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Faculty and Students' Perception towards Outcome Based Education in Teaching Engineering Courses at the Maritime Academy of Asia and the Pacific

Jose Jr Barlis
Group Leader – Math and Sciences Courses
Maritime Academy of Asia and the Pacific
Philippines

Carol Dacwag
Professor
Maritime Academy of Asia and the Pacific
Philippines

Josefin III Fajardo
Professor
Maritime Academy of Asia and the Pacific
Philippines

Erdy Aganus
Function Head
Maritime Academy of Asia and the Pacific
Philippines

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Faculty and Students' Perception towards Outcome Based Education in Teaching Engineering Courses at the Maritime Academy of Asia and the Pacific

Jose Jr Barlis

Carol Dacwag

Josefin III Fajardo

Erdy Aganus

Abstract

With the implementation of Content based Education to Outcome Based Education (OBE) in the field of Engineering as mandated by the Commission on Higher Education (CHED) of the Philippines, the Physics group of the Maritime Academy of Asia and the Pacific (MAAP) implemented OBE as their teaching approach. A survey has been conducted to obtain feedback from the instructors and students and to determine which among the OBE areas need to be improved or be given attention for the full realization of the OBE.

A total of 222 students or 54% of the total student population and five (5) instructors teaching engineering physics participated in the survey during the first semester of the Academic Year 2013 – 2014. Stratified and convenient sampling was used to determine the respondents.

It was found that the implementation of OBE learning methodology is well accepted by students and instructors. Among the OBE areas, based on the perception of the students, time factor, that is students do not have enough time to finish all the requirements for the course needs to be given attention. Based on the perception of the instructors, the MAAP management should take a look at the resources like the availability of computers and accessibility of internet for the utilization of the students.

Keywords: Outcome Based Education (OBE), Commission on Higher Education (CHED), Maritime Academy of Asia and the Pacific (MAAP).

Introduction

The quality education today is measured not only by effectiveness, efficiency and sustainability, but also by relevance (CHED Memorandum Order 37, Series of 2012). Relevance in education would mean addressing the needs of the students and the employers of today and providing the future graduates a curriculum of global comparability. It also entails critical mass of diverse Higher Education Institutions (HEIs) offering quality programs that meet both national and international standards for disciplines/ professions such as maritime education (CMO 46, S. 2012). The purpose of transforming engineering education into an outcome-based system is to meet the demands of global equivalency of quality standards in engineering program.

Outcomes based education (OBE) is a process that involves the restructuring of curriculum, assessment and reporting practices in education to reflect the achievement of high order learning and mastery rather than the accumulation of course credits (Tucker, 2004). It is also defined as a comprehensive approach to organizing and operating an education system that is focused on and defined by the successful demonstrations of learning sought from each student (Spady, 1994). Nowadays, OBE is a recurring methodology or teaching approach. It is considered as a student-centered learning philosophy that deals more on empirically measuring the student's performance, which is called outcomes. Outcomes are said to be the learning results that are required of the students to demonstrate at the end of a certain period. Outcomes are said to be the tangible demonstration of knowledge or applications of the learners on what they have learned and not their beliefs, values and attitudes. This means that outcomes are more on actions and performances that embody and reflect learner's competence in using content, information, ideas, and tools successfully. Having learners do important things with what they know is a major step beyond knowing itself. Because outcomes involve actual doing rather than just knowing or a variety of other purely mental processes, they must be defined according to the actions or demonstration processes being sought.

Behind these definitions lies an approach to planning, delivering and evaluating instruction that requires administrators, teachers and learners to focus their respective attention and efforts on the desired results of education (Killen, 2000) and to be accountable for what transpires (Spady, 1994; Vella, et al, 1998).

The shift toward OBE is similar to the total quality movement. It reflects the best way for individuals and organizations to get where they are going. Proponents of OBE assume there are many ways to arrive at the same results. OBE is currently favored internationally in countries such as Canada, South Africa, New Zealand and United States (Malan, 2000).

