Implementation of Outcome-Based Education to STEM Strand in Pangasinan State University

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Abstract- *Outcome-Based Education (OBE) has become an integral part in teaching Science, Technology, Mathematics and Engineering (STEM) strand in the Philippines. It is a paradigm shift in the education system that's changing the way students learn, teachers think and schools measure excellence and success. The research aimed to find out the significant difference between the perception of students and teachers in the level of implementation of Outcome-Based Education of Pangasinan State University-Integrated Laboratory Schools (PSU-ILS)-High School Department in Bayambang Campus during the 1st Semester of A.Y. 2019 - 2020. Also, the research sought to answer the extent of the manifestation of the following behaviors by the STEM students after their exposure to OBE. The descriptive method of research, frequency count and T-test for significant differences were used in the study. Reliability was analyzed using IBM SPSS version 25. The findings of the study echoed that the level of implementation of Outcome-Based Education (OBE) approach as perceived by Science, Technology, Engineering and Mathematics Students is highly implemented with a composite mean of 3.73. Also, the extent to which effort to implement OBE has influenced certain educational practices in the school is perceived by teachers' as moderately implemented with the composite mean of 2.83. Lastly, there is a significant difference in students' and teachers' perception in the area of the school's mission statement that reflects a commitment to enable all students to be successful with the computed significance of 0.042 which is lower than 0.05 level of significance. In addition, a significant difference in students' and teachers' perception in the staff's commitment to the written mission statement with the computed significance of 0.046 which is lower than 0.05 level of significance. Finally, anchoring on the findings, conclusions and recommendations of the study, the administration, principal and teachers are encouraged work collaboratively to further improve the implementation of Outcome-Based Education.*

Keywords- *Outcome-Based Education, descriptive survey method and frequency count*

INTRODUCTION

Senior High School (SHS) is two years of specialized upper secondary education; students may choose a specialization based on aptitude, interests, and school capacity. The choice of career track will define the content of the subjects a student will take in Grades 11 and 12. SHS subjects fall under either the Core Subjects or Specialized/ Applied Subjects. Each student in Senior High School can choose among three tracks: Academic; Technical-Vocational-Livelihood; and Sports and Arts. The Academic track includes three strands: Accountancy, Business, Management (ABM); Humanities and Social Sciences (HUMSS); and Science, Technology, Engineering, Mathematics (STEM). This is under the Republic Act 10533 otherwise known as the Enhanced Basic Education Act of 2013 mandates the Department of Education to create another level of the basic education composed of two years (Republic Act 10533, 2013).

The K-12 program basically added two more academic school years to the then-existing 10-year pre-university format of secondary education institutions. In SHS, students will go through a core curriculum and subjects under a track of their choice. These two additional years will equip learners with skills that will better prepare them for the future, whether it be: Employment; Entrepreneurship; Skills Development (further Tech-Voc training); and Higher Education (College) (The K to 12 Basic Education Program, n. d.). Science, Technology, Engineering, and Mathematics are intertwining disciplines when applied in the real world. With goals of achieving educational equity, the K-12 program aims to equip students with the much-needed skills to gain employment even without a college degree (Yu, 2018). Since its approval last 2013, the K to 12 system has changed the way high school students are educated and trained but more importantly how they are rigorously prepared for employment.

In Department of Education, (OBE) has been an integral part in teaching STEM. Outcome-based education (OBE) is an educational theory that bases each part of an educational system around goals (outcomes). By the end of the educational experience, each student should have achieved the goal. There is no single specified style of teaching or assessment in OBE; instead, classes, opportunities, and assessments should all help students achieve the specified outcomes (Spady, 1994). The role of the faculty adapts into instructor, trainer, facilitator, and/or mentor based on the outcomes targeted. Outcome-based methods have been adopted in education systems around the world, at multiple levels.

The difference of the STEM curriculum with the other strands and tracks is the focus on advanced concepts and topics. Under the track, a student can become a pilot, an architect, an astrophysicist, a biologist, a chemist, an engineer, a dentist, a nutritionist, a nurse, a doctor, and a lot more. Those who are also interested in Marine Engineering should take this track. STEM education in school is important to spark an interest in pursuing a STEM career in students. STEM education is critical to help the performance of the students in our country in the area of Science and Mathematics. If STEM education is not improved, the Philippines will continue to fall in world ranking with math and science scores (Dela Cruz, J.S. 2017).

