Measuring Outcome-based Education (OBE): The Impact of Teaching Humanity and Social Science (HSS) for Final Year BE Students

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Abstract— **Outcome-based Education (OBE) has become a Global Entity (GE) in all aspects of teaching levels. All Technological Universities (TU) must be affiliated with Washington Accord (WA) which is an agreement recognized undergraduate engineering degree holders internationally. As part of the requirement for this, Humanity and Social Science (HSS) with Engineering Aspects Course has been introduced and commenced in Final Year B.E level curriculum at twenty-eight technological universities since 2017-2018. The purpose of this research is to be realized the high impact of teaching performance on HSS by using students' evaluation, and to prove effective and efficient Outcome-based Education with an organized curriculum in Technological University Hmawbi). In this study, total sample students were 200 students. They were assessed by 60% of exam marks and 40% of internal mark (Classwork), which was assessed by systematic rubric used in mapping with Course Outcomes and Program Outcomes (CO and PO), Program Educational Objectives and Program Outcomes (PEO and PO) adopted by Engineering Education Accreditation Committee (EEAC), Myanmar Engineering Council (MEngC). Students' Evaluation and Feedback data collections were analysed by Microsoft Excel Spreadsheet and Statistical Package for Social Science (SPSS). It can identify the high impact of an importance-performance gap of Graduate Attribution (GA) for the graduates. The results findings show that not only teacher's performance but also effective teaching methodologies, and curriculum have revealed that students attained critical thinking skills and problem-solving skills, collaborative skills, creativity, mutual understanding, leadership skill and self-confidence for their life-long learning, which agrees with industrialization.**

Keywords— **Outcome-based Education (OBE), Humanity and Social Science (HSS), Graduate Attributes (GA), Students' evaluation, teacher's performance, Course Outcomes (CO)**

1. INTRODUCTION

The purpose of education is to create teaching and learning environments that would produce more knowledgeable, creative and better-skilled learners with positive values and attitudes. According to the desired outcomes, teaching events such as contents, strategies and assessments can be organized, planned and continuously improved according to a well-known process introduced by William Spady called outcome-based education (OBE)(CM.VIVEK, 2017). The main objectives of the study are to create active learners in teaching and learning environment, to be realized high impact of teaching performance on Humanity and Social Science (HSS) by using students' evaluation and to prove effective and efficient Outcome-based Education with an organized curriculum in Technological University (Hmawbi).

To follow up on the OBE approach, it must have proceeded to include Program Educational Outcome (PEO), Program Outcome (PO) and Course Outcomes (CO). Since, OBE has become the prime criterion for engineering accreditation in Myanmar, teaching activities and assessment strategies for all subjects in HSS must meet with the OBE approach.

1.1. OBE, PEOs, Pos, and COs

OBE as " … an educational process that is focused on achieving certain specified outcomes in terms of individual student learning. Outcomes are key things students should understand and be able to do or the qualities they should develop [Helen (2011)] (Laguador, 2015). Implementation of Outcomes-Based Education (OBE) is the main thrust of most Higher Education Institutions in Myanmar today to go along with the standards of foreign universities all over the world (Laguador, 2015). It aims to exercise fairness and transparency in making the evaluation process more reliable and truthful.

The Program Educational Objectives (PEOs) of an engineering degree program are the statements that describe the expected achievements of graduates in their career, and what the graduates are expected to perform and achieve during the first few years after graduation(Mansor et al., 2008).

PEOs of Technological University (Hmawbi) are categorized to measure the graduates' achievement. They are technical competence, communication skill/leadership, and professional ethics/ life-long learning. Program Outcomes are narrow statements that describe what the students are expected to know and would be able to do upon graduation. These relate to the skills, knowledge, and behaviour that students acquire through the program.(Mansor et al., 2008).

Course Outcomes are narrower statements that describe what students are expected to know and be able to do at the end of each course/subject(Mansor et al., 2008).

In Engineering Education Accreditation Committee (EEAC) mentions twelve program outcomes (POs). Among them, PO_3, PO_7, PO_8, PO_9, PO_{11}, and PO_{12} are consistent with the HSS subject. PO_{11}, and PO_{12} are for Engineering Management subject and Environmental Science subject is for PO_3 and PO_7. While Engineering Ethics agrees with PO_8 and PO_{12}, Occupational Safety and Health, Engineering Communication and International Relations subjects correlate with PO_9 and PO_{12} (Mansor et al., 2008).

These POs can be variously mapped with the course outcomes (CO) and Program Educational Objectives (PEO). After implementing the concept of OBE, the respective PO-CO and PO-PEO mappings are evaluated and analysed for improvement in the learning assessments.