MAAP's implementation of the outcome-based education was established and driven by some of the following external entities such as: 1) Regulatory bodies like the Commission on Higher Education (CHED), the Professional Regulation Commission (PRC), Maritime Authority (MARINA); and 2) the

local and international accrediting bodies such as the Philippine Association of Colleges and Universities Commission on Accreditation (PACUCOA), Det Norske Veritas (DNV), PSV , European Maritime Safety Agency (EMSA) and others.

In 2012, the Commission on Higher Education (CHED) issued Memorandum Order (CMO) Number 37 Series of 2012 on Policies, Standards and Guidelines in the implementation of an Outcomes –Based Education (OBE) system in Higher Education Institutions offering engineering programs for the purpose of transforming engineering education into an outcomes – based system to meet the demand of global equivalency of quality standards in engineering programs as well as to promote continuous quality improvement in higher education institutions. The CMO mandated HEI's to follow a new set of policies, and standards for all baccalaureate engineering programs that defined the needed competencies for the practice of each engineering field, and a set of program outcomes that engineering students in the different fields are expected to have acquired by the time they graduate.

Likewise, CHED together with Maritime Industry Authority (MARINA) issued Outcomes – Based Monitoring Tool to all maritime institutions in the Philippines. Outcomes based monitoring is an assessment of the processes and procedures that are instrumental to the competence outcome of education and training (MC 2013 – 01). It focuses on the output of education and training – the students/trainees, looks on processes and procedures, checks not only on the front door but also on the backdoor and intends to make maritime education and training institutions as well as all academic / training personnel responsible for the program or training course they offer (Marina – STCW). The said monitoring tool was based on the European Maritime Safety Agency (EMSA) findings. This tool was made after the EMSA had conducted an independent audit on Philippine maritime schools and reported its findings of gross deficiencies on several schools (Philstar.com, 2013). The findings on monitoring system as highlighted in 2012 were: ineffective monitoring system, focus on availability of materials/equipment, not on the outcomes of education and training.

In support of MAAP's shift to outcomes-based education and as a strategy to promote academic excellence, the academic department of the academy has embarked on a proactive plan to implement OBE in all its academic courses taken by the first year students. The priority of the said changes is all the courses offered for the first year taking Bachelor of Science in Marine engineering (BSMarE) and Bachelor of Science in Marine Transportation (BSMT) as prescribed by CHED and in preparation for the change in curriculum of maritime courses as mandated by the CHED based on STCW Manila amendments. Thus, assessing the implementation of OBE in the MAAP's courses based on the perceptions of faculty and the learners may be used for the improvement of the newly implemented way of delivering the course.

How OBE Was Implemented in MAAP

For the implementation of OBE, the first thing is to determine what kind of graduates MAAP plans to produce for the two programs, BSMT and BSMarE.

To start with, MAAP developed its mission and vision. It is clearly stated that mission and vision of the institution should be clearly defined. The program outcome was based on the CMO 13 series of 2013 for BS Marine Transportation Program and CMO 14 series of 2013 for BS Marine Engineering Program. Together with assessments, the course intended outcome should be connected and aligned with the program outcome and should follow the mnemonic SMART which stands for simple, measurable, attainable, realistic and time bound.

Figure 1 shows the constructive alignment from vision, mission and goals up to the assessment tasks, (Haboc 2013). The first step is to decide what kind of knowledge is to be taught whether it is declarative or functioning then select the topics to be taught; decide the levels of understanding/performance the students are expected to achieve for the different topics; consider if all ILOs are of equal importance; ensure a clear understanding and agreement of the ILOs within the teaching team and other relevant parties, i.e. external reviewer, and communicate the ILOs to the students.

