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Graduates' Perspective & Assessment of Program Learning Outcome (PLO) of Electrical Engineering Department Based on Exit Survey at Sultan Idris Shah Polytechnic (PSIS)

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Abstract: The graduate survey's objective is to gather student thoughts and impressions of the program's learning outcomes rather than having being evaluated by the faculty. Additionally, this survey can be used to evaluate Sultan Idris Shah Polytechnic's Department of Electrical Engineering's (JKE) educational standards and pinpoint areas for program enhancement. 181 respondents are included in the sample; they completed the survey in session 1 in 2021/2022 and December 2020. In order to gauge how well the program learning outcomes (PLOs) for the Electrical Engineering Department were achieved from the graduate perspective and to determine how they were perceived in terms of the facilities and resources offered, a set of questionnaires was prepared. The medium for collecting the responses is a Google form. The survey was divided into three sections: demographic data, 12 program learning outcome (PLOs) achievements from the graduate perspective, and students' perceptions of the facilities and resources provided the data gathered was analysed using descriptive analysis. Results indicate that upon graduation, all 12 PLOs were successfully completed with high and extremely high scores. It is possible to compare the findings of this survey to those of the faculty (through formal assessment by the department). The results also demonstrate that most respondents are content with the resources and facilities provided by the Department of Electrical Engineering (JKE) at Sultan Idris Shah Polytechnic (PSIS). However, the study suggests that graduates would prefer if the institution of higher learning had a more reliable internet connection on campus.

Keywords: Electrical Engineering, Exit Survey, Program Learning Outcome, Graduates Perspective

1. Introduction

The graduate survey is a method of obtaining information about the quality and success of the program from the perspective of graduates after they have completed their studies. Graduate survey is also known as an exit survey. This survey refers to an indirect measurement method of students' self-evaluation or individual perception for the assessment of qualities as prescribed in PLOs, which was conducted upon graduation (Taib, Salleh, Zain, Azlan, Mahzan, Hafeez, Ong, Ahmad, A Rahman, Nasir, Azmi, & Ngali,2017). The purpose of this survey is to gather impressions of the program learning outcome from the student's point of view. This kind of survey will serve as a key point in reviewing and improving the program and education for the attainment of industrial needs. This study examines the Program Learning Outcomes (PLOs) and perception of students on facilities and resources offered in the Electrical Engineering Department (JKE) of Sultan Idris Shah Polytechnic (PSIS).

The Electrical Engineering Department at Sultan Idris Shah Polytechnic offers two programs: A diploma in Electronic Engineering (Computer) (DTK) and Diploma in Electronic Engineering (Communication) (DEP). The main aim of the programs is to educate individuals to be resourceful and adaptable technicians in supporting the nation's aspiration of providing engineering talent. Both programs are established to produce balanced TVET graduates. Previously in PSIS, both programs (DTK and DEP) are being reviewed, assessed, and certified by the Malaysian Qualification Agency (MQA) to assuring the quality and standard of education (programs) offered. In 2019, changes have been made to Engineering Programs offered, and all engineering programs in PSIS are being reviewed by *Engineering Technology Accreditation Council* (ETAC). It is being suggested by the ETAC reviewer in the year 2019 to also assess the PLOs through the indirect method along with the direct method in evaluating the program.

In practice, DTK and DEP PLOs are being assessed through direct methods through formative assessments throughout the semesters: quizzes, tests, practical works, end-of-chapters, and practical tests. Together with the formative assessments, summative assessments are also being implemented at the end of each semester through final examinations. The standard weightage used for formative and summative assessments in DTK and DEP is 60:40. It is being discussed that exams, quizzes, assignments, and projects have been used for direct outcome assessment (Tooba, 2017). The combinations of course work such as quizzes, exams, projects, reports, presentations, and homework are the direct assessments of course learning outcome (CLO) which the students are required to fulfill to complete each of the courses, whereby attaining these CLOs, is directly linked to PLOs via performance indicators. (Ghaly, 2019)

