

MEASURING THE ACHIEVEMENT OF EXPECTED LEARNING OUTCOMES AS A WAY TO ENHANCE AUN-QA OUTCOMES-BASED EDUCATION AT INDUSTRIAL UNIVERSITY OF HO CHI MINH CITY

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Abstract. Outcomes-based education (OBE) implementation at Industrial University of Ho Chi Minh City (IUH) is built based on ASEAN University Network – Quality Assurance (AUN-QA) outcomes-based concept, which provides quality outcomes at the end of educational process. The goals for this are to meet the requirements of stakeholders with a set of expected learning outcomes (ELOs). The expected learning outcomes are concerned with the achievements of the learner at the graduation time rather than the intentions of the teacher, which are often written as aims, goals or objectives of the program. Measuring the achievement of ELOs is considered to enhance OBE. Focus of providing evidences of program assessment is on the cumulative effect of student learning and influences. Principles of program assessment are to seek the answers for such questions: “When to collect data? From whom to collect data? What is interpretation of the assessment results? This work demonstrates an example of ELOs measurement at program level at IUH.

Keywords: Outcomes-based education; OBE; Expected learning outcome; ELO; program assessment; program evaluation; performance indicator; PI; AUN-QA.

1. INTRODUCTION

Outcomes-based education (OBE) can be described as a way in which curriculum is defined, organized and directed based on all the things that learners would learn and demonstrate successfully when they complete the study program [1]. The focus of OBE is on the results of learning, where the knowledge, skills and attitudes including habits of mind, the learners are expected to learn are clearly identified and expressed as expected learning outcomes (ELOs). The expected learning outcomes, which are formulated from the needs of the stakeholders, form the starting point of the program design. Learning outcomes are concerned with the achievements of the learner at the graduation time rather than the intentions of the teacher, which are often written as aims, goals or objectives of the program [1]. Learning outcomes should be written in a way where learning is translated into observable and measurable results which can be demonstrated and assessed [1,2].

OBE implementation at Industrial University of Ho Chi Minh City (IUH) is built based on ASEAN University Network – Quality Assurance (AUN-QA) outcomes-based concept, which provides quality outcome at the end of educational process [1]. The goals for this are to meet the requirements of stakeholders with a set of ELOs. The ELOs are also formulated with references of Vietnamese Qualifications Framework (VQF) [3]. Measuring the achievement of ELOs is considered to enhance OBE. Focus of providing evidences of program assessment is on the cumulative effect of student learning and influences. Principles of program assessment are to seek the answers for such questions: “When to collect data? From whom to collect data? What is interpretation of the assessment results? What is faculty plan for improvement?”

This work demonstrates an example of ELOs measurement at program level at Faculty of Automotive Engineering Technology (FAET) at IUH. The Automotive Engineering Technology study program has certified by AUN-QA since August 2019 with a highest results and expectations from AUN-QA assessors.

2. PRINCIPLES OF PROGRAM ASSESSMENT

A road map of measuring the achievement and improvement of ELOs is set at FAET as in Fig. 1. Details of each step are discussed as follow.



Fig. 1. Road map for quality enhancement.

2.1. Assessment Process

Fig. 2 describes a 4-year cycle of program assessment and evaluation plan during four years from 2014 to 2018. The cycle is set for 4 years as the period of reviewing a study program. The program team processes data collected from lecturers through course-embedded assessments; from the enterprises through the internship assessment or from the graduation project (thesis) assessment. The assessment results in each cycle are reviewed and decided to improve on assessment methods, teaching methodology by the Program Scientific Committee. The improvement on the assessment tools is applied after each cycle.

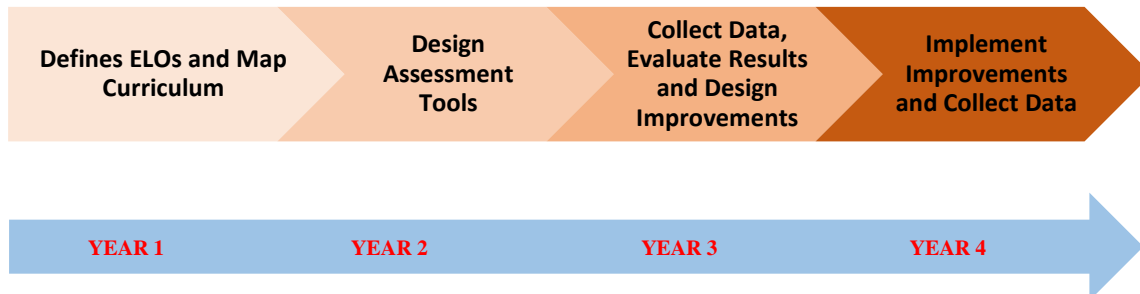


Fig. 2. A process of a 4-year cycle.

