecahedron, math debate, measurement of body parts, and the art works. To sum it all, they view MATWRLD as challenging because it is a combination of computations, definitions, formulas and they found less application to their daily life. Students suggested to shift the topics from formulaic to practical, from memorization to application; show that every topic has an equivalent real-life application; tailor the course to fit to the degree of the students; and to remove topics which require memorization like history and mathematicians and their contributions to the field.

As to what should be given more emphasis, according to them, it would be better if the course focuses heavily on financial literacy (but not the business math because it was already taken in high school), and taxation. Also, for the students statistics and logic lessons were very useful and perhaps should also be the main focus of the MATWRLD. As to what should be added, respondents suggested that the course should include refresher topics like basic algebra and geometry as needed by the students; additionally, if the goal was to contribute to civic and common good, then there should be a greater focus on how this math course can be used for nation building. Lastly, respondents suggest all MATWRLD courses in the participating HEI should teach the same topics regardless of the program or schools where they came from.

3.2 Recommendations

In view of these, it is recommended that the current topics included in the MATWRLD be reviewed as to what are essential and enduring for the students to know. All selected topics must have real-life applications because this is the reason why the course is offered.

Delivery: A good teacher is not only a good lecturer, s/he should be a good story-teller and also an entertainer. This was the gist of the students' suggestions on how their teachers should deliver the lessons. These were the

exact words from the students: "I hope there'll be more kinesthetics in teaching, not just plain auditory and visuals, more interaction; implement some fun math related or game-oriented activities to keep the students engaged in the course; teach in a basic manner so we can easily understand each topic; have more group activities prior to having assignments and quizzes; more drills and activities; explain things slowly; also they should not rush in teaching; maybe before they proceed to the new lesson make sure that the whole class understands the lesson; please make the terms or vocabulary words clearer or more understandable; have a Q and A sessions before the end of the period to reflect on the lessons that took place; hope MATWRLD utilizes BigSky more often".

With all of these suggested instructional delivery from the students, it is therefore imperative that teachers should adhere to the OBE-LC principles because respondents tend to expect more teacher-learner interactions.

Requirements/Workload: For the students, the requirements and workloads in the course were so overwhelming considering that the school follows a trimester schedule. The amount of home works, activities every meeting, long readings and portfolio entries were so difficult to accomplish all at the same time. So to improve learning, students suggested to lessen activities by removing those which are less important or are not directly connected to the course, and to give them ample time to finish the projects by having reasonable deadlines. Giving of unexpected activities should be avoided, and pair or groupworks should be well-monitored and reconsidered because uncooperative groupmates were burden to the group.

Likewise, there is a need to re-assess the requirements of the course; it should not be too many for the learners to appreciate the learning tasks and their application in the real world. It also recommended that teachers provide various activities for students to choose from according to their field of study and interest.

Classroom environment: An unorganized and noisy classroom with students not following the class rules was a challenge to learning. On the other hand, teachers who were so lax, and did not mind the noise was equally challenging. According to respondents, a classroom culture that invites learning was all about relationships between teachers and students. As some respondents lamented, "teaching needs to be more personal because it helps in building trust and confidence on the part of the students". Also, students felt that teachers should encourage all students to participate in the discussions, not just the ones who were fast learners. More group activities because they helped build interpersonal skills; another suggestion was to make the class active, by giving social interactive activities; energize the students at the start of the session so that they will interact more during the discussions. It is therefore recommended that MATWRLD teachers should build a classroom full of interactions and engagements.

Assessment: Assessment drives OBE and enhances learning (CHED Handbook, 2014). Assessment is a challenge for the students of MATWRLD because most tests involved memorization rather than active analytical thinking; according to them, the lecture dealt more on problem solving skills while the exam was more on comprehension. As some respondents lamented, "the switching of gears makes it challenging, because we were to show results in comprehension rather than application". So, respondents have the following suggestions: More practice tests on the lessons that were difficult to understand; more practice exercises, so the students will do good on their quizzes and examinations; to have outside activities to learn more math in the world outside; more outputs to compensate failed quizzes; assess students' understanding before and after a lesson; include recitation points; and make use of Kahoot quizzes to learn and have fun.

HEI educators may also re-think and possibly re-tool themselves on the idea of testing; looking into the possibility of tests beyond the confines of paper and pencil types. It may also be considered that greater weight in grading requirements may go to outputs, to adhere to the principles of OBE. This is added to the fact the respondents see the course to be more engaging through application to the real world rather than comprehension. Also, assessment should always be non-arbitrary; that is evaluating the efficacy of the outputs based on the three domains of the intended learning outcomes - Knowledge, Skills and Values. Results also show that teachers of MATWRLD in the participating HEI need to be re-oriented on OBE, and inclusion/accommodation.