For education stalwart Dr. William Spady, outcome-based education (OBE) is a paradigm shift in the education system that's changing the way students learn, teachers think and schools measure excellence and success (Transforming PHL Education, 2017). In addition, OBE is more concerned with how successful one is in achieving what needs to be accomplished in terms of skills and strategies. In OBE, real outcomes extend far beyond the paper-and-pencil test.

It is the objective of the study to determine the level of implementation of Outcome-Based Education (OBE) approach as perceived by Science, Technology, Engineering and Mathematics Students. Also, the study aims to discover the extent to which effort to implement OBE has influenced certain educational practices in school as perceived by the teachers. Finally, it is the goal of the study to analyze if there is a significant difference between the perception of students and teachers in the level of implementation of Outcome-

Based Education (OBE) approach to STEM education.

It is in this context that a study of the level of implementation of Outcome-Based Education to STEM Strand in Pangasinan State University is conceived.

Scope and Delimitations

The main focus of this research is the use of Outcome-Based Education Approach to STEM Strand and determine its level of implementation in terms of students' performance. It will identify the advantages of the Outcome Based Education approach and its impact in teaching STEM Strand based on the perception of teachers and students. The scope of this research is delimited to Senior High School STEM Strand Students in order to address the broad profile of intelligences operating within each learner in Pangasinan State University Integrated Schools – High School in Bayambang Campus. It does not cover other High Schools. The study will be conducted during the Second Semester of A.Y. 2019 - 2020 at Pangasinan State University Integrated Schools – High School in Bayambang Campus.

METHODOLOGY

Research Design

This study was a Quantitative research which was based on the measurement of quantity or amount. The design of this research used non-experimental design. This study used a descriptive method of research and a methodological approach where data from different disciplines can be integrated. The quantitative data were gathered using a survey questionnaire. There will be two samples, the students and teachers of STEM strand. The data collected from these two samples will be compared to determine the implementation of Outcome-Based Education (OBE) according to the perception of students and teachers in the STEM Strand. In addition, to determine whether there is a significant difference in the perception of students and teachers in the level of implementation of Outcome-Based Education (OBE) approach to STEM Education.

Subjects of the Study

Population was generally the objects of the research while sample is a part of the population that would be investigated. Population was all of the things that would be observed which were relevant with the questions or problems that was asked, while sample was totally (not all) of the things that would be observed which were relevant with the question the question that asked, based on this statement, population referred to the whole targets of the research that were observed by the researcher. The population of this study were the students and teachers of STEM Strand. It consisted of Grade 11 and Grade 12 students. Under Grade 11 students there twenty-six (26) males and forty-seven (47) females. While for the Grade 12 students, there are sixteen (16) males and twenty-four (24) females. The total population of the STEM Strand students is one hundred thirteen (113). Also, the STEM Strand teachers teaching Science and Math are also involved as separate respondents. The total number of teachers teaching Science and Math in STEM Strand is four (4).

The researchers decided to utilize total enumeration of the population since this will serve as a baseline data to administration and principal of said school on evaluating the implementation of Outcome-Based Education approach to STEM strand.

Data Gathering Instrument

In any educational research, instrument for collecting data is important part. The accuracy of the result of research is mostly dependent on how accurate the use of instrument.

Based on the research problems, the researchers used two types of survey questionnaires as an instrument. In this study, one questionnaire will be used to measure the level of implementation of Outcome-Based Education (OBE) based on the perception of STEM strand students. And the other is for the implementation of OBE as perceived by the STEM strand teachers. The questions will be rated using 5-point Likert scale (5: Very Highly Implemented to 1: Least Implemented). The

data were analyzed using IBM SPSS version 25. And the questionnaire was prepared in English.

Data Gathering Procedure

The researchers requested all the Grade 11 and 12 STEM strand students and teachers of Pangasinan State University-Integrated Laboratory Schools (PSU-ILS) High School Department in Bayambang Campus to answer the survey questionnaires considering the venue and their availability. Also, the researchers read the questions one-by-one and explaining each item as needed to ensure accuracy of the respondents' answers.

A letter addressed to the school principal was given to get the exact number of students from Grade 11 and 12 STEM strand students. In addition, a letter of permission addressed to the school principal and advisers to carry out the study were submitted for answering the survey questionnaire. The availability of the respondents was noted, and their schedules were taken into consideration before administering the questionnaire.

The respondents were fully informed about regarding the objectives of the study, while they were assured that their answers were treated with confidentiality and used for academic purposes and only for the purpose of the particular research. Except from the above, the participants were not harmed nor abused, both physically and psychologically, during the conduct of the research. In contrast, the researchers attempted to create and maintain a climate of comfort.