In contrast, the indirect PLOs evaluation achievement is made through an exit survey, end-of-course survey, and industrial training (Mohammad & Zaharim, 2012). It is considered that the senior/graduates exit survey is one of the indirect assessment tools to evaluate PLOs (Othman et al., 2011). The exit survey provides information on graduate achievement and perception based on PLOs, the student career perception, and the relationship between students' lecturers (Khamis, Tahir, Wahid, Sabri, & Ihsan, 2013). Besides that, course evaluation surveys, alumni surveys, and employer surveys are known as indirect PLOs assessments. An indirect method of assessing PLOs is through industry surveys, graduates exit surveys, and external panels' evaluation (Taib et al., 2017; Ghaly, 2019)

Both direct and indirect methods are required in determining the achievement of PLOs in Electrical Engineering programs (Alzubaidi, 2016). The result of the PLOs assessment determines the student's strengths and weaknesses to formulate strategies to improve the program offered (Rogers, 2006). Taib et al. (2017) share the same perspective, PLOs evaluation contributes to continuous quality improvement for the education provider in pre-determined aspects. The students' feedback involving the final semester students which is known as the exit survey is valuable information to improve an academic program (Takriff, Abdullah, Mohammad & Anuar, 2011). Thus, the information generated from the survey is resourceful for the continuous quality improvement of an educational program.

On the other hand, campus facilities contribute to the success of the program offered. Students' opinions regarding how the educational process is organized, the learning support resources available, and the learning environment reflect how satisfied they are with their education (Harvey,2003). Continuous education quality improvement can be done through graduate surveys, which is collected in higher education institutions (Razinkina, Pankova, Trostinskaya, Pozdeeva, Evseeva, & Tanova, 2018). Student surveys are regularly conducted to track student satisfaction with the educational system because the quality of educational services contributes to the educational institution's competitiveness.

Consequently, as one of the initiatives for continuous quality improvement for DTK and DEP, students' feedback is collected among final-year students through an exit survey. The survey (questionnaires) is an effective evaluation method to measure the strength of the education program and is important for curriculum improvement which provides students' feedback on the achievements as well as on the satisfaction level of the education provider upon graduation (Othman et al, 2010). Parallel to this, Ahmad and Khoon (2010) say graduates' reflection on their education system and achievement indicates the level of the university's program, as well as becoming a benchmark for improvement in the future.

1.1 Program Learning Outcome (PLO)

The electrical Engineering Course offered in PSIS possesses 12 areas of knowledge and skills which comprise knowledge in engineering practices (PLO1); problem analysis skills (PLO2); designing/developing solutions (PLO3); investigating skills (PLO4); ability to apply engineering tools (PLO5); the engineer skills and society (PLO6); sustainability and environmental responsibilities (PLO7); professional ethics (PLO8); ability to function as individual and as a team (PLO9); effective communication (PLO10); ability to handle projects (PLO11); and undertake lifelong learning (PLO12). These twelve components are properly embedded and written in all twelve PLOs of the program.

Table 1: Program Learning Outcome

PLO	Program Learning Outcome
PLO 1	Apply knowledge of applied mathematics, applied science, engineering fundamentals, and an engineering specialisation as specified in DK1 to DK4 respectively to wide practical procedures and practices;
PLO 2	Identify and analyse well-defined engineering problems reaching substantiated conclusions using codified methods of analysis specific to their field of activity (DK1 to DK4);
PLO 3	Design solutions for well-defined technical problems and assist with the design of systems, components, or processes to meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations (DK5);
PLO 4	Conduct investigations of well-defined problems; locate and search relevant codes and catalogues, conduct standard tests and measurements;
PLO 5	Apply appropriate techniques, resources, and modern engineering and IT tools to well-defined engineering problems, with an awareness of the limitations (DK6);
PLO 6	Demonstrate knowledge of the societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to

	engineering technician practice and solutions to well-defined engineering problems (DK7);
PLO 7	Understand and evaluate the sustainability and impact of engineering technician work in the solution of well-defined engineering problems in societal and environmental contexts (DK7);
PLO 8	Understand and commit to professional ethics and responsibilities and norms of technician practice;
PLO 9	Function effectively as an individual, and as a member of diverse technical teams;
PLO 10	Communicate effectively on well-defined engineering activities with the engineering community and with society at large, by being able to comprehend the work of others, document their work, and give and receive clear instructions;
PLO 11	Demonstrate knowledge and understanding of engineering management principles and apply these to one's work, as a member or leader in a technical team and to manage projects in multidisciplinary environments;
PLO 12	Recognize the need for, and have the ability to engage in independent updating in the context of specialized technical knowledge;

