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Indirect Assessment of Program Student Outcomes Through Student's Learning Experiences at the Faculty of Engineering

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ABSTRACT
This paper is to investigate the relationship between the learning experiences of students and achieving program student outcomes (PSOs) based on ABET Accreditation of undergraduate study programs at the Faculty of Engineering Universitas Andalas. A questionnaire consisted of seven PSOs, which represent learning experiences of student's knowledge, skills, and behavior in 21 questions that were distributed to 177 students. It is found that the learning experiences of students in achieving PSOs between males and females were different except for the ability of students in communication, teamwork skills, and experimentation. Civil and Mechanical Engineering students have the highest achievement of PSOs through their learning experiences.

Keywords: *Learning experiences, Program students outcomes, Indirect assessment*

1. INTRODUCTION

Program student outcomes (PSOs) are defined as the knowledge, skills, abilities, or attitudes that students have at the end of their study before getting a degree or certificate. Study programs have generated PSOs based on the requirements of internal and external stakeholders. In engineering programs, PSOs have been established by the Engineering Accreditation Commission (EAC) of the Accreditation Board for Engineering and Technology (ABET), which is consisted of seven PSOs [1]. Faculties try to design the teaching and learning process to make sure that PSOs can be achieved by students after their learning. The humanistic education theory states that (1) the learners' perceived meaningfulness of a learning experience as an essential measure of the educational outcomes, and that (2) the leaners are a legitimate evaluator of his learning. A course, perceived meaningfulness, and value are related to the perceived learnings in the cognitive- subject matter, affective-personal, and behavioral domain [2,3]. According to [4,5,6] the quality of learning outcomes is determined by the approaches to learning. The study conducted by [6] with nursing students shows that the deep approach of learning leads to better quality learning outcomes. Based on the student's perception, the deep approach was associated with excellent teaching, choice of ways to learn, openness to the views of students, and the student center learning could encourage a deep approach to learning [7].

To make sure that students can achieve the PSOs, study programs might conduct the assessment. Assessment is conducted not only to measure student achievement of PSOs [8] but also to prepare for further study in the program, to encourage and document faculty dialogue about student learning and achievement, to help faculty with program improvement, and to communicate and clarify our expectations to students. PSOs can be assessed in many ways, such as assessment trough linked course level outcomes (CLOs), where faculty might assess PSOs in a capstone project and could assess development a set of skills of students. These kinds of assessments are based on direct evidence of student learning, which we called direct assessment methods [9]. This method is tangible, visible, and measurable and tends to be more compelling evidence of exactly what students have and have not learned.

In the other hand, indirect assessments of student learning ascertain the perceived extent or value of learning experiences. Amongst indirect methods are surveys, exit interviews, focus groups, and the use of external reviewers. They assess opinions or thoughts about student knowledge or skills. Indirect measures can provide information about student perception of their learning and how this learning is valued by different constituencies [10]. An indirect assessment is useful in that it can be used to measure certain implicit qualities of student learning, such as values, perceptions, and attitudes, from a variety of perspectives [11]. However, in the absence of direct evidence, assumptions must be made about how well perceptions match the reality of the actual achievement of student learning. Indirect methods can flesh out areas that direct assessments cannot capture.

1.1. Learning Experience

Based on experiential learning theory, it says that learning as a process whereby knowledge is created through the transformation of experience [11]. Learning experience refers to any interaction, course, and program. Learning experience not only occurs in the classroom and outdoor environments, but also it includes students learning from teachers and professors or through games and interactive software applications. Besides that, learning experience may also be used to reinforce the goal of an educational interaction of learning.

The use of the term learning experiences is growing that reflects larger pedagogical and technological shifts. In the design and delivery of education to students, the shifts have occurred; new technologies have dramatically multiplied and diversified how students can learn from and interact with educators and learning independently through the learning management system (LMS). Students can use software programs, videos created by teachers, apps, and educational games to learn on their own time and their own pace. Listening to a lecture, reading a book, and completing homework are ways learning experiences in the past, but students are now learning in a different way and a wide variety of outside of the school of setting, such as internship and volunteer activities.

1.2. Assessment Methods

Assessment of student outcomes in higher education involves a variety of methods, such as direct, indirect, quantitative, and qualitative, to measure students' achievement and provides adequate feedback to the program to identify strengths and weaknesses of the curriculum [12]. In general, there are two types of assessment: direct and indirect. Direct assessment is the evaluation of student work or performance, for example, exams, reports, presentations. Indirect assessment is the evaluation of data that would imply achievement without directly observing the student or students' work product, for example, student self-assessment, employer focus groups, or retention, graduation, and placement rates.