2.2. Assessment Metrics and Methods

ELOs are evaluated based on their performance indicators (PIs), which are defined as specific, measurable statements identifying student performance(s) required to meet the outcome, confirmable through evidences [2]. The linkage between ELOs and course learning outcomes (CLOs) throughout PIs is described in Fig.3.

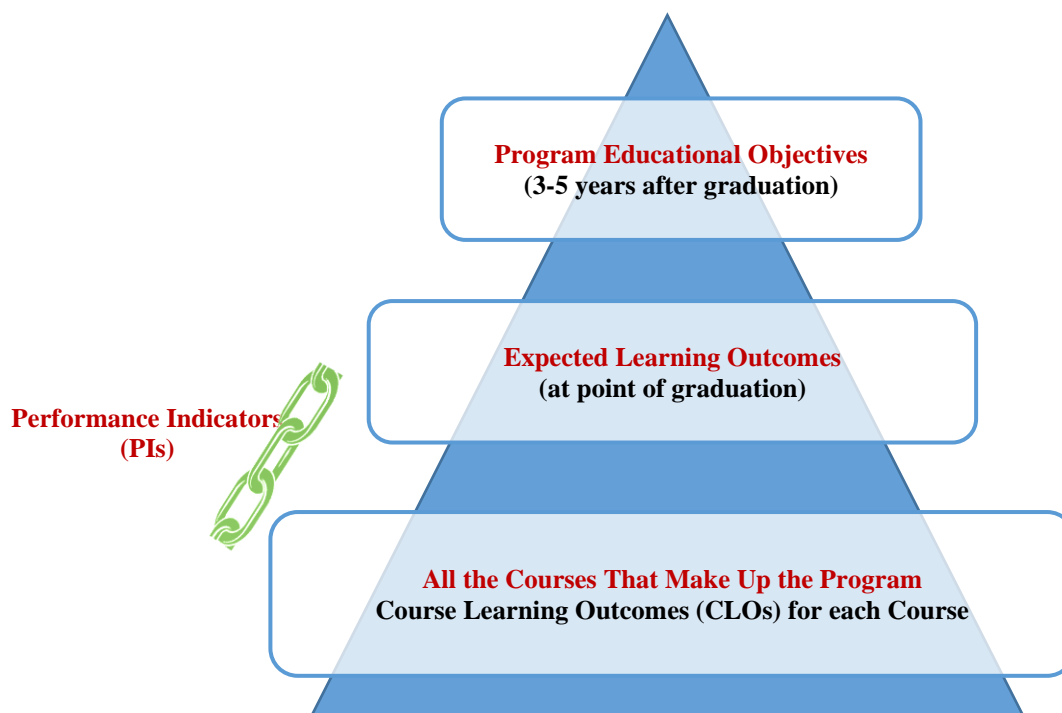


Fig. 3. Performance Indicators and ELOs [4]

As an example, for ELO d, the AET program has set up 3 PIs to measure students' achievement [5].

ELO d: Utilize specialized skills and tools to solve automotive problems

PI1. Identify technical problems of cars.

PI2. Perform technical operations in automobile maintenance and repair.

PI3. Solve car damages by using some searching/diagnostics software and specialized equipment.

Using the cognitive level of Bloom, in order to achieve the “Utilize specialized skills and tools” skill, the student needs to meet the requirement of “Identifying technical problems”, “Performing technical operations” and “Solving car damages”.

In each cycle, the ELOs are evaluated based on the assessment tools from triangular data resources (Fig. 4). The idea of using triangular resources is to make sure that the Program Committee has a whole view of their students' achievement. First, it is to measure the achievement of students right after they finish courses that provided by faculty before being sent outside. Second, it is to measure the achievement of students after they apply their knowledge and skill in real working environments. Third, it is to measure how students feel about their achievement of abovementioned ELO.