These 12 PLOs are incorporated in four (4) areas of Program Educational Objectives (PEOs) as follows:

1. PEO1 - Practicing technician in an electrical engineering-related field.
2. PEO2 – Contributing to society with professional ethics and responsibilities.
3. PEO3 – Engaging in enterprising activities that apply engineering knowledge and technical skills.
4. PEO4 – Engaging in activities to enhance knowledge for successful career advancement.

2. Methodology

This section describes all the necessary information that is required to obtain the results of the study. It consists of Research Design, Research Procedure, and Research Instrument. This study employed a quantitative research method. Data collection and analysis are done to describe and determine the level of PLOs attainment and the perception of students on the facilities provided by the Department of Electrical Engineering (JKE) at Sultan Idris Shah Polytechnic (PSIS). Using the Statistical Package for the Social Sciences (SPSS) version 20's descriptive analysis, responses from the respondents are displayed in the corresponding tables and charts to highlight the findings. In conducting the survey, a set of questionnaires were developed to assess the achievement of PLOs of Electrical Engineering Department graduates for session 1 2021/2022 and session December 2020. The questionnaires are distributed among 181 students who completed their studies in the sessions using *Google Forms* as the platform to collect responses. The survey consists of three sections:

1. The first section collects demographic data,
2. The second section covers 12 PLOs achievements from the graduates' viewpoint, and
3. The third section measures the facilities and resources provided by JKE.

The Likert scale is being used in sections 2 and 3 of the questionnaires. Cronbach's Alpha test is used to evaluate that all 37 items in the questionnaires are reliable. All items are reliable and accepted with a score of 0.951.

3. Results and Discussion

Table 3: Program Learning Outcome – (PLO)

Study Session	Session June 2018 – Dec 2020		Session Dec 2018 – 1 2021/2022		BOTH SESSIONS	
Program [At the end of the study program, I could..]	(N=143)		(N=38)		(N=181)	
	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
PLO1 - Apply knowledge of applied mathematics, applied science, engineering fundamentals, and an engineering specialisation as specified in DK1 to DK4 respectively to wide practical procedures and practices;	4.20	.798	4.11	.649	4.18	.769
PLO 2 - Identify and analyse well-defined engineering problems reaching substantiated conclusions using codified methods of analysis specific to their field of activity (DK1 to DK4);	4.17	.772	4.00	.658	4.14	.751
PLO3 - Design solutions for well-defined technical problems and assist with the design of systems, components, or processes to meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations (DK5);	4.06	.824	3.89	.689	4.03	.799
PLO4 - Conduct investigations of well-defined problems; locate and search relevant codes and catalogues, conduct standard tests and measurements;	4.01	.839	3.84	.718	3.98	.816
PLO 5 - Apply appropriate techniques, resources, and modern engineering and IT tools to well-defined engineering problems, with an awareness of the limitations (DK6);	4.27	.798	4.16	.594	4.25	.759
PLO 6 - Demonstrate knowledge of the societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to engineering technician practice and solutions to well-defined engineering problems (DK7);	4.38	.680	4.32	.620	4.36	.666
PLO7 - Understand and evaluate the sustainability and impact of engineering technician work in the solution of well-defined engineering problems in societal and environmental contexts (DK7);	4.34	.723	4.24	.714	4.32	.720
PLO8 - Understand and commit to professional ethics and responsibilities and norms of technician practice;	4.51	.680	4.55	.602	4.52	.663
PLO9 - Function effectively as an individual, and as a member of diverse technical teams;	4.34	.721	4.34	.669	4.34	.709