TABLE 1.1. LISTS OF PROGRAM OUTCOMES (POs) FOR HSS

PO3 (Cognitive)	Able to design solutions for complex civil engineering problems to meet specified needs considering public health and safety, cultural, societal, and environmental requirements
PO7 (Affective)	Able to appraise the impact of professional civil engineer solutions in societal, environmental contexts and sustainability development
PO8 (Affective)	Able to apply ethical principles and commit to professional ethics and responsibilities and norms of civil engineering practice
PO9 (Psychomotor)	Able to communicate effectively on complex civil engineering activities with the engineering community and with society at large
PO11 (Psychomotor)	Able to demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments
PO12 (Affective)	Able to recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

1.2. Humanity and Social Science (HSS)

HSS is a wide field of studies including six different subjects: Engineering Ethics (EE), Occupational Safety and Health (OSH), Engineering Communication (EC), Environmental Science (ES), Engineering Management (EM) and International Relation (IR) in final year curriculum of all twenty-eight technological universities. Humanities course emphasizes on social skills and are rigorous in written and oral communication. These courses prepare students to improve the soft skills of the students and become better scientists and engineers. Students should be prepared to fulfil their civic and cultural responsibilities through university life. Studying the humanities allows students to become familiar with and use creative ideas from great minds outside of their field of study – which can help them generate new ideas and broadened their horizon (Maung, Oo, & Win, 2018).

TABLE 1.2. COURSE OUTLINES FOR HSS

1.Subject Code	HSS 61011		
2. Credit Hour	3		
4.Learning Outcomes (Course Outcomes)	On successful completion of this subject, students can LO1 – decide about the fundamental principles of engineering ethic such as public welfare, professional obligations LO2 - follow and create a safe place of work taking into accounts of major instruments, key principles and core OSH principles, its rights and duties LO3 – display about the management functions and the type of management activity and skills associated with each project LO4 - exhibit the philosophy that all engineers need to know about the environmental impact, engineering communication, and international relations		
5.Assessment Scheme	Class Works (Presentation, Debate,	To enhance the understanding of	40%

	Discussion, Report, Assignment, Tutorial)	basic concepts of lectures	
	Final Exam	Written Exam (Open Book)	60%

2. TYPES OF CLASSWORK IN HSS

2.1. Presentation

In this presentation, the company profile from the Engineering Communication subject was presented in the English language with 20 groups made of 10 students. There is a total of 200 final year Civil Engineering students of class A and B in Technological University (Hmawbi).

2.2. Debate

Students were allowed to debate a (teacher assigned) pre-determined topic of International Relations subject with two groups in each class. Students debated the topic with Myanmar language because it can be difficult to use the vocabulary in International Relations subject.

2.3. Discussion

All students in the class were allowed to be voluntarily discussed about the topics of Ethics, Occupational Safety and Health, Engineering Management and Environmental Science.

2.4. Report

All students were asked to write the facts about their thoughts in mind or their creations for Engineering Communication subject.

2.5. Assignment

Students were assigned about Engineering Ethics, Occupational Safety and Health and Engineering Management.

2.6. Tutorial

The tutorial test was made only one at the end of the semester as a sample of the exam.

2.7. Rubrics of Classwork

Presentation = 10 marks, Debate = 5 marks, Discussion = 5 marks, Report = 5 marks, Assignment = 10 marks, Tutorial = 5 marks

TABLE 2.1. RUBRICS FOR CLASSWORKS

Marks	Excellent	Good	Fair	Poor
10	10	8	6	0 (Absent)
5	5	4	3	0 (Absent)

*All are based on participation in class

3.RESEARCH METHODOLOGY

In this paper, a systematic OBL approach for OBE was performed by using Assessment Skill and Students' evaluation of final year Civil Engineering, Technological University (Hmawbi). They were assessed by 60% of exam marks and 40% of internal mark (Classwork), which was assessed by systematic rubric used in mapping with Course Outcomes and Program Outcomes (CO and PO), Program Educational Objectives and Program Outcomes (PEO and PO) adopted by Engineering Education Accreditation

Committee (EEAC), Myanmar Engineering Council (MEngC).

In this study, total sample students were 200 students. They were divided into 20 groups; each was made with 10 students' final year Civil Engineering students in Technological University (Hmawbi). Their performance in assignments, tutorial, presentation, debate, and combination of these was checked by different modules. Students' Evaluation and Feedback data collections were analysed by Microsoft Excel Spreadsheet and Statistical Package for Social Science (SPSS).