Statistical Treatment

To interpret the data effectively, the researchers will employ the following statistical treatment. The Percentage, Weighted Mean and T-Test are tools used to interpret data.

FINDINGS AND DISCUSSIONS

Table 1 presents the summary of responses on Outcome-Based Education practices and standards of Pangasinan State University – Integrated Schools – High School STEM Students.

Table 1
SUMMARY RESPONSES ON OBE PRACTICES AND STANDARDS OF PSU-IS-HS STEM STUDENTS

Indicators	Mean	Descriptive Equivalent
A collectively endorsed mission statement	3.91	Highly Implemented
Clearly defined, publicly derived exit outcomes	3.55	Highly Implemented
A tightly articulated curriculum framework of program, course and unit outcomes	3.71	Highly Implemented
A system of instructional decision making and delivery	3.74	Highly Implemented
A criterion-bases consistently applied system of assessment, performance standards, student credentialing, and reporting	3.75	Highly Implemented
Composite	3.73	Highly Implemented

As gleaned from the table above, on the average, STEM Students perceived the implementation of Outcome-Based Education practices and standards as highly implemented with a composite mean of 3.73. Analysis of data reveals that the school in this study was successful at developing written mission statement that reflect a commitment to the success of all students. Examination of the summary shows that PSU – IS - HS more likely has clearly defined, publicly derived exit outcomes as well as tightly articulated curriculum framework of program, course and unit outcomes both having descriptive equivalent of highly implemented. In the same way, the STEM students perceived that the system of instructional decision making,

delivery and promotion on the student's ability to demonstrate all unit, course/ grade level and program outcomes are highly implemented. Hence, the finding of the study echoed the statement of Eslapor, M.F (2017) that outcome-based education (OBE) approach claims it is very much after on how students can demonstrate their knowledge and skills. The logic there is how the schools could assess student outcomes as required by industries. The OBE approach is said to be on track to changing the educational system from inputs based to outputs based. A significant part of the OBE process involves determining appropriate and measurable outcomes.

On the other hand, table 2 presents the summary of responses on outcome-based education practices and standards of Pangasinan State University – Integrated Schools – High School STEM Teachers. It is worth mentioning that the STEM teachers perceived OBE to be highly implemented with a cumulative mean of 3.91.

Table 2
SUMMARY RESPONSES ON OBE PRACTICES AND STANDARDS OF PSU-IS-HS STEM TEACHERS

Indicators	Mean	Descriptive Equivalent
A collectively endorsed mission statement	4.83	Very Highly Implemented
Clearly defined, publicly derived exit outcomes	4.00	Highly Implemented
A tightly articulated curriculum framework of program, course and unit outcomes	3.93	Highly Implemented
A system of instructional decision making and delivery	4.13	Highly Implemented
A criterion-bases consistently applied system of assessment, performance standards, student credentialing, and reporting	4.00	Highly Implemented
A system of instructional organization and delivery	3.88	Highly Implemented
A system which recognizes the power of organizational culture on student and staff development and stablishes a climate that enables all students and staffs to perform at high quality levels	3.83	Highly Implemented
An ongoing system of program improvement	3.75	Highly Implemented
A data base of course and unit outcomes for all students and other key indicators of school effectiveness that is used and updated regularly to improve the conditions and practices that affect students and staff success	3.89	Highly Implemented
Extent to which effort to implement OBE has influenced certain educational practices in the school	2.83	Moderately Implemented
Composite	3.91	Highly Implemented

As reflected from the table, the teachers strongly agreed that the school is successful at implementing outcome-based education with collectively endorsed mission statement having the highest mean of 4.83 and is interpreted as very highly implemented. Likewise, the teacher-respondents all strongly agreed that other areas and components of outcome-based education ate highly implemented in the school paving way for students to benefit from well-developed exit outcomes, multiple opportunities to master important objectives and successful demonstration of appropriate

exit outcomes. The teachers perceived that students are given more real life situations and are expected to improve by continuing to work beyond the normal grading system. Also, it is evident from the above result that, the school strives to promote high performance of all staff leading to successful and high learning experience of all STEM strand students. This is well supported by the composite mean of 3.91 interpreted as highly implemented.

As to the extent to which effort to implement OBE has influenced certain educational practices in the school is perceived by teachers' as moderately implemented with the composite mean of 2.83. This means that the utilization of exit outcomes and course/grade level outcomes, students' opportunity to master important objectives and classroom assessment are all moderately implemented.

Meanwhile, Table 3 presents the summary of the perception of students and teachers in the level of implementation of Outcome-Based Education (OBE) to STEM education.

