A Design Of An Automated Assessment Process For The Outcomes-Based Education In The Industrial Engineering Department Of The Faculty Of Engineering At The University Of Santo Tomas

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Abstract. Outcomes-Based Education (OBE), a new model of education, is an outcome-centered approach to education that focuses on developing students’ outcomes preparing them for the real world after graduation. It advocates a paradigm shift from traditional teaching to a more student focused method. It is believed to be a better measurement of students’ attainment of key knowledge and skills. This study focuses on standardizing the assessment process of Outcomes-Based Education at the University of Santo Tomas Industrial Engineering (IE) Department of the Faculty of Engineering. The proponents proposed an automated system of SO grade computation where the results will be transparent to the students raising awareness of their outcomes standing. This study elaborated the current practice of the outcomes-based assessment process. Qualitative Analysis were used to gather, analyze, and interpret data. Research methods involved were questionnaires, observations, and document investigations. The unit of analysis was the faculty members of the IE department. Results disclosed that the initial implementation of the system is expected to be tedious but upon the standardization of the system and its corresponding components, the automated OBE assessment process will offer a faster, simpler, standardized and more convenient alternative of the current OBE assessment process. Thus, addressing the problems of the current assessment process.

1. Introduction

Outcomes Based Education (OBE) is an educational process that focuses on achieving certain specified outcomes in terms of individual student learning. In contrary with traditional education, which predominantly focused on the inputs - the resources that are available to the student [1]. OBE generally focuses on its goals. This new approach altered from a traditional input, such as course credits earned and hours spent in class to results or outcomes. OBE lets its students to primarily exhibit skills that are intended to be established rather than acquired knowledge prior to its application [2]. It promotes experiential learning for students, which is essential in presenting desired outcomes

With the continual innovations globally, higher education sectors adapted changes, restructuring educational system manner to Outcomes Based Education (OBE) [3]. The Philippine higher education
institutions have been stepping up their evaluation systems following other countries [4]. With the said development, OBE has been implemented to offer quality degree programs meeting world class standard and producing graduates with lifelong learning competencies by changing the methods of assessment [5]. Assessment of students’ outcomes is prime and a critical step in learning. Instructors were able to track students and evaluate them whether they are learning, going extra mile, doing fine, or needs improvement to better comprehend the results of students performances [6]. Targets, metrics, and indicators were being established to be able to measure student’s performance. OBE in the Philippines started as a manual assessment of student outcomes, however the conventional way of assessing did not clearly justify acquisition of the desired outcomes.

Several approaches to curriculum evaluation were adopted where both external and internal evaluations have been positive, which encouraged continuation with the outcome-based approach as reported by few previous works [7-11].

It was reported that among the many different processes under the Outcomes Based Education Curriculum is the Assessment process of instructors to students [12]. Assessment of program objectives through the evaluation of course objectives is only part of the overall assessment model[10-12]. Assessment was the integral part of the whole system where students will not get marked just for remembering subject content but also because of their different aspects of ability such as creativity and critical thinking [9-11].

The implementation of OBE in the Faculty of Engineering at the University of Santo Tomas engendered the formulation of corresponding program outcomes or POs to different engineering programs. In particular, the Industrial Engineering Program had 16 program outcomes.

Thus, the main purpose of this research is to standardize the assessment process of OBE. The Industrial Engineering department would be the initial beneficiary of this study. One of the objectives of this system is to help the professors from the IE Department to efficiently compute the student outcomes in line with the OBE curriculum in UST. The study focused on the automation of the current Outcomes Based Education assessment process. The researchers conducted their study in the Faculty of Engineering of the University of Santo Tomas.

2. Methodology

2.1. Research Design

The research proponents of this study opted to present a design and method demonstration of an automated approach in the assessment process, particularly in the encoding procedure, in an Outcomes-Based Education system. Problems observed and encountered on the manual assessment procedure were recognized beforehand and a thorough understanding on the current procedure helped the researchers on determining significant areas for improvement. These information were used further on the development of ideas for the method and design of the proposed system. The proposed system will contain the following elements which are Student information, professor information, syllabus, Rubrics, OBAT template, student outcomes, course intended learning outcomes, assessment activities and actual grade scores.

2.2. Subjects and Study Site

The researchers conducted their study in the Faculty of Engineering of the University of Santo Tomas situated along Espana Blvd. at Sampaloc, Manila, Metro Manila. Due to time constraint, the researchers solely focused on the Faculty of Engineering’s Industrial Engineering Department. The proponents of this study considered the assessment process in the point of view of the professors of the said department.