At the program level and at the course level, both direct and indirect assessment requires a significant effort on the part of faculty, and it is often difficult to leverage the data to test the impact of curricular innovations over time. Curricular workgroups were engaged in course-based direct assessment and how the process was utilized to achieve consistency amongst courses taught by different educators. That effort was successful in developing a documented process, and this process was being used at the course level to track improvements overtime at the course level. However, as evidence of student learning, indirect measures are not as strong as direct measures because assumptions must be made about what precisely the self-report means. If students report that they have attained a particular learning outcome, how can that report be validated?. An indirect assessment is useful in that it can be used to measure certain implicit qualities of student learning, such as values, perceptions, and attitudes, from a variety of perspectives [9]. However, in the absence of direct evidence, assumptions must be made about how well perceptions match the reality of the actual achievement of student learning.

It is important to remember that all assessment methods have their limitations and contain some bias. A meaningful assessment program would use both direct and indirect assessments from a variety of sources (students, alumni, faculty, employers, etc.). This use of multiple assessment methods provides converging evidence of student learning. Indirect methods provide a valuable supplement to direct methods and are generally a part of a robust assessment program [9].

1.3. Program Student Outcomes

Program student outcomes (PSOs) describe what students are expected to know and able to do by the time of graduation (skills, knowledge, and behaviors). The engineering study programs of Universitas Andalas have adopted PSOs of ABET (1) to (7) for their program student outcomes, as listed in Table 1.

1.4. Performace Indicators

Each PSOs is associated with two or more performance indicators (PIs) describing the characteristics, skills, knowledge, attitudes, and/or values that students exhibit to demonstrate achievement of the PSOs. PIs are a means for faculty to articulate the program-specific interpretation of each ABET outcome relative to the engineering study programs at the faculty of engineering Universitas Andalas and are not additional criteria that students must meet. The achievement of PSOs is accomplished by the successful demonstration of at least one performance indicator. The list of PIs presented in Table 2 was informed by learning activities and course learning outcomes of individual courses in the engineering study programs at Universitas Andalas. It is anticipated that PIs may change over time as part of the continuous improvement process. The assessment system is designed to incorporate changes in PIs without diminishing our ability for longitudinal assessment of PSOs achievement.

In this paper, we investigated how to make sure that the program student outcomes (PSOs) can be achieved by students through their learning experiences as long as the learning process. This study based on a survey carried out to engineering students at the Faculty of Engineering Universitas Andalas.

Table 1 PSOs of engineering study programs

No.	**Program Student Outcomes (PSOs) [1]**	**Skills, Knowledge, and Behaviour**
1.	an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	Engineering foundation and complex problem solving
2.	an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	Design
3.	an ability to communicate effectively with a range of audiences	Communication
4.	an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	Professional responsibility and broad education
5.	an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	Teamwork
6.	an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	Experimentation
7.	an ability to acquire and apply new knowledge as needed, using appropriate learning strategies	New knowledge

Table 2 Performance indicators (PIs) for each program student outcomes (PSOs)

No.	**Skills, Knowledge, and Behaviour**	**Performance Indicators (PIs)**
1.	Engineering Foundation Complex and problem solving	a. Students are able to use math to solve problems in the engineering field. b. Students are able to use engineering science in formulating a problem in the field of engineering. c. Students are able to solve and formulate a complex problem.
2.	Design	a. Students are able to do a design concept by considering health, safety, welfare, global, cultural, environmental, economic factors b. Students are able to Functional decomposition c. Students demonstrate the ability to create a prototype and to do tests.

3.	Communication	a. Students are able to create graphical things to explain something in the engineering field. b. Students demonstrate the ability to do an oral presentation. c. Students are able to make a technical report
4.	Professional responsibility and broad education	a. Students are able to use code and standard when they design b. Students are able to show their professional responsibility as an engineer. c. Students are able to show their awareness by considering impact engineering solutions in global, economic, environmental, and societal contexts.
5.	Teamwork	a. Students are able to work in project planning and show their leadership. b. Students are able to contribute and interact in teamwork with their colleagues in solving engineering problems. c. Students are able to use new tools in solving engineering problems or projects.
6.	Experimentation	a. Students are able to design and build an experimentation b. Students are able to conduct an experiment c. Students are able to analyze and interpret data.
7.	New knowledge	a. Students are able to know the current event of the engineering field. b. Students demonstrate the abilities to study in independent learning c. Students are able to know the emerging technologies in the engineering field.