Figure 1. *Procedure in Designing Course Outcome*
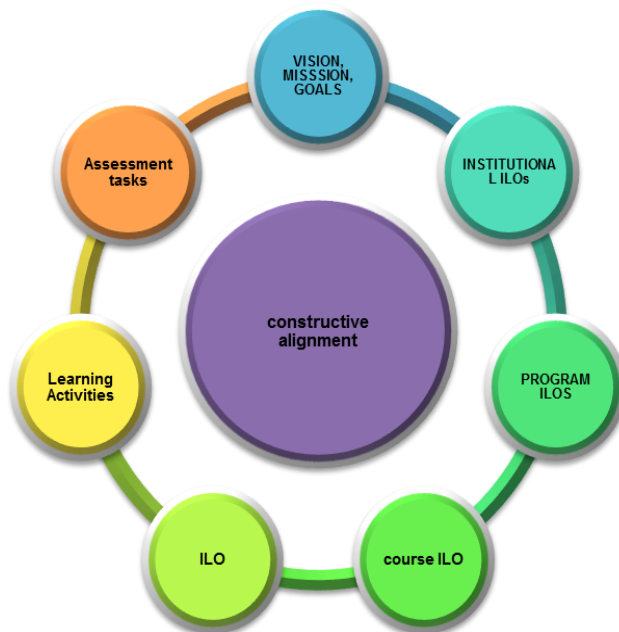
Source: Haboc, 2013

Parallel to the above statement, Biggs and Tang (2007) suggested that the intended learning outcomes must have three levels, namely: 1. Institutional, 2. Program, and 3. Course outcome.

On the institutional level, it should be in parallel to the vision and mission of MAAP, which is to provide quality education and training to midshipmen/ trainees for the development of competent seafarers who shall possess the character, knowledge, and skills necessary for the successful pursuit of a maritime career and to become the leading institution of excellence in the maritime education and training in the Asia-Pacific region and beyond.

On the 2nd level, the program outcome is based on the IMO Conventions such as STCW 1978. It is a statement of what graduates from a particular degree program should be able to do. Finally on level 3, the course outcome is a statement of what students should be able to do at the completion of a given course or subject which is related to the program outcome.

To measure the understanding of the learners, the intended learning outcomes, appropriate learning activities and assessment plans should be designed. The assessment should be valid, reliable, fair, and should reflect the knowledge and skills that the learners should have learned. It must also tell educators and individual learners something they do not already know, stretching learners to the limits of their understanding and ability to apply their knowledge. It should be comprehensive and explicit, and it should support every learner's opportunity to learn things that are important. Lastly, because learners are individuals, assessment should allow this individuality to be demonstrated (Killen 2000). Likewise, appropriate grading criteria to measure the attainment of a given objectives should be specified in the revised syllabus.

Conceptual Frame Work

This study identified the implementation of OBE in terms of course outcome, references, assessments and time as the independent variables. The dependent variable considered is the perceptions of faculty and students on the implementation of OBE. A self-made questionnaire was used to determine the perceptions of the respondents. The instrument focused on the four (4) indicators namely: course outcome, resources, assessment and time. Fig 1 shows the independent and dependent variables used in the study.

Figure 1. *Paradigm of the Study*
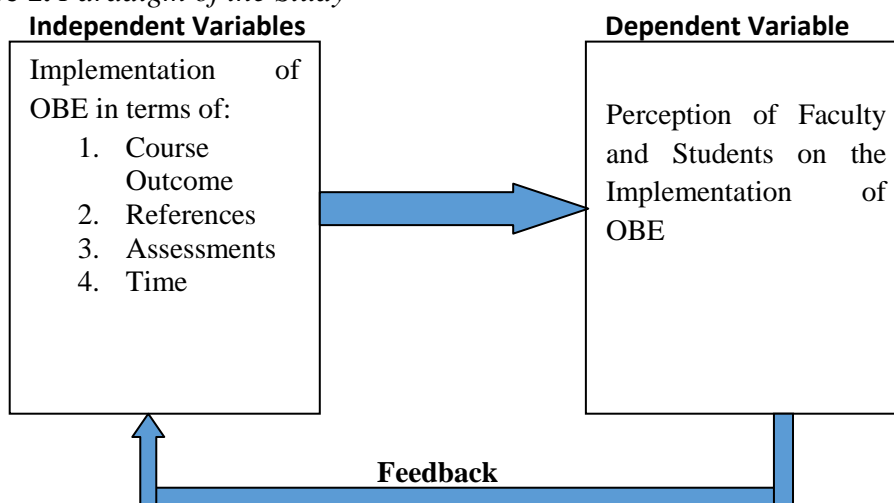
Objective

The main objective of this paper is to highlight the findings of the survey, namely: a) to obtain the instructors and students' perceptions and views towards OBE based on the delivery and approach of the course and b) to identify OBE areas that need to be addressed for the full realization of OBE.