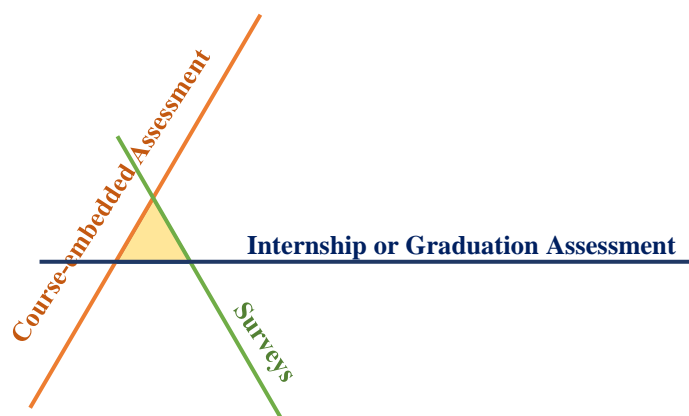


Fig. 4. Triangular data assessment resources

The results assessed on different instruments will be used for comparison and consideration when deciding on appropriate improvements.

a. Course-embedded assessment (direct assessment): This assessment method is used to measure the CLOs of courses that serve to assess to PIs of ELOs in the program. As CLOs support for PIs at different levels (I – Introduction , R - Reinforce, E - Emphasized), PIs are mainly assessed on some courses whose CLOs are at level E as summative assessment (most of data comes from these key courses). Some courses corresponding to I and R levels are also assessed as formative assessment in order to finding out the cause when the attainment of the corresponding performance indicator does not reach the expected degree.

b. Internship or Graduation project assessment (direct assessment): After students complete the internship, we send a form to assess some performance indicators to the enterprises hosting the internship. This form includes the rubrics of the corresponding performance indicators to ensure the reliability of the assessment tool. Unlike other assessment tools, this tool is conducted by external evaluators who are the instructors supervising the student's internship in the enterprise or graduation project. The faculty also assesses their students' performance throughout their internship reports or graduation project reports and defense. Most of them use rubrics as strong and fair assessment tools.

c. Surveys (indirect assessment): This indirect assessment is aimed to get the feedbacks from learners after they finish their graduation thesis. A set of questionnaires are given to students to ask for their opinions on how they achieve the ELOs. Their responses are severed as an indicator how our customers feel whenever they gain the program knowledge and skills set.

2.3. Assessment Schedule and Frequency

Table 1 describes the assessment plan and cycle of ELO d (as an example).

- The “**PIs**” column represents the PIs to be evaluated by the corresponding ELO d.
- The “**Educational Strategies**” column lists the name of the courses contributing to each PI, mapped from the curriculum. For example, there are 9 courses (including Internship) with different levels for the PI1.
- The “**Method(s) of Assessment**” column presents the assessment methodology for collecting the required data. These methods include course-embedded (written tests, essay, exams...), internship/graduation project. This column also has the information about the assessment tools, such as marking schemes, rubrics, or the assessing form for enterprises during the time that students practice at the company.
- The “**Where data are collected**” column states the courses and their CLOs or the internship/graduation project assessment used to collect data of the student's PI achievement level.

- The "When data are collected", "Who collected data" and "Length of Assessment Cycle" columns present the time, the person in charged and the frequency of data collecting.
- The "Target" column states the threshold for each performance indicator. The meaning of setting the threshold is to show the level of satisfaction for each PI. When setting the threshold, these facts are also considered, such as cognitive level, complexity of application, and curriculum support. The program team tends to set the target for each PI not lower than 2/3 of the number of students being assessed. The threshold in this work is set at 60%, as a baseline. After each measuring cycle, this target might be increased up to over 75% for continuous improvement.

In order to prepare for the assessment and data collection, all the lectures participated in training workshops, which were held by Office of Testing and Quality Assurance. In this workshop, lectures were trained how to measure course learning outcomes and analyze collected data.