2.3. Data Measure

Information used in the study were solely from the Department of Industrial Engineering of the Faculty of Engineering at the University of Santo Tomas.
2.4. Mode of Data Analysis
Data collected from sources, Industrial Engineering department faculty member, by the proponents were managed through instruments in preparation for analysis to augment the research information. These instruments were quality tools such as Flow Process Chart and simulation that will assist the proponents to better understand and tailor the data to the fullest. Flow Process Charts were utilized for the presentation of the sequence of the current and proposed systems. This was to have an overview of the whole assessment process that the researchers believed will contribute to better understand the system and communicate it to others. The use of flow process charts enabled the researchers to draw comparisons between the current and the proposed system. Information gathered through the process of interview were transcribed and used to support assumptions and ideas in this study. Significant insights from the interview were taken into account in coming up with conclusions to justify the proposed automation of the assessment process.

2.5. Hypotheses Testing
To determine if automating the Outcomes-Based Education (OBE) assessment process will minimize the number of steps to compute for OBE grade, the following hypotheses was set.
H0: Automating the OBE assessment process does not minimize the number of steps to compute for the OBE grade.
H1: Automating the OBE assessment process minimizes the number of steps to compute for the OBE grade.

In addition, To determine if automating the Outcomes-Based Education (OBE) assessment process will help on the standardization of the assessment system
H0: Automating the OBE assessment process does not yield a more standardized process of the assessment system
H1: Automating the OBE assessment process yields a more standardized process of the assessment system.

Also, to determine if automating the Outcomes-Based Education (OBE) assessment process will provide a system that would give the students access to information on their OBE grades and standing
H0: Automating the OBE assessment process will not provide a system that would give the students access to information on their OBE grades and standing.
H1: Automating the OBE assessment process will provide a system that would give the students access to information on their OBE grades and standing.

3. Result and Discussion
3.1. Brief on the Proposed System
Figure 1 shows the Log-in Interface of the system that will be shown as the user accesses the site. This is where the user would input his credentials. With the use of the inputted data, the system would automatically determine the role as to whether the user is an Administrator, Professor or Student.

![Figure 1. Log-in Interface](image-url)
3.2. Hypothesis testing

The proponents, with the use of all the available data and the analyses of gathered information, attempted to test the hypotheses that this study aims to address.

To determine if automating the Outcomes-Based Education (OBE) assessment process will minimize the number of steps to compute for OBE grade, these two H0 and H1 were tested.

H0: Automating the OBE assessment process does not minimize the number of steps to compute for the Student Outcome grade. H1: Automating the OBE assessment process minimizes the number of steps to compute for the Student Outcome grade.

The proponents demonstrated the difference between the current and proposed assessment process for the Outcome-Based Education regarding the number of steps to go through upon computing a certain student outcome grade through Table 1. The proponents wanted to determine whether automating the assessment process of the Outcomes-Based Education Curriculum will minimize the number of steps to compute each student outcome grade or not. It was evident in the theoretical framework encoding flow process chart that a professor should undergo a somewhat tedious process of computation for student outcomes grade. In the proposed encoding flow process chart from the conceptual framework of the Outcomes-Based Education, the steps were reduced from 8 steps to 5 steps. It was then concluded to reject the null hypothesis, H0, thus, accept the alternative hypothesis, H1. It was proven by the theoretical and conceptual frameworks together with their respective flow process charts that the steps were fewer when automated rather than manual execution of the process. It was proven that automating the OBE assessment process did minimize the number of steps to compute for the student outcome grade.

Table 1. Comparison between Current and Proposed — Number of Steps

| Current OBE Assessment Process | Proposed OBE Assessment Process |
|-------------------------------|--------------------------------|
| Eight (8) Steps on Encoding Process | Five (5) Steps on Encoding Process |
| 1. Open spreadsheet | 1. Access site |
| 2. Input students names | 2. Login |
| 3. Input performances | 3. Edit data |
| 4. Input assessment activity score | 4. Input raw grades |
| 5. Compute actual scores | 5. Submit changes |
| 6. Formulation of equation | |
| 7. Percentage Range definition | |
| 8. Input rating for each performance | |
| Indicator. | |

Next, To determine if automating the Outcomes-Based Education (OBE) assessment process will help on the standardization of the assessment system, the following H0 and H1 were tested.

H0: Automating the OBE assessment process does not yield a more standardized process of the assessment system.

H1: Automating the OBE assessment process yields a more standardized process of the assessment system. The proponents looked into the difference between the current and proposed assessment process for the Outcomes-Based Education regarding to their standardization through Table 2. The proponents ascertained if automating the Outcomes-Based Education Curriculum assessment process yields a standardized assessment process by the help of a table, comparing the current and proposed OBE assessment process. All information used with regards to the current process came from Problem Statements and insights of faculty members while the information with regards to the proposed process came from the conceptual design ideas formulated by the proponents, which turned out to be an attainable system. The proposed assessment process of the OBE, autonation, was believed to fix the concern about lack of standardization among professors. By automation, it meant that uniformity will be observed such as templates provided which will be used by all professors as well as due dates on submission of syllabus and rubrics. It was then concluded to reject H0, thus, accept H1. It was proven...
by the comparison of the current and proposed OBE assessment process that subjectivity has been
practiced by many professors today thus resulting to lack of standardized system. H1, stating that
automating the assessment process of OBE yields a more standardized assessment process is correct.