TABLE 3.1. INSTRUCTIONS FOR THE RELATIONSHIP BETWEEN TOTAL MARKS AND PERFORMANCE STATUS

Totals for P, De, Di, R, A and T	Performance Status	Total for Di, A and T	Performance Status
31-40	Excellent	16-20	Excellent
21-30	Good	11-15	Good
11-20	Fair	6-10	Fair
0-10	Poor	0-5	Poor

In table 3.1, it shows two columns in which are related total marks and performance status: Excellent, Good, Fair and Poor. By using this, test for crosstabulation of total classwork marks PO_3 & PO_{12} and PO_7, PO_8, PO_9 & PO_{11} respectively. It was utilised by Statistical Package for Social Science (SPSS). (Table 4.2 and 4.3)

4. RESULTS AND DISCUSSIONS

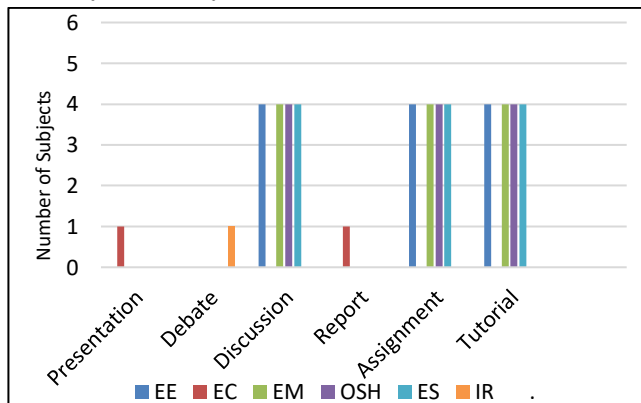### 4.1. Performance of Classwork

Fig1. Performance of classwork for six subjects in HSS

Figure 1 shows that the performance of classwork in six subjects' assessment for related classwork. Presentation and report are for Engineering Communication and Debate is for International Relation. Discussion and Tutorial are made for Engineering Ethics, Occupational Safety and Health, Engineering Management and Environmental Science. Assignment is for Engineering Ethics, Occupational Safety and Health and Engineering Management.

4.2. Descriptive Statistics for Classwork Marks

TABLE 4.1. DESCRIPTIVE STASTICS FOR CLASSWORK MARKS

Classwork	N	Mini	Maxi	Mean	Result with Std Deviation
Presentation	200	8	10	9.52	9.52±0.86
Debate	200	4	5	4.35	4.35±0.48
Discussion	200	4	5	4.35	4.35±0.48
Report	200	5	5	5	5.00±0.00
Assignment	200	8	10	8.9	8.90±0.99
Tutorial	186	5	5	5	5.00±0.00

It was found that those numbers of students well performed in these HSS assessments which agrees with the course outlines. It was analysed by Statistical Package for Social Science (SPSS) Software.

TABLE 4.2. TESTS FOR CROSSTABULATIONS OF TOTAL CLASSWORK MARKS AND PO 3& 12 AND PO 7,8,9 & 11

Marks	PO 3& 12		PO 7, 8,9 & 11	
	Excellent	Good	Excellent	Good
Twenty-nine	0	9	0	9
Thirty-one	3	0	0	3
Thirty-four	39	0	39	0
Thirty-five	2	0	2	0
Thirty-six	55	0	55	0
Thirty-eight	28	0	28	0
Forty	64	0	64	0
Total	191	9	188	12

It can be seen that the results are strongly met with PO 3,7,8,9,11&12. It was analysed by Statistical Package for Social Science (SPSS) Software.

TABLE 4.3. TESTS FOR CROSSTABULATIONS OF TOTAL CLASSWORK MARKS AND COURSE OUTCOMES

Marks	Course Outcomes	
Twenty-nine	0	9
Thirty-one	3	0
Thirty-four	39	0
Thirty-five	2	0
Thirty-six	55	0
Thirty-eight	28	0
Forty	64	0
Total	191	9

It shows that the results are strongly met with CO. It was analysed by Statistical Package for Social Science (SPSS) Software.

