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Exploring the Impacts of Self-Directed Learning Approach among Polytechnic Mechanical Engineering Students

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Self-Directed Learning (SDL) is an independent learning approach that develops students' learning skills and professional skills through teaching and learning process. To embrace the SDL approach, the Department of Polytechnics has developed Curriculum Information Document Online System (CIDOS) as an online learning platform. Hence, the aim of this research is to study the impacts of SDL approach among polytechnic Mechanical Engineering students in their learning. This study targeted total 82 students from Material Science and Engineering Management classes. And the study, produced mixed findings reporting that students believed that their learning attributes, initiative, control and, self-efficacy have enhanced