PLO10 - Communicate effectively on well-defined engineering activities with the engineering community and with society at large, by being able to comprehend the work of others, document their work, and give and receive clear instructions;	4.41	.695	4.42	.642	4.41	.683
PLO11 - Demonstrate knowledge and understanding of engineering management principles and apply these to one's work, as a member or leader in a technical team and to manage projects in multidisciplinary environments;	4.10	.808	4.08	.818	4.09	.808
PLO12 - Recognize the need for, and have the ability to engage in independent updating in the context of specialized technical knowledge;	4.45	.699	4.32	.662	4.42	.692

Table 3 shows the evaluation of PLOs' achievement from the students' perception. The Likert Scale used consists of five scales from 1-very poor to 5-excellent. Thus, the mean score is divided into five categories: 1.00 – 1.80: very low, 1.81 – 2.60: low, 2.61 – 3.20: medium, 3.21 – 4.20: high, and 4.21 – 5.00: very high. The survey shows that PLO5, PLO6, PLO7, PLO8, PLO9, PLO10, and PLO12 have very high mean scores (ranging from 4.27 to 4.51) for December 2020 graduates. Meanwhile, as for session 1 2021/2022 graduates, all seven PLOs that scored very high in the previous session (session December 2022), maintain the same category except for PLO5 which drops from 4.27 (very high) to 4.16 (high) and PLO7 which decreases from 4.34 to 4.24. The result of PLOs achievement from the graduate's perspective shows that all PLOs achieved scores above high level to very high. The standard deviation of both sessions' ranges from 0.663 to 0.816 which indicates that the data is spread out close to the mean of the data set. The results of PLOs attainment are illustrated in Table 4.

Table 4: PLOs Attainment for Session Dec 2020 and Session 1 2021/2022

PLO	Session Dec 2020	Session 1 2021/2022
PLO 1	High	High
PLO 2	High	High
PLO 3	High	High
PLO 4	High	High
PLO 5	Very High	High
PLO 6	Very High	Very High
PLO 7	Very High	High
PLO 8	Very High	Very High
PLO 9	Very High	Very High
PLO 10	Very High	Very High
PLO 11	High	High
PLO 12	Very High	Very High
Ratio Very High to High Attainment for PLO	7: 5	5:7

In general, all those 12 PLOs are in a stable position, and the students rated them as high and very high, which indicates that those 12 PLOs are being successfully achieved upon completion of the study.

Moving on, Table 5 shows the survey result of students' perceptions of the facilities and educational resources provided in the Electrical Department. The survey includes 10 aspects of facilities and resources. Students reported all the facilities in very good condition (which is in very good condition: a mean ranging from 4.23 to 4.51) except for the internet access elements (which show a mean of 3.67).

Table 5: Perception of students on facilities and resources provided

	N	Mean	Std. Deviation
Internet Access	181	3.67	1.100
Computer Lab	181	4.23	.788
Lab/workshop's Condition	181	4.30	.684
Lecturer Room's Condition	181	4.24	.720
Software Provided in Computer Lab	181	4.28	.770
Quality of tools/equipment in lab/workshop	181	4.24	.779
Safety in lab/workshop	181	4.42	.650
Quality of Sport & Recreation	181	4.29	.766
Quality of library	181	4.51	.672
Quality of Counselling System	181	4.36	.788
Valid N (listwise)	181		

Along with this result, the majority of the respondents are satisfied with the facilities and resources offered in PSIS (with 32.6% of the total respondents having no recommendation), whilst 36.46% of the respondents provide suggestions from multiple aspects including the following:

1. to add more educational activities on campus that may augment the program,
2. to have face-to-face classes over online classes. (This is because the respondents are graduates who undergo both face-to-face and online classes according to their study phase due to the COVID-19 pandemic),
3. to provide more water filters on campus and in the hostel,
4. to organize motivational programs for students,
5. to build a special room in the hostel as a study room,
6. to have the opportunity of using the swimming pool (P.S.I.S do have a swimming pool, but it is only used for training purposes for tourism students),
7. to enhance the transportation system inside and nearby the campus.