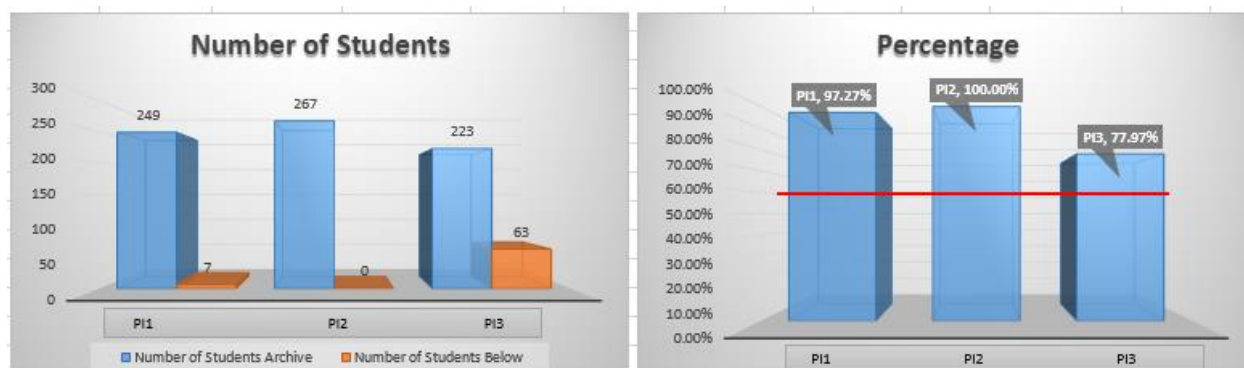
2.4. Evaluation for Improvement

The results of evaluation of collected data from embedded-course, internship/graduation project, and surveys for ELO d are presented as below.

2.4.1. Course-embedded assessment

Table 2. Results of Course-embedded assessment [5].

ELO d	Target	Number of Students		Percentage	
		Achieve	Below	Achieve	Below
PI1	60%	249	7	97.27%	2.73%
PI2		267	0	100.00%	0.00%
PI3		223	63	77.97%	22.03%



2.4.2. Fig. 5. Results of Course-embedded assessment

Table 1. Details of assessment plan for ELO d [5].

ELO d: Utilize specialized skills and tools to solve automotive problems.								
PIs	Educational strategies	Method(s) of Assessment	Where data are collected		When data are collected	Who collected data	Target	Length of Assessment Cycle
			Courses	CLO				
PI1. Identify technical problems of cars.	Practice of the Internal Combustion Engine	Exams (Mid Term, Final Term); Marking scheme, rubrics	Practice of Automotive air Conditioning Systems	CLO2	Semester 7, 2017, Final Term	Lecture 1	60%	One year
	Practice of Automobile Powertrains System							
	Practice of Diesel Engine							
	Driving Techniques Practice							
	Practice of Motorbike							
	Practice of Vehicle Body Repair and Paint							
	Practice of Automotive air Conditioning Systems							
	Automotive Testing Method							
Internship	Assessing form with rubrics	Internship	CLO4	Semester 8, 2019	Lecture 2			
PI2. Perform technical operations in automobile maintenance and repair.	Practice of the Internal Combustion Engine	Exams (Mid Term, Final Term); Marking scheme, rubrics	Practice of Automobile Motion – Control System	CLO3	Semester 5, 2016, Final Term	Lecture 3	60%	One year
	Practice of Automobile Powertrains System							
	Practice of Automobile Motion – Control System							
	Practice of Diesel Engine							
	Practice of Motorbike							
	Practice of Automotive Body Electrical Systems							

	Practice of Vehicle Body Repair and Paint							
	Practice of Automotive Engine Electrical Systems							
	Practice of Automotive air Conditioning Systems							
	Internship	Assessing form with rubrics	Internship	CLO5	Semester 8, 2019	Lecture 4		
PI3. Solve car damages by using some searching/diagnostics software and specialized equipment.	Practice of Diesel Engine	Exams (Mid Term, Final Term); Marking scheme, rubrics	Practice of Automotive Engine Electrical Systems	CLO2		Lecture 5	60%	one year
	Practice of Motorbike							
	Practice of Automotive Body Electrical Systems							
	Practice of Automotive Engine Electrical Systems							
	Practice of Automotive Electronic Engineering	Assessing form with rubrics	Internship	CLO6	Semester 8, 2019	Lecture 6		

Assessment Results Summary: The expected target for all PIs are at least 60% of the students reaching the satisfactory (passed) level. The results showed that students achieved satisfactory level for PI1, PI2, and PI3 (97%, 100%, and 77.97% respectively).

Evaluation on PIs:

- PI1: The question was at advanced level. Students only finished their tasks without having comparison or analysis. In the next cycle, more problems need to be solved to help students achieve the higher level of thinking.
- PI2: This result reflected teaching and learning method in alignment with the level cognition of Bloom. The next approach is that academic advisor should let the students use technology machines to perform on real objects.
- PI3: This PI had lower performance than other ones. Active leaning with more discussion and presentation, mind map and model could be supplement for solving problems. This might increase the number of students archiving target.