Population of the Study

Convenient and stratified sampling method was used to determine the respondents of the study. Moreover, the researcher made equal representations for the two programs, the Bachelor of Science in Marine Transportation and Bachelor of Science in Marine Engineering. Aside from the students, the researcher also sought the perceptions of some instructors teaching engineering physics. Table 1 shows the distribution of respondents per program.

Table 1. *Distribution of Students in Terms of the Number of Graduates per Class and the Percentage of Respondents*

Program	Number of Respondents	Total Number of Students	Percentage of the Respondents
BSMT	126	216	30.88%
BSMarE	96	192	23.52%
Total	**222**	**408**	**54.41%**

Results and Discussion

Perception towards Areas of OBE

Table 2 shows the perception of faculty members and students in terms of course outcome. The overall rating of students of the course outcome with a composite mean of 4.03 is fairly satisfactory, while the faculty members have

4.93 showing very satisfactory perception. It also shows that the students have difficulty in passing the written examination with a total mean rating of 3.78 during the semester.

Table 2. *Mean Perception of Respondents on OBE Course Outcome*

Indicator	Mean Ratings		
	Student	Faculty	Total
1. Ability to acquire and apply knowledge of basic science and engineering fundamentals	4.16	4.80	4.18
2. Ability to apply laws and concepts into a working project parallel to maritime profession	4.16	4.80	4.18
3. Provide multiple learning opportunities matching learner's needs with teaching techniques	4.01	5.00	4.03
4. Supports for the notion that the learner is accountable for his or her own achievement	4.07	5.00	4.09
5. Ability to pass all the written examination	3.75	5.00	3.78
6. It shows explicit learning outcomes with respect to the required skills and concomitant proficiency	4.00	5.00	4.02
Composite	4.03	4.93	4.05

Scale of Means	Descriptive Equivalent	Implication
4.50 – 5.00	Strongly Agree	Very Satisfactory
3.50 – 4.49	Agree	Fairly Satisfactory
2.50 – 3.49	Undecided	Neutral
1.50 – 2.49	Disagree	Unsatisfactory
1.00 – 1.49	Strongly Disagree	Very Unsatisfactory

The results of the survey demonstrated that the students have difficulty in terms of written examination. Students may find the new approach strange since they were familiar with the content based education. In content based education, the teachers /trainers are responsible for learning. Influenced by personality of the teacher, the discussion focused more on textbook/worksheet and the teacher does the talking most of the times. In outcome based education, learners take responsibility of their learning; they are motivated by constant feedback/affirmation of worth; and the learners monopolize the discussion through facilitated group or team works (Butler 2004).

Table 3 shows the mean perception of the respondents towards OBE resources. It can be gleaned from the table that the availability of computers and accessibility of internet got the lowest rating with a mean of 2.96 from the students while library materials for referencing received the lowest rating of 3.40 from the faculty.

Table 3. *Mean Perception of Respondents on OBE Resources*

Indicator	Mean Ratings		
	Student	Faculty	Total
1. Availability of materials to be used in the project is readily at hand	3.35	3.80	3.36
2. There are enough library materials for referencing	3.72	3.40	3.71
3. Computers and access to internet are always available	2.96	3.60	2.98
4. Faculty members are available to supervise and check the performance of the learners	3.96	4.80	3.98
5. Laboratory facilities and equipment are available for usage, testing and manipulation	4.11	4.80	4.13
Composite	3.62	4.08	3.63

Scale of Means	Descriptive Equivalent	Implication
4.50 – 5.00	Strongly Agree	Very Satisfactory
3.50 – 4.49	Agree	Fairly Satisfactory
2.50 – 3.49	Undecided	Neutral
1.50 – 2.49	Disagree	Unsatisfactory
1.00 – 1.49	Strongly Disagree	Very Unsatisfactory

The result reveals that in order for the OBE to be fully realized, the management may consider adding computers and library materials, and ease of access to internet.