4.3. EEAC forms for Course Matrix (CO Assessment and Achievement)

TABLE4.4.COURSE MATRIX (CO ASSESSMENT AND ACHIEVEMENT)

Course Outcome (CO)	Bloom's Taxonomy Level**	Classworks						Total Contributions	(%)Achievement	Achievement (Pass/Fail)*
		Others (Legend: P = Presentation; De= Debate, Di = Discussion, R = Report, A= Assignment,T= Tutorial;)								
		P	De	Di	R	A	T			
1	A4	1		1		1	1	4	98.25%	PASS
2	C6		1	1		1	1	4	98.25%	PASS
3	P4	1		1		1	1	4	98.25%	PASS
4	A5		1	1	1	1	1	5	98.60%	PASS
Percentage of passes		100%	100%	100%	100%	100%	93%			

In this table, it is shown that the achievement percentage for each CO classwork agree with the overall "PASS".

TABLE4.5. COURSE MATRIX (PO-CO MAPPING & PO ACHIEVEMENT)

Course Outcome (CO)	Programme Outcomes (PO)						% of Passess
	3	7	8	9	11	12	
1			1			1	98.25%
2	1			1			98.25%
3				1	1		98.25%
4		1				1	98.60%
Total Contributions	1	1	1	2	1	2	
Achievement%	98.25 %	98.60 %	98.25 %	98.25 %	98.25 %	98.43 %	

In this table, it shows that according to twelve POs, only PO3, PO7, PO8, PO9, PO11 and PO12 are coincided with the HSS CO1, CO2, CO3 and CO4. In addition, those are all consisted of agreement with achievements values from Table 4.4.

TABLE 4.6. MAPPING OF PEO & PO

	Programme Outcomes (POs)												Total Contributions	(%)Achievement	Achievement (Pass/Fail)*
	1	2	3	4	5	6	7	8	9	10	11	12			
PEO1	1	1	1	1									4	24.6%	FAIL
PEO2				1			1	1	1				4	49.2%	PASS
PEO3					1	1	1					1	4	73.8%	PASS
			98.3%			98.6%	98.3%	98.3%			98.3%	98.4%			

In the above table, mapping conditions between PEO and PO are precisely agreed except PEO1 because final year civil engineering students got PEO1 in previous years.

4.4. Students' Evaluation Results

In Students' evaluation sheets, there are two comments and nine portions which consist of strongly agree, agree, neutral, disagree and strongly disagree. In the calculation of the marks for student evaluation, the formats were 5 marks for strongly agree, 4 marks for agree, 3 marks for neutral, 2 marks for disagree and 1 mark for strongly disagree.

All are written with Myanmar and English language. These are as below:
1. Appears well-versed in this subject area
2. Be enthusiastic in teaching subject in class room
3. Be well-prepared and communicates clearly in class
4. Be approachable to discuss
5. Provides useful guidelines
6. Be effective teacher
7. Allows student to be active in the classroom learning environment
8. Manages the time well
9. Encourages the students to speak up and be active in the class
10. Please comment on the teacher's teaching strengths and weakness
11. Please comment on how you think to improve the teaching and learning in this subject

TABLE 11. STATISTICS FOR STUDENTS' EVALUATIONS OF HSS (NO 1 TO 9 0NLY)

N	Valid	195
	Missing	0
Mean		41.76
Median		43
Mode		45
Std. deviation		3.6
Range		15
Minimum		30
Maximum		45

From the results, 195 students participated in students' evaluations for the HSS subject. The maximum marks are 45 and the minimum is 30. Since the standard deviation is 3.6, the significant results are shown as 45 ±3.6. Most of the students paid "Strongly Agree" and so it was seen that mode is 45.

In No 10 comment as a teacher's teaching strength and weakness, most of the students commented that they got knowledge and skills about Humanity and Social Science with Engineering Aspects.

For No 11 comment of improving the teaching and learning on HSS subject, they paid "Excellent" because a flipped classroom system was used as a teaching methodology.

5. CONCLUSIONS

In this teaching and learning research paper, it is evident that proposed changes to the final year Civil Engineering Curriculum that includes Humanity and Social Science (HSS) will make the learning community more efficient. The students on their successful completion of the HSS curriculum will have at least a minimum level of knowledge and skills. The course outcomes of the various courses will be met with the students' learning achievement.

HSS curriculum for all technological universities in Myanmar should be the same according to the achievement of this study. Moreover, Exam assessment on HSS subject should be either an "Open Book" system or "Close Book" System. Moreover, it would be a more effective teaching and learning system that the HSS subjects should be included in other academic years such as fourth and fifth academic years or two semesters of final year. And, it would be quite useful methodologies to be applied in other engineering courses.

REFERENCES

CM.VIVEK. (2017). Outcome Based Education – a Review. *International Research Journal of Engineering and Technology*, *04*(07), 2395–56.

Laguador, J. M. (2015). Outcomes-Based Faculty Performance Evaluation in Research. *Scholars Journal of Arts, Humanities and Social Sciences*, *3*.