Table 2. Comparison between Current and Proposed — Number of Steps

| Criteria for Comparison       | Current OBE Assessment Process | Proposed OBE Assessment Process |
|------------------------------|--------------------------------|---------------------------------|
| Process                      | There is no standard procedure as to how the Assessment Process is done | The Assessment Process has been standardized with the use of the system |
| Rating per Student Indicator | There are grounds for student rating but the analysis of what ratings to give per student per performance indicator are only based from professor judgment and are therefore very subjective. | A template has been devised which will be disseminated to Industrial engineering Faculty members. The template already has established ranges for the ratings, which will then serve as basis for evaluating students actual grades |
| Number and type of Assessment Activities | Assessment activities are not prepared and plotted prior to the start of the semester which may lead to misses in testing particular Student Outcomes | Number of assessment activities has been set before the semester in order to have a uniform way of computing Student Outcomes |
| Submission of Syllabus and Rubrics | Not all professors are able to pass their accomplished Syllabus and rubrics | All professors are required to submit accomplished Syllabus and Rubrics prior to the start of a semester |

The proponents ascertained if automating the Outcomes-Based Education Curriculum assessment process yields a standardized assessment process by the help of a table, comparing the current and proposed OBE assessment process. All information used with regards to the current process came from Problem Statements and insights of faculty members while the information with regards to the proposed process came from the conceptual design ideas formulated by the proponents, which turned out to be an attainable system. The proposed assessment process of the OBE, automation, was believed to fix the concern about lack of standardization among professors. By automation, it meant that uniformity will be observed such as templates provided which will be used by all professors as well as due dates on submission of syllabus and rubrics. It was then concluded to reject H0, thus, accept H1. It was proven by the comparison of the current and proposed OBE assessment process that subjectivity has been practiced by many professors today thus resulting to lack of standardized system. H1, stating that automating the assessment process of OBE yields a more standardized assessment process is correct.

To determine if automating the Outcomes-Based Education (OBE) assessment process will provide a system that would give the students access to information on their OBE grades and standing

H0: Automating the OBE assessment process will not provide a system that would give the students access to information on their OBE grades and standing

H1: Automating the OBE assessment process will provide a system that would give the students access to information on their OBE grades and standing

The proponents demonstrated the difference between the current and proposed assessment process for the Outcome-Based Education regarding student access to information on their OBE grades and standing as shown in Table 3. Automating the assessment process of the Outcomes-Based Education
curriculum will work over the OBE’s lack of transparency to students. Students now have accounts, thus giving them access to an OBE web application wherein they can see everything regarding their OBE standing. The proponents came up with the rejection of the null hypothesis, $H_0$ and acceptance of the alternative hypothesis, $H_1$. Examining the comparison made between the current and proposed assessment process of the Outcomes-Based Education, it was clearly visible that automating the OBE assessment process will provide a system that would give the students access to information on their OBE grades and standing.

| Criteria for Comparison          | Current OBE Assessment Process | Proposed OBE Assessment Process                                                                 |
|---------------------------------|--------------------------------|--------------------------------------------------------------------------------------------------|
| Viewing of grades               | Only professors can view and contemplate the Student Outcomes | Students are able to view their OBE grades                                                      |
| Information regarding OBE performance | Students are not very informed of their OBE standing and are not given an overview of their OBE performance | Student Outcome grade of the student which covers the student’s entire stay in the university. Student Outcome grade of the student per course is stated. This promotes awareness to students with regards to their OBE standing |

### 4. Conclusion

After conducting the study, the proponents conclude that there is a need to improve the current Outcomes-based Assessment Process. This is due to the insufficient knowledge and understanding of the professors about the OBE and its assessment process. Faculty members have yet to fully grasp the concept of OBE per se, thus the evaluation based on student outcomes has not been widely used within the Industrial Engineering department. The process has been proven to be tiresome and time-consuming, based on the information gathered from the interview. Bottomline, the current OBE assessment process being practiced is complex in many ways, justifying the need for its simplification. To address the need for improvement, the proponents designed a system to automate the process of OBE assessment. Initially, the system will be made available solely for the Industrial Engineering department. The system was designed for three-way use, which means it will be beneficial to administrators, to professors and to students as well. The idea of designing the system was aimed toward providing a standardized portal for the IE department in order to elaborate the concept of outcomes-based learning and the development of student outcomes. The initial implementation of the system is expected to be tedious but the proponents concluded that upon the standardization of the system and its corresponding components, the automated OBE assessment process will offer a faster, simpler, standardized and more convenient alternative of the current OBE assessment process.
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