Research Problem 4: Is there a significant difference on the extent to which the outcomes developed by CHED for the Revised General Education Curriculum have been realized in the MATWRLD according to the students of the four schools (SDA, SDG, SHRIM and SMIT)?

Both Intellectual Competencies and Practical Skills have $p<0.05$, which shows that there is a significant difference on the mean responses from the four schools, with SDA having significantly lower mean for Intellectual Competencies and SDG having significantly higher mean for Practical Skills. On the other hand, there is no significant difference on the mean responses from the four schools for Personal and Civic Responsibilities ($p>0.05$). The overall mean responses shows significant difference ($p<0.05$), with SDA having significantly lower mean. These results further revealed that the students from the School of Design and Arts (SDA) has significantly lower perception that the outcomes developed by the CHED for the new GE have been realized in the MATWRLD, as compared to the perceptions of the respondents from the other three schools.

It can be further inferred that students from the SDA are the least appreciative of the MATWRLD as part of their curriculum, which confirms what literatures and teachers in the participating HEI said that students in the

arts are usually math averse. Thus, teachers of the MATWRLD should exert efforts to make the course more appealing to the students of SDA. Meanwhile, students from the SDG, SMIT and SHRIM show significantly higher perception on the extent of the realization of the outcomes developed by the CHED for the new GE courses in the MATWRLD. So, with the overall perceptions of the students that the outcomes have been realized in the course Mathematics in the Modern World to a great extent for the intellectual competencies and practical skills and moderate extent for the personal and civic responsibilities, this researcher concluded that the teachers of participating HEI were doing the right thing. As the logic model (Chen, 2015) stated that ***"if the outcomes have been realized, then the outputs have been delivered, planned activities have been accomplished, and inputs have been properly utilized"***. However, teachers and administrators should listen to the suggestions and recommendations of the students on how teaching and learning of the course can be improved.

The most salient recommendation of the study for future research is to replicate this endeavor with the other General Education core courses to find out which among them are consistent and aligned with the goals, context, purposes and intended learning outcomes of the general education as stipulated in Commission on Higher Education Memorandum Order no. 20 s-2013. In addition, the perspectives of teachers handling the course is another research area, which should be pursued, as they were the ones who gather, prepare, and deliver the materials.

References

Billard, J. 2011. Formative Assessment. Downloaded on March 14, 2019 from http://teachingthroughthearts.blogspot.com/2011/07/formative-assessment-when-cook-tastes.html. Accessed on 24 January 2019.

Booker, Z. 2016. *A new logic model for change* (Order No. 10192077). Available from ProQuest Central; ProQuest Dissertations & Theses A&I; ProQuest Dissertations & Theses Global. (1849321499). Retrieved from https://search.proquest.com/docview/1849321499?accountid=28547. Accessed on 20 January 2019.

Boulmetis, J., & Dutwin, P. 2011. *The abcs of evaluation : Timeless techniques for program and project managers* (Third ed., Research methods for the social sciences, 46) [Third edition.]. San Francisco: Jossey-Bass. (2011). Retrieved January 5, 2019, from INSERT-MISSING-DATABASE-NAME.

Brown, C. A. 2012. Use of logic models to plan and assess graduate internship experiences. *TechTrends, 56*(6), 37-43. doi:http://dx.doi.org/10.1007/s11528-012-0612-2. Accessed on 20 January 2019.

CHED (Commission on Higher Education). 2014. Handbook on Typology, Outcomes - Based Education and Institutional Sustainability Assessment. https://docs.google.com/viewer?a=v&pid=sites&srcid=ZGVmYXVsdGRvbWFpbnxjYXJhZ2Fkb3dubG9hZHN8Z3g6MmUxNTdlZDc3NzNmYzM5Yw. Accessed on 8 October 2019.

Chen, H. 2015. Practical program evaluation : Theory-driven evaluation and the integrated evaluation perspective (Second ed.). Los Angeles: SAGE Publications.

Cullen, P. et. al 2016. The importance of context in logic model construction for a multi-site community-based aboriginal driver licensing program. *Evaluation and Program Planning, 57*, 8. doi:http://dx.doi.org/10.1016/j.evalprogplan. 2016.03.011

Espiritu, J. & Budhrani, K. 2015. Implementing an Outcome-Based Education (OBE) Framework in the Teaching of Industrial Psychology. Presented at he DLSu Research Congress. https://www.researchgate.net/publication/326635478_Implementing_an Outcome-Based_Education_OBE_Framework_in_the_Teaching_of_Industrial_Psychology. Accessed on 8 September 2019.