2.4.3. Internship or Graduation project assessment

Table 3. Results of Internship or Graduation project assessment [5].

ELO d	Target	Number of Students		Percentage	
		Achieve	Below	Achieve	Below
PI1	60%	298	1	99.67%	0.33%
PI2		297	2	99.33%	0.67%
PI3		299	0	100.00%	0.00%

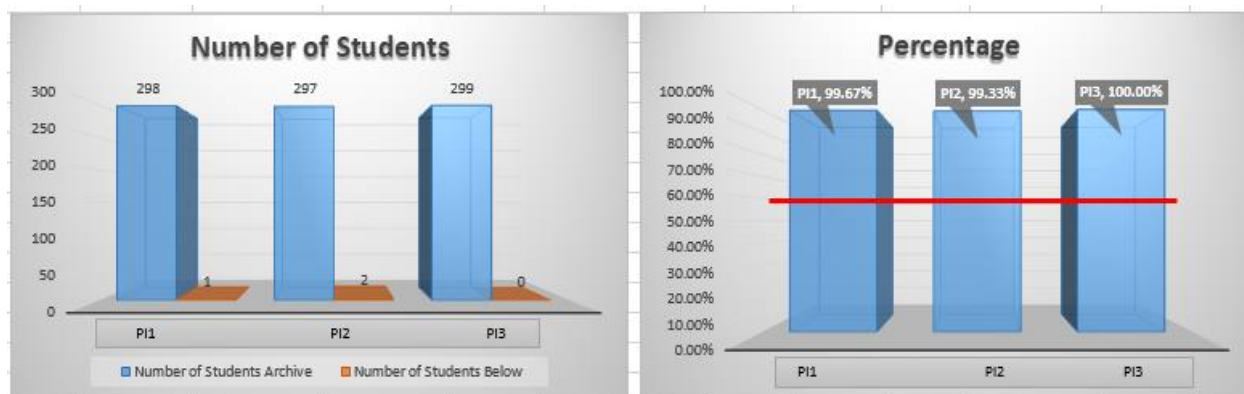


Fig. 6. Results of Internship or Graduation project assessment

Assessment Results Summary: The expected target for all PIs are at least 60% of the students reaching the satisfactory (passed) level. The results showed that students achieved satisfactory level for PI1, PI2, and PI3 (99.7%, 99%, and 100% respectively).

Evaluation on PIs:

- PI1: According to the requirement to actively participate in learning about works of enterprises, the supervisor evaluated that FAET students actively joined in the work at enterprises. This demonstrated students' awareness and self-learning ability and inquiry.
- PI2: This result demonstrated that the study program of the FAET fit to practical directions as well as students after graduation can meet the employment needs of enterprises.
- PI3: The use of specialized devices as well as software at the enterprise during the internship was assessed by enterprises as satisfactory because they always took the initiative in learning and finding out new devices. Through this assessment, students' self-learning ability was very good. They completely can meet the requirements of enterprises after 02 months of actual working.

2.4.4. Surveys

The question in the survey asked students to share their opinion on archiving of ELO d after finishing the program “At the time of graduation, you are be able to utilize specialized skills and tools to solve automotive problem”. The survey used Likert scale (5 levels of satisfaction) to get information from the students. The result is shown in the chart bellowed.