Table 4 shows the mean perception of respondents towards assessments. Based on the perceptions of the students, assessments that allow individuality of the students to be demonstrated got the lowest rating with a mean of 4.04 while the percentage allocation for lecture and laboratory grades as well distributed got the highest rating with a mean of 4.16. On the part of the faculty members, assessments that are fair, valid and enough, and the well distributed allocation for lecture and laboratory got the highest mean of 4.80 while others have 4.20 mean.

Table 4. *Mean Perception of Respondents on OBE Assessment*

Indicator	Mean Ratings		
	Student	Faculty	Total
1. Assessments are fair and valid	4.07	4.80	4.09
2. There are enough assessments during the semester	4.15	4.80	4.16
3. The percentage allocation for lecture and laboratory grade is well distributed (e.g. mastery test – 30%, quizzes – 20%, seatwork – 10%, project – 30% and reporting – 10% for the lecture)	4.16	4.80	4.18
4. Assessments support every learner's opportunity to learn things that are important.	4.14	4.20	4.14
5. Assessments are comprehensive and explicit	4.10	4.20	4.10
6. Assessments allow individuality of the students to be demonstrated	4.04	4.20	4.04
Composite	4.11	4.50	4.12

Scale of Means	Descriptive Equivalent	Implication
4.50 – 5.00	Strongly Agree	Very Satisfactory
3.50 – 4.49	Agree	Fairly Satisfactory
2.50 – 3.49	Undecided	Neutral
1.50 – 2.49	Disagree	Unsatisfactory
1.00 – 1.49	Strongly Disagree	Very Unsatisfactory

Table 5 reveals the perceptions of the students and instructors towards time factor. It shows that learners do not have enough time to finish all the requirements for the course because of the mean rating of 3.24 while the time allotted for the assessment and evaluation as sufficient for the learners to answer and show their mastery of subject got the highest rating with a mean of 3.72. Meanwhile, on the perceptions of the faculty, it shows that the indicator flexible time frames got the lowest score with 4.00 mean while the time allotted for the assessment and evaluation as sufficient for the learners to answer and show their mastery of subject had a highest mean of 4.70.

Based on the mean scores, the students find it difficult to comply with all the requirements needed for the course since most of the courses were converted to OBE. The faculty, on the other hand, believes that the learners have difficulty to work at their own pace. Although it is outcome based, learners should be given time frames to comply with all the requirements since the course only lasts for 18 weeks.

Table 5. *Mean Perception of Respondents on OBE Time*

Indicator	Mean Ratings		
	Student	Faculty	Total
1.Learners have enough time to finish all the requirements for the course	3.24	4.20	3.26
2.Flexible time frames - learners work at own pace	3.49	4.00	3.50
3.Used alterable source – match needs of educator & learners	3.69	4.20	3.70
4.The time allotted per topic is enough to finish the discussion and learners were able to comprehend the lessons	3.66	4.60	3.68
5.The time allotted for the assessment and evaluation is sufficient for the learners to answer and show their mastery of subject	3.72	4.70	3.74
Composite	3.56	4.34	3.58

Scale of Means	Descriptive Equivalent	Implication
4.50 – 5.00	Strongly Agree	Very Satisfactory
3.50 – 4.49	Agree	Fairly Satisfactory
2.50 – 3.49	Undecided	Neutral
1.50 – 2.49	Disagree	Unsatisfactory
1.00 – 1.49	Strongly Disagree	Very Unsatisfactory

Table 6 shows the summary of mean perception of respondents towards the implementation of OBE in teaching engineering courses. Based on the perception of the students the time factor got the lowest rating with a mean of 3.57 followed by resources with 3.62, course outcome with 4.03, and the assessment factor topped the survey with 4.11 mean rating. Based on the perception of the faculty members, resources got the lowest mean rating of 4.08 followed by time factor with 4.28, assessment with 4.5 and course outcome topped the survey with 4.93 mean rating. Overall, time factor got the

lowest rating with 3.58 mean score while the assessment topped with 4.12 mean rating.