Mansor, W., Hashim, H., Abdullah, S. A. C., Kamaluddin, M. U., Latip, M. F. A., Yassin, A. I. M., … Kamal, M. M. (2008). Preliminary results on the implementation of Outcome-Based Education on the non-examinable computer engineering modules. *Proceedings - Frontiers in Education Conference, FIE*, 20–25. https://doi.org/10.1109/FIE.2008.4720675

Maung, S. A., Oo, Z., & Win, K. Z. (2018). Teaching Methodologies for Humanity and Social Science (HSS) with Engineering Aspects. *1st International Conference on Engineering Education and Innovation*, *1*, 57–60.

Appendix

Form No. TUHMB-077

Student's Evaluation Sheet

Academic Year : ....   Evaluation Date: ....

Semester : ....

Subject Teacher (ယခုဘာသာရပ်ကိုသင်ကြားသည့်ဆရာ/ဆရာမအမည်) : ....

Subject (ယခုသင်ကြားနေသောဘာသာရပ်အမည်နှင့်Code No.) : ....

Section (ယခုသင်ကြားနေသော အတန်း/တန်းခွဲ) : ....

Sr. No	Questionnaries for student's evaluation on teacher ဆရာ/ ဆရာမ၏ စာသင်ကြားမှုအပေါ် ကျောင်းသား၊ ကျောင်းသူ များ၏ အကဲဖြတ်မှုဆိုင်ရာမေးခွန်းများ (သဘောတူသည့်အကွက်တွင် အမှတ်ခြစ်ရန် √)	Strongly Agree (လုံး၀သဘောတူ)	Agree (သဘောတူ)	Neutral (ဖွဲ့နဲ့/သာမန်)	Disagree (သဘောမတူ)	Strongly Disagree (လုံး၀သဘောမတူ)
		5	4	3	2	1
1	Well-versed in this subject area. ဘာသာရပ်နှင့်ပတ်သက်၍ကောင်းစွာတတ်ကျွမ်းနှံ့စပ်ပုံပေါ်သည်။					
2	Enthusiastic in teaching subject in class room. စာသင်ခန်းထဲ၌ ဘာသာရပ်ကိုသင်ပြရာတွင် စိတ်အားထက်သန် မှုရှိသည်။					
3	Well prepared and communicates clearly in class. စာသင်ကြားရန်ကောင်းစွာပြင်ဆင်လာ၍ စာသင်ခန်းထဲ၌ ရှင်းလင်းစွာ ပြောဆို သင်ပြနိုင်သည်။					
4	Approachable to discuss. ဆရာ/ ဆရာမအား စာမေးရန်/ စာဆွေးနွေးရန်အတွက် လွယ်ကူသည်။					
5	Useful guidelines. ကျောင်းသား၊ ကျောင်းသူများအား အသုံးဝင်သည့် လမ်းညွှန်မှုများ ပေးနိုင် သည်။					
6	Effective teacher. ထိရောက်စွာ စာသင်ကြားနိုင်သော ဆရာ/ ဆရာမကောင်းတစ်ဦးဖြစ်သည်။					
7	Able to create an achieve class room. (student centered learning environment) ကျောင်းသား၊ ကျောင်းသူများအား တက်ကြွပျော်ရွှင်ဖွယ်ကောင်းသော learning environment ဖြစ်လာစေရန် ဆောင်ရွက် ပေးသည်။					
8	Manages the time well. အချိန်ကို ကောင်းစွာ စီမံအသုံးချနိုင်သည်။					
9	Encourages students to speak up and be active in the class. ကျောင်းသား၊ ကျောင်းသူများအား စာသင်ခန်းထဲတွင် တက်တက်ကြွကြွနှင့် ပြောဆိုဆွေးနွေးနိုင်ရန် တွန်းအားပေးလေ့ရှိသည်။					

10. Please comment on the teacher's teaching strengths and weakness.
(ဆရာ/မ စာသင်ကြားခြင်းနှင့်ပတ်သက်၍ လေ့လာအကဲခတ်မိသော အားသာချက်များ/ အားနည်းချက်များ။)

11. Please comment on how you think to improve the teaching and learning in this subject.
(ဤဘာသာရပ်ကို သင်ကြား/သင်ယူရာတွင် မည်ကဲ့သို့ ပိုမိုတိုးတက်ထိရောက်လာအောင် ပြုလုပ်သင့်သည်ကို သင်၏ ထင်မြင်ယူဆချက်အား အကြံဥာဏ်ပေးပါ။)

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