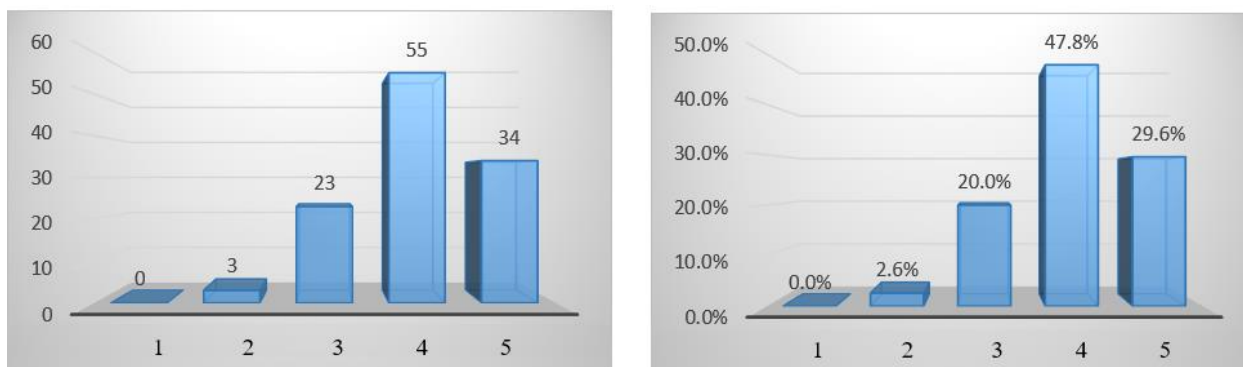


Fig. 7. Results of survey [5].

The result shows that over 98% students confirmed that they achieve the ELO d. Such a high number of student’s satisfaction showed the quality output of the program throughout year 1 to year 4 with the improvement of teaching and learning, assessment and evaluation of students’ outcomes.

3. CONCLUSION

The results of Course-embedded assessment let the program team find out the areas of strength and weakness of students. Based on these results, the team has plan for students to improve their skill, before sending for internship. In this case, the results showed that PI3, with skill “Solve car damages by using some searching/diagnostics software and specialized equipment”, achieved less target than the others. Realizing this problem, the program team communicated with students of years 3. The information reached to students, so that they had plan to improve this skill during summer vacation of year 3, before taking the internship in year 4.

The results of Internship or Graduation project assessment once again proved the improvement of students. As the enterprise assessed students during internship period, PI 3 had reached 100% students’ achievement. This result indicated that the strategies which program team had made to help students during summer vacation was appropriate and enhance the outcome of the program.

Students perform better when they get feedback on their performance to know their areas of strength and weakness and what they need to do to improve. Students perform even better when they know the relevance of what they are learning to their future careers and personal lives. Not to mention, students are informed only about their assessment and evaluation results, not about the ELOs measurement process to make sure the objectives of continous improvement.

Collecting data is always a main problem to program outcomes measurement. As one study program might have more than an ELO, the key point in measuring number of ELOs is to set suitable and reliable Assessment Metrics and Methods. It is suggested the Program Commette to define and verify Assessment Metrics and Methods before their implementation to study program.

Later on, this ELOs measurement methodology was also implemented for other study programs that have been successfully certified by AUN-QA in August 2019. This proved that OBE implementation with VQF references at IUH is step by step expanded to all the study programs.

AKNOWLEDGMENT

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ĐO LƯỜNG CHUẨN ĐẦU RA CHƯƠNG TRÌNH ĐÀO TẠO THEO MÔ HÌNH CHẤT LƯỢNG CỦA AUN-QA TẠI TRƯỜNG ĐẠI HỌC CÔNG NGHIỆP THÀNH PHỐ HỒ CHÍ MINH

Tóm tắt. Dạy học theo chuẩn đầu ra (OBE) được triển khai tại Trường Đại học Công nghiệp Thành phố Hồ Chí Minh (IUH) dựa trên nguyên tắc đảm bảo chất lượng đầu ra (ELOs) của sinh viên khi hoàn thành các khóa học. Mục đích chính của việc đào tạo OBE là đáp ứng các yêu cầu của các bên liên quan, trong đó, quan trọng nhất là nhà tuyển dụng. Do đó, đo lường mức độ đạt được chuẩn đầu ra của sinh viên tại thời điểm tốt nghiệp sẽ giúp các chương trình đào tạo có cơ sở củng cố mô hình dạy học này. Căn cứ vào kết quả đo lường, các chương trình sẽ có kế hoạch cải tiến liên tục quá trình đào tạo. Đo lường mức độ đạt được chuẩn đầu ra cấp độ chương trình đào tạo tập trung tìm kiếm câu trả lời cho các câu hỏi: “Khi nào thu thập dữ liệu? Ai thu thập dữ liệu? Thu thập từ đâu? Nhận xét kết quả như thế nào?” Bài viết này cung cấp một ví dụ về đo lường chuẩn đầu ra chương trình đào tạo tại IUH.

Từ khóa. Đào tạo theo chuẩn đầu ra; OBE; chuẩn đầu ra; ELO; đo lường; đánh giá; chỉ số hiệu năng; PI; AUN-QA.

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