3. METHODS

A cross-sectional study was used to measure of achieving PSOs through student's learning experiences as long as the learning process at the faculty of engineering Universitas Andalas. A survey-based on the perception of students regarding their learning experiences was developed to make sure that POs are achieved. The students were asked to choose a number on a scale from 1-7: 1 as least favorable, 7 as most favorable.

The research hypotheses for this research are as follows:

H1: There are differences between males and females in achieving PSOs through their learning experiences

H2: There are differences amongst study programs in achieving PSOs through their learning experiences

H3: Which PSOs are different amongst study programs in achieving PSOs through their learning experiences

3.1. Sampling

The sample included 177 students from five study programs (Mechanical Engineering, Civil Engineering, Industrial Engineering, Electrical Engineering, and Environmental Engineering) at the Faculty of Engineering Universitas Andalas. All students, at least in the 8th semester who were active in odd semester Y2019/2020 were asked to participate. Of the 707 students, 177 (25,05%) agreed to take part and completed the questionnaire that met our quality criteria for inclusion in the final sample. The respondence included more males (62.15%) than females and consisted of 65 Mechanical Engineering students, 30 Civil Engineering students, 29 Industrial Engineering students, and 28 Environmental Engineering students.

3.2. Reability and Validity Analysis

To guaranty that the instrument is reliable, the reliability and validity analysis were conducted. The reliability of the experiment is achieved when an experiment gives the same results repeatedly [13]. From the analysis, the value of Cronbach's coefficient was 0,93, and according to Murphy and Balzer [14], the value of Cronbach's coefficient of above 0.7 is considered suitable and reliable.

4. RESULTS AND DISCUSSION

4.1. Demografic Profiles and Frequency

The number of students in the population, Frequency, and percent of each of the demographic features are shown in Table 3. The total respondents were 177 students who come from 5 study programs. 62.15 % of the total respondents were male, and 37.85% were female.

This research was conducted using a structured questionnaire with 21 questions to measure student's perceptions of their learning experiences. The learning experiences of students are measured to achieve PSOs, which have three dimensions, namely: skill, knowledge, and behavior. All of the PSOs were covered with 21 questions which represent performance indicators, and the structure of the questionnaire is shown in Table 4.

Table 3 Demographics of survey respondent

Demographic features	Demographic features	Frequency	Percent
Study Programs:			
1. Mechanical Engineering	159	65(8)	36.72%
2. Civil Engineering	205	30(14)	16.95%
3. Industrial Engineering	108	29(8)	16.38%
4. Electrical Engineering	143	25(19)	14.13%
5. Environmental Engineering	92	28(18)	15.82%
Total	**707**	**177(67)**	**100.00%**
Gender:			
1. Male	456	110	62.15%
2. Female	251	67	37.85%
Total	**707**	**177**	**100.00%**

Table 4 PSOs consisted of skill, knowledge, and behavior and questions in the questionnaire

No.	PSOs (Skills, Knowledge, and Behaviour)	Questions
1.	Engineering foundation and complex problem solving	1 - 3
2.	Design	4 - 6
3.	Communication	7 - 9
4.	Professional responsibility and broad education	10 - 12
5.	Teamwork	13 - 15
6.	Experimentation	16 - 18
7.	New knowledge	19 - 21

4.2. Results of Learning Experiences in Achieving PEOs Based on Sex

The perception of students in achieving PEOs based on learning experiences between males and females was compared by using a t-test. Table 5 shows that there are significant differences obtained between males and females in achieving PEOs with p = 0,028. The average total PSOs achievement of the male is higher than that of the female where male are 5,54 while female are 5,29.

If we saw more detail from PSOs were consist of 7 SOs. In general, the PSOs can be grouped in skill, knowledge, and behavior. From Table 6, we can see that SO3, SO5, and SO6 are no differences in the learning experiences of students between males and females with p > 0,05. It means that communication ability (SO3) and teamwork (SO5) well-knowns as skills are no differences between males and females. The otherwise cognitive ability of males was higher than that of females.

From Table 7, it shows that on SO1, only PI 3 was not significantly different between male and female. The same cases in SO2 and SO4, where PI 4 and PI 10, respectively, were not significant based on sex with p > 0,05.