Flora, M., & Marquez, S. 2015. Formative evaluation of a master of public health curriculum. *Medical Education, 49*(5), 519-20. doi:10.1111/medu.12702

Frechtling, J. 2007. *Logic modeling methods in program evaluation* (1st ed.). San Francisco: Jossey-Bass.

Frye, A. W., & Hemmer, P. A. 2012. Program evaluation models and related theories: AMEE Guide No. 67. Medical Teacher, 34(5), e288–e299. https://doi.org/10.3109/0142159X.2012.668637

Grim, M., et al. 2013. Formative evaluation of myfit: A curriculum to promote self-regulation of physical activity among middle school students. *American Journal of Health Education, 44*(2), 81-87.

Grodzicki, G., & Madigan, P. 2011. Outcomes-based assessment in instrumentation and measurement. *International Journal of Electrical Engineering Education, 48*(4), 451-462. doi:10.7227/IJEEE.48.4.9

Han, Y., Hu, M. and Li, L. 2013. "Formative Evaluation of the No-Fee Teacher Education Program from the Students' Standpoint." Chinese Education & Society 46 (2/3): 100–118. doi:10.2753/CED1061-1932460207.

Lady, R. E., & Wilhelm, E. 2010. *Career education evaluation in the state of Missouri* (Order No. 3437864). Available from ProQuest Central; ProQuest Dissertations & Theses Global. (821590162). https://search.proquest.com/docview/821590162?accountid=190479. Accessed on 9 September 2019.

Louw-Potgieter, J., et al. 2012. A formative evaluation of a pay-for- performance system : Original research. *Sa Journal of Human Resource Management, 10*(3), 1-12.

Martinez, C. 2005. The importance of Evaluation. https://www.guidestar.org/Articles.aspx?path=/rxa/news/articles/2005/importance-of-evaluation.aspx. Accessed on 18 March 2018.

Mills, T., Lawton, R., & Sheard, L. 2019. Advancing complexity science in healthcare research: The logic of logic models. *BMC Medical Research Methodology, 19* doi:http://dx.doi.org/10.1186/s12874-019-0701-4

Nasrallah, R. 2014. Learning outcomes' role in higher education teaching. *Education, Business and Society: Contemporary Middle Eastern Issues,7*(4), 257-276. doi:10.1108/EBS-03-2014-0016

Plowright, A., et. al 2018. Formative evaluation of a training intervention for community health workers in south africa: A before and after study. *Plos One, 13*(9), 0202817. doi:10.1371/journal.pone.0202817

Policy Brief of the Senate Planning Office; retrieve from http://legacy.senate.gov.ph/publications/PB%202011-02%20-%20K%20to%2012%20The%20Key%20to%20Quality.pdf. Accessed on May 26, 2018

Rose, K. C. 2016. *An evaluation of the character education program at kamehameha schools hawai'i high school using the gap analysis approach* (Order No. 10820710). Available from ProQuest Dissertations & Theses Global. (2061007408). Retrieved from https://search.proquest.com/docview/2061007408?accountid=190479. Accessed on 11 April 2018.

Ruedel, K., & McInerney, M. 2007. Formative evaluation of the U.S. - Brazil student exchange program m: Methods, findings, and implications. *Journal of Applied Rehabilitation Counseling, 38*(3), 31-38. Retrieved from https://search.proquest.com/docview/216474191?accountid=190479. Accessed on 25 May 2018.

Santos, S. D. 2014. A comprehensive model for developing and evaluating study abroad programs in counselor education. *International Journal for the Advancement of Counselling, 36*(3), 332-34 doi:http://dx.doi.org/10.1007/s10447-014-9210-7

Schlechter, A., & Salie, S. 2012. A formative evaluation of a staff reward and recognition programme : Original research. *Sa Journal of Human Resource Management, 10*(3), 1-11.

Smith, R. 2001. Formative evaluation and the scholarship of teaching and learning. *New Directions for Teaching & Learning*, *2001*(88), 51. https://doi.org/10.1002/tl.37

Tam, M. 2014. Outcomes-based approach to quality assessment and curriculum improvement in higher education. *Quality Assurance in Education, 22*(2), 158-168. doi:10.1108/QAE-09-2011-0059

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