As shown in Figure 1, aside from those aforementioned categories, the highest recommendation from the graduates is to improve the internet connection (with a score of 13.26% of the respondents). The internet is becoming popular nowadays for supporting the education system through e-learning which enables students to quickly search for electronic materials. Moreover, the respondents are selected from the graduates who experienced online classes during the COVID-19 phase. Thus, the respondents see the internet connection as an important element in their educational process.
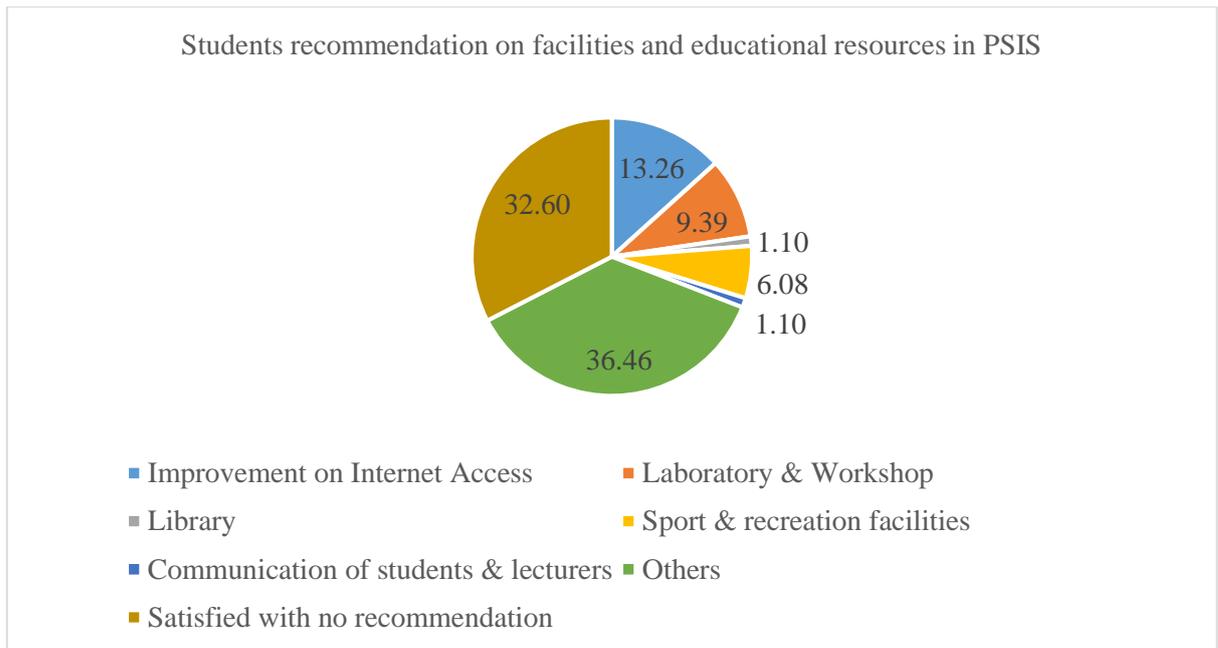
Students recommendation on facilities and educational resources in PSIS

- Improvement on Internet Access
- Library
- Communication of students & lecturers
- Satisfied with no recommendation
- Laboratory & Workshop
- Sport & recreation facilities
- Others

Figure 1: Pie Chart on Student recommendations on facilities and educational resources in PSIS

4. Conclusion

The study was successfully conducted for two consecutive batches of students at Sultan Idris Shah Polytechnic: Session June 2018 – December 2020 and Session December 2018 – 1 2021/2022. All 12 PLOs indicate that they were successfully achieved upon graduation. In contrast, this exit survey is based solely on student perceptions of the achievement of all PLOs. Thus, to obtain more concrete results, the results of this survey can be compared to the results of the faculty (through formal assessment by the department). Regarding student perceptions of the facilities and resources offered by the Department of Electrical Engineering (JKE), most respondents are satisfied with the facilities and resources offered at PSIS. However, the emphasis should be placed on improving internet access on campus in preparation for the transition to IR 4.0, the introduction of blended learning, and the blending of various instructional processes using technology. The survey suggests that graduates favour it if the education provider offers a more stable internet connection on campus.

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