Table 6. *Summary of Mean Perception of Respondents on OBE Implementation*

	Student		Faculty		Total	
	Mean	Interpretation	Mean	Interpretation	Mean	Interpretation
Course Outcome	4.03	Fairly Satisfactory	**4.93**	Very Satisfactory	4.05	Fairly Satisfactory
Resources	3.62	Fairly Satisfactory	*4.08*	Fairly Satisfactory	3.63	Fairly Satisfactory
Assessment	**4.11**	Fairly Satisfactory	4.50	Very Satisfactory	**4.12**	Fairly Satisfactory
Time	*3.57*	Fairly Satisfactory	4.28	Fairly Satisfactory	*3.58*	Fairly Satisfactory
Overall	3.83	Fairly Satisfactory	4.45	Fairly Satisfactory	3.84	Fairly Satisfactory

It only shows that the students have difficulty to finish all the requirements for the course. It should be noted that the learners should be given a flexible time frame and teachers should employ methodologies that will match the needs of the learner allowing them more than one opportunity to succeed (Killen, 2000).Spady also advised that while all learners can learn and succeed, they cannot do so on the same day because learners have different learning rates as well as learning styles. Moreover, to ensure that assessments are fair, objective and rational, they should be identified, formulated and made known to all learners prior to the administration.

Comparison of Perception towards OBE Implementation between Students and Faculty Members

Table 7 presents the comparison of students' perception towards OBE implementation with that of the faculty members' perspectives using One Sample T-test. In this test, the mean perception of the students is compared with the target mean (which is that of the faculty members). The mean perception of the faculty members is considered as the target mean because it is assumed that they have more accurate perspective of the OBE implementation on the subject matter which they are teaching. The table shows that the perceptions of the students are significantly different from the perceptions of the faculty. It is presumed that the faculty have high acceptance on the change in course delivery since they are considered subject matter experts on their fields compared to the perceptions of the students who find the change in the course delivery strange.

Table 7. *One-Sample T-test Output Comparing Mean Perception of Faculty Members and Students*

OBE Area	Faculty Mean	Student Mean	│t-value│	Sig.	Remarks
Course Outcome	4.93	4.03	27.00	.000	Significant; Reject Ho
Resource	4.08	3.62	9.57	.000	Significant; Reject Ho
Assessment	4.50	4.11	11.11	.000	Significant; Reject Ho
Time	4.28	3.57	13.62	.000	Significant; Reject Ho
Overall	4.45	3.83	17.73	.000	Significant; Reject Ho

Comparison of Perception towards OBE Implementation when grouped according to Programs

Table 8 shows the comparison of the mean perception towards OBE of the BSMT and BSMarE students using Independent Sample T-test. This test is used to compare mean values of two (2) groups.

It is assumed that there is no significant difference on the perceptions of students on the implementation of OBE for both programs on the premises of having the same instructors teaching the course, the same grading systems, teaching syllabus and assessments.

Based on the results of the survey, course outcome and assessment factors have no significant difference on the perception of the students for both programs. However, the table revealed that the perceptions of the students towards resources and time factors have significant differences. Overall, there is a significant difference on the perceptions of students from both programs towards the implementation of OBE.

It is noticeable that the students have different perceptions even if they have the same instructors, assessments and grading systems. The only difference between the two programs is the time. Students taking BSMarE have 25 units equivalent to 31 hours while students taking BSMT have also 25 units but they have longer academic hours which are 33 hours per week. Students taking BSMarE have ample time to finish all the requirements needed for the completion of the course. They have vacant time to utilize all the resources available like computers and internet access while students taking BSMT have limited hours to complete all the requirements.