Table 3
Summary of the perception of students and teachers in the level of implementation of Outcome-Based Education (OBE) to STEM education

Indicators	Mean	diff	t-value	Sig.
The school has a written mission statement.	4.1416 4.7500	-.60841	-2.276	.087
The school has a written mission statement that reflects a commitment to enable all students to be successful.	3.9558 4.7500	-.79425	-2.979	.042
The staff in my school is committed to the written mission statement.	3.6018 4.5000	-.89823	-2.955	.046
The school has developed clearly defined exit outcomes.	3.4956 4.0000	-.50442	-1.214	.306
The school has developed clearly defined exit outcomes with input from the public.	3.5398 4.0000	-.46018	-1.103	.344
The school utilizes exit outcomes that students must demonstrate or requires that an intervention plan will be developed before they can advance.	3.5752 4.0000	-.42478	-1.019	.378
The school has developed program outcomes.	3.7788 4.0000	-.22124	-.530	.630
The school has developed program outcomes for each discipline area.	3.6106 4.2500	-.63938	-2.417	.077
The school has developed program outcomes that support the exit outcomes.	3.4513 3.7500	-.29867	-.615	.580
In my school, teachers base grade level promotion on the	3.7168 4.2500	-.53319	-2.004	.118

student's ability to demonstrate the appropriate outcomes.				
The school has a vision of how our school should look and operate.	4.1062 4.2500	-.14381	-.539	.619
The school's OBE steering committee oversees the implementation of OBE.	3.5664 3.7500	-.18363	-.378	.729
The school reviews course/grade level and unit outcomes to assure relevancy.	3.6637 4.0000	-.33628	-.806	.475
The school systematically reviews curriculum to assure that it supports our outcomes.	3.5752 4.2500	-.67478	-2.510	.066
The school uses a monitoring system that documents student's demonstration of outcomes.	3.5575 4.2500	-.69248	-2.553	.061
Students demonstrate more awareness of what is expected of them.	3.7345 4.0000	-.26549	-.635	.567
Students are interested and motivated to achieve the outcomes.	4.0265 4.2500	-.22345	-.842	.449
Students demonstrate more responsibility for their own learning.	3.9646 4.2500	-.28540	-1.078	.345
Students score higher on standardized tests.	3.4513 3.5000	-.04867	-.096	.929
Students have improved their grades.	3.6372 3.7500	-.11283	-.232	.831
Students are able to apply knowledge better.	3.8673 4.2500	-.38274	-1.451	.226
Students are more focused on specific curriculum goals.	3.6991 4.0000	-.30088	-.721	.519
Higher expectations for ALL teachers and ALL Students are set forth.	3.9558 4.2500	-.29425	-1.079	.338
They became more successful as a student and as a teacher.	3.6549 3.7500	-.09513	-.356	.740

Noticeably in Table 3, there is a significant difference in students' and teachers' perception in the area of the school's mission statement that reflects a commitment to enable all students to be successful with the computed significance of 0.042 which is lower than 0.05 level of significance. In addition, a significant difference in students' and teachers' perception in the staff's commitment to the written mission statement with the computed significance of 0.046 which is lower than 0.05 level of significance.

It can be drawn from these findings that the students' perception does not match teachers' perception about the commitment of the school in its mission statement and how it contributes to the success of the students.

However, there is no significant difference in the perception of students' and teacher's in all other indicators. Areas such as the school has written statement, well-developed clearly defined exit outcomes and developed program outcomes that support the exit outcomes. Also, teachers base grade level promotion on the student's ability to demonstrate the appropriate outcomes and the school's OBE steering committee oversees the implementation of OBE. As a result, students demonstrate more awareness of what is expected of them and motivated to achieve the outcomes. The students demonstrate more responsibility for their own learning and have improved their grades. Moreover, students are able to apply knowledge better and students are more focused on specific curriculum goals.

Conclusion

Based on the findings of the study the following conclusions were drawn:

1. The level of implementation of Outcome-Based Education (OBE) approach as perceived by Science, Technology, Engineering and Mathematics Students is highly implemented with a composite mean of 3.73.
2. the extent to which effort to implement OBE has influenced certain educational practices in the school is perceived by teachers' as moderately implemented with the composite mean of 2.83.
3. there is a significant difference in students' and teachers' perception in the area of the school's mission statement that reflects a commitment to enable all students to be successful with the computed significance of 0.042 which is lower than 0.05 level of significance. In addition, a significant difference in students' and teachers' perception in the staff's commitment to the written mission statement with the computed significance of 0.046 which is lower than 0.05 level of significance.

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