Table 5 The average total of achieving PSOs based on sex

Program Student Outcomes (PSOs)	**Male**	**Female**	***p***
Total	5,54 ± 0,71	5,29 ± 0,76	0,028

Table 6 The average of each PSOs based on sex

Student Outcomes	**Male**	**Female**	***p***
SO 1	5,51 ± 0,754	5,18 ± 0,836	0,007
SO 2	5,15 ± 1,012	4,66 ± 1,102	0,003
SO 3	5,95 ± 0,917	6,02 ± 0,756	0,624
SO 4	5,54 ± 0,921	5,18 ± 0,945	0,013
SO 5	5,73 ± 0,839	5,72 ± 0,877	0,919
SO 6	5,38 ± 1,106	5,19 ± 0,997	0,246
SO 7	5,51 ± 0,937	5,08 ± 0,929	0,004

Table 7 The average of each PIs based on sex

Performance Indicators (PIs)	**Male**	**Female**	***p***
PI 1	5,41 ± 1,025	5,04 ± 1,224	0,035
PI 2	5,55 ± 0,797	5,18 ± 1,086	0,009
PI 3	5,58 ± 1,128	5,33 ± 1,006	0,133
PI 4	5,35 ± 1,154	4,99 ± 1,331	0,053
PI 5	5,06 ± 1,152	4,58 ± 1,304	0,011
PI 6	5,03 ± 1,337	4,40 ± 1,346	0,004
PI 7	6,11 ± 0,932	6,30 ± 0,817	0,172
PI 8	5,85 ± 1,195	5,79 ± 0,962	0,713
PI 9	5,90 ± 1,108	5,97 ± 0,969	0,669
PI 10	5,40 ± 1,175	5,15 ± 1,184	0,171
PI 11	5,75 ± 0,999	5,24 ± 1,156	0,002
PI 12	5,48 ± 1,139	5,15 ± 1,062	0,055
PI 13	5,99 ± 0,873	5,96 ± 1,079	0,810
PI 14	5,71 ± 0,961	5,61 ± 1,141	0,545
PI 15	5,49 ± 1,147	5,58 ± 1,032	0,595
PI 16	5,15 ± 1,141	5,00 ± 1,101	0,542
PI 17	5,53 ± 1,224	5,31 ± 1,131	0,248
PI 18	5,46 ± 1,055	5,25 ± 1,035	0,198

PI 19	5,69 ± 1,011	5,27 ± 1,009	0,008
PI 20	5,35 ± 1,184	4,93 ± 1,132	0,021
PI 21	5,50 ± 1,155	5,06 ± 1,127	0,014

4.3. Results of Learning Experiences Based on Study Programs

The research used a one-way ANOVA test to investigate what the average total learning experiences of PEOs were impacting on study programs. Before one-way ANOVA test was conducted, the homogeneity test was conducted first. The result of the homogeneity test ($p > 0,05$) shows that the data distribution of the group was normal. Table 8 shows the results of a one-way ANOVA test. Civil Engineering has the highest average total of PSOs, whereas Industrial Engineering has the lowest one. There were significant differences in the average total of PEOs amongst study programs with $p < 0,003$.

If we see more detail for each PSOs as shown in Table 9, SO3, SO5, and SO7 were not different amongst study programs with $p > 0,05$. It means that soft skills ability (communication and teamwork skills) and experimentation of students were not significant differences.

Table 10 shows 21 PIs that represent the learning experiences of students. From the table, it shows that PI 7, PI 8, PI 9, PI 13, PI 14, PI 20, and PI 21 were not different amongst study programs.

Table 8 The average total of PSOs based on study programs

PSOs	Mechanical Eng.	Civil Eng.	Electrical Eng.	Industrial Eng.	Environ. Eng.	*p*
Total	5,62 ± 0,69	5,71 ± 0,93	5,21 ± 0,58	5,19 ± 0,66	5,25 ± 0,63	0,003

Table 9 The average differences of each PEOs based on study programs

PSOs	Mechanical Eng.	Civil Eng.	Electrical Eng.	Industrial Eng.	Environ. Eng.	*p*
SO1	5,61 ± 0,73	5,62 ± 1,04	5,17 ± 0,63	5,01 ± 0,73	5,21 ± 0,66	0,001
SO2	5,33 ± 1,00	5,23 ± 1,18	4,64 ± 0,97	4,63 ± 1,16	4,45 ± 0,70	0,000
SO3	6,04 ± 0,86	6,01 ± 1,00	5,76 ± 0,85	5,97 ± 0,67	6,02 ± 0,91	0,734
SO4	5,53 ± 0,85	5,87 ± 1,14	4,93 ± 0,87	5,16 ± 0,83	5,30 ± 0,88	0,002
SO5	5,87 ± 0,84	5,92 ± 0,99	4,45 ± 0,70	5,59 ± 0,83	5,57 ± 0,79	0,105
SO6	5,48 ± 1,01	5,70 ± 1,22	5,27 ± 0,71	4,83 ± 1,20	5,01 ± 0,92	0,007
SO7	5,46 ± 0,89	5,58 ± 1,12	5,25 ± 0,85	5,12 ± 1,01	5,17 ± 0,91	0,242

Table 10 Differences average of each PIs based on study programs

PIs	Mechanical Eng.	Civil Eng.	Electrical Eng.	Industrial Eng.	Environ. Eng.	*p*
PI 1	5,63 ± 0,86	5,23 ± 1,50	5,28 ± 0,74	4,72 ± 1,31	5,04 ± 1,12	0,004
PI 2	5,54 ± 0,79	5,63 ± 1,25	5,00 ± 0,82	5,31 ± 1,04	5,36 ± 0,73	0,082
PI3	5,66 ± 1,09	6,00 ± 1,08	5,24 ± 0,97	5,00 ± 1,10	5,25 ± 0,89	0,002
PI 4	5,46 ± 1,05	5,50 ± 1,57	4,56 ± 1,26	5,17 ± 1,34	4,96 ± 0,84	0,013
PI 5	5,18 ± 1,21	5,30 ± 1,26	4,56 ± 0,92	4,59 ± 1,34	4,32 ± 1,02	0,002
PI 6	5,34 ± 1,30	4,90 ± 1,52	4,80 ± 1,08	4,14 ± 1,53	4,07 ± 1,09	0,000
PI 7	6,20 ± 0,87	6,47 ± 0,94	5,96 ± 0,94	6,14 ± 0,74	6,07 ± 0,98	0,276
PI 8	5,86 ± 1,10	5,80 ± 1,24	5,64 ± 1,11	5,79 ± 1,11	6,00 ± 0,90	0,831

PI 9	6,05 ± 0,99	5,77 ± 1,36	5,68 ± 0,90	5,97 ± 0,98	6,00 ± 1,05	0,552
PI 10	5,45 ± 1,12	5,90 ± 1,30	4,76 ± 1, 05	5,07 ± 1,10	5,07 ± 1,12	0,002
PI 11	5,68 ± 0,97	5,97 ± 1, 16	5,16 ± 1,14	5,21 ± 1,08	5,54 ± 1,07	0,021
PI 12	5,46 ± 1,03	5,73 ± 1,31	4,88 ± 0,93	5,21 ± 1,24	5,29 ± 1,01	0,056
PI 13	6,12 ± 0,84	6,13 ± 1,22	5,84 ± 0,75	5,83 ± 1,04	5,75 ± 0,93	0,273
PI 14	5,8 ± 0,94	5,77 ± 1,36	5,44 ± 0,71	5,52 ± 1,21	5,64 ± 0,87	0,529
PI 15	5,68 ± 1,15	5,87 ± 1,25	5,08 ± 1,15	5,41 ± 0,91	5,32 ± 0,82	0,049
PI 16	5,38 ± 1,25	5,43 ± 1,48	5,08 ± 0,91	4,45 ± 1,45	4,75 ± 1,24	0,006
PI 17	5,57 ± 1,17	5,87 ± 1,41	5,40 ± 0.76	5,00 ± 1,28	5,21 ± 1,07	0,046
PI 18	5,51 ± 0,95	5,80 ± 1,10	5,32 ± 0,95	5,03 ± 1,18	5,07 ± 1,02	0,021
PI 19	5,57 ± 0,92	6,03 ± 1,07	5,60 ± 1,00	5,10 ± 1,11	5,29 ± 0.98	0,006
PI 20	5,42 ± 1,10	5,40 ± 1,35	4,80 ± 1,19	5,07 ± 1,19	4,89 ± 1,03	0,085
PI 21	5,40 ± 1,21	5,30 ± 1,37	5,36 ± 0.99	5,21 ± 1,05	5,32 ± 1,12	0,964

4.4. Results of a Significant difference in achieving PSOs amongst Study Programs

To investigate the differences in total average in achieving PSOs amongst study programs, an analysis statistic was used by using Tukey's HSD (honestly significant difference) test. It is found that the total average in achieving PSOs of Civil Engineering was different from Industrial engineering and Electrical engineering (Table 11); otherwise, the total average in achieving PSOs was not different amongst Civil Engineering, Mechanical Engineering, and Environmental Engineering.

Investigation of more detail in achieving SOs, Turkey's HSD test was conducted for each SO, as shown in Table 12. From 7 SOs, only SO3 and SO7 were not significantly different amongst study programs. Industrial engineering's student was still low in achieving SO1, SO3, and SO5, whereas Environmental Engineering's student and Electrical Engineering's student were low in achieving SO2 and SO4, respectively.

Table 11 Tukey's HSD test for total average in achieving PSOs

Study Programs	**N**	**Sub set for alpha = 0,05**	
		1	**2**
Industrial Engineering	29	5,19	
Electrical Engineering	25	5,21	
Environmental Engineering	28	5,25	5,25
Mechanical Engineering	65	5,62	5,62
Civil Engineering	30		5,71
Sig.		**0,123**	**0,085**

4.5. Discussion

Based on the investigation, males and females were different learning experiences in achieving of PSOs and the same case with a study program where PEOs average were different amongst study program. It is shown that students do not all learn the same thing on the same day in the same way. This is a challenge for faculties to know students well enough to cater to their varying needs in the classroom [15]. To accomplish this situation, faculties should explore differentiated instructional strategies to enhance student learning experiences [16]. Tomlinson [17] describes differentiated instruction as a deliberate and conscious method of planning and teaching to address student variance and addresses the varied learning needs of students with the view of maximizing the potential of each learner.

The ability of females through their learning experiences in achieving PSOs was not different from males in communication, teamwork skills, and experimentation. Learning experiences of males were still dominant in engineering foundation and engineering complex design, design, professional responsibility and broad education, and new knowledge. It is shown that male students are better at engineering knowledge than female students. According to [18] sex-related differences in cognitive, especially in math, were small.

Amongst study programs at the Faculty of Engineering, there were no differences in achieving SO3, SO5, and SO7 through their learning experiences. Otherwise, for S01, S02, S04, and SO6, there were significantly different, especially for Industrial, Electrical, and Environmental engineering study programs. Faculties in three study programs could increase student achievement for SO1, SO2, and SO6 through student center learning methods for increasing the experiences of students. Even if the indirect assessment does not measure directly specified learning outcomes and is not direct in nature, one must not rush to judgment that the assessment is, therefore, indirect and is assessing learning [9].

Table 12 Tukey's HSD test for significantly different SOs amongst study programs

Student outcomes	Study Programs	N	Sub set for alpha = 0,05	
			1	2
SO1	Industrial Engineering	29	5,01	
	Electrical Engineering	25	5,17	5,17
	Environmental Engineering	28	5,21	5,21
	Mechanical Engineering	65		5,61
	Civil Engineering	30		5,62
	Sig.		**0,831**	**0,144**
SO2	Environmental Engineering	28	4,52	
	Industrial Engineering	29	4,63	4,63
	Electrical Engineering	25	4,64	4,64
	Civil Engineering	30		5,23
	Mechanical Engineering	65		5,33
	Sig.		**0,949**	**0,056**
SO4	Electrical Engineering	25	4,93	
	Industrial Engineering	29	5,16	
	Environmental Eng.	28	5,30	5,30
	Mechanical Engineering	65	5,53	5,53
	Civil Engineering	30		5,87
	Sig.		**0,076**	**0,099**
SO6	Industrial Engineering	29	4,83	
	Environmental Engineering	28	5,01	5,01
	Electrical Engineering	25	5,27	5,27
	Mechanical Engineering	65	5,49	5,49
	Civil Engineering	30		5,70
	Sig.		**0,091**	**0,069**

5. CONCLUSION

Learning experiences of Faculty of Engineering's students in achieving PSOs were different between males and females. Females were still low to attain SO1, SO2, SO4, and SO6. Educators should encourage females in the class and find innovation in teaching and learning for them. The total average of achieving PSOs were no differences between Civil Engineering, Mechanical Engineering, and Environmental Engineering. Industrial Engineering was low in achieving SO1, SO4, and SO6, whereas Electrical Engineering and Environmental Engineering were low in achieving SO4 and SO2, respectively, through their experiences. It can be noted for faculties at the study programs to increase and develop innovation in teaching and learning methods. Even though indirect assessment methods do not measure specified learning outcomes, but they are assessment about learning.

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