Table 8. *Independent Sample T-test of Comparison of Mean Perception towards OBE Implementation of Students Grouped According to their Programs*

OBE Area	Course	N	Mean	Std. Deviation	|t-value|	Sig.	Remarks
Course Outcome	BSMT	126	3.98	0.50	1.53	.128	Not Significant Do not reject Ho
	BSMarE	96	4.09	0.48			
Resources	BSMT	126	3.48	0.73	3.54	.000	Significant Reject Ho
	BSMarE	96	3.81	0.65			
Assessment	BSMT	126	4.06	0.55	1.68	.094	Not Significant Do not reject Ho
	BSMarE	96	4.18	0.49			
Time	BSMT	126	3.45	0.85	2.59	.010	Significant Reject Ho
	BSMarE	96	3.72	0.65			
Overall	BSMT	126	3.74	0.55	2.98	.003	Significant Reject Ho
	BSMarE	96	3.95	0.45			

Interrelationship of Variables

Table 9 shows the correlation matrix of the perception of respondents towards OBE implementation and their grades in Engineering Physics. Pearson R correlation is used to determine the relationship of two (2) variables.

Table 9. *Correlation Matrix of Perception towards OBE Implementation and Grades*

	Course Outcome	Resources	Assessment	Time	Overall OBE	Grade
Course Outcome	1	$.45^{**}$	$.52^{**}$	$.60^{**}$	$.751^{**}$	$.04^{ns}$
Resources		1	$.56^{**}$	$.59^{**}$	$.812^{**}$	$.05^{ns}$
Assessment			1	$.67^{**}$	$.821^{**}$	$.01^{ns}$
Time				1	$.891^{**}$	$-.02^{ns}$
Overall OBE					1	$.02^{ns}$
Grade						1

**. Correlation is significant at the 0.01 level (2-tailed). ns – not significant at 0.05 level

Pearson Correlation	*Interpretation*
$\pm.80 - \pm 1.0$	high correlation
$\pm.60 - \pm.79$	moderately high correlation
$\pm.40 - \pm.59$	moderate correlation
$\pm.20 - \pm.39$	low correlation
$\pm.01 - \pm.19$	negligible correlation

Evidently, the different aspects of OBE implementation are inter-correlated or are affecting each other as indicated by their correlation coefficients with each other and the overall OBE implementation.

As seen on the table, Course Outcome is correlated highest with Time having a moderately high correlation coefficient of 0.60 which implies that these two (2) variables have a coefficient of determination or R-squared value of 0.36. The R-squared value of 0.36 indicates that 36% of the variability in the

Course Outcome is shared with Time while the other 64% is shared with other factors. This result suggests that Time is the most important aspect of OBE which is associated with Course Outcome. This is followed by Assessment and Resources.

Further, Resources is also most associated with Time having a moderate correlation of 0.59 suggesting a 35% shared variance by these two (2) variables.

Moreover, Assessment is most correlated with Time (R = 0.67) and then to Resources (R = 0.56).

To add, Time is associated most with Assessment having a moderately high correlation coefficient of 0.67.

On the other hand, the different aspects of OBE implementation are not related with the performance of the students in Physics. It only means that their perception does not affect their performance during the delivery of the course. Despite the fact that they find the system quite new and difficult, they still manage to pass the course. Likewise, the grades of the students do not depend only on one criterion.

Conclusions and Recommendations

The students perceive time as the factor that needs to be given attention. They cannot finish and submit all the requirements on the due date because of lack of time. Second to this is the availability of materials in the library and access to internet. The management may consider additional computers and library materials for referencing to accommodate the students in the academy. Moreover, students may be allowed to bring their own laptops to the academy regardless of their class so they can do their own researches and projects during their available time without necessarily reserving and queuing up in the library for computers. Also, internet connection should be strengthened for a faster and more efficient surfing and browsing.

In relation to curriculum design, developers should consider coverage in relation to the number of hours allotted for one semester. Also, the number of courses offered for one semester should be evaluated. The number of courses squeezed in one semester affects the quality of education delivered to the students.

Overall, both faculty members and students rated their perception on the implementation of Outcome Based Education (OBE) in teaching engineering courses as fairly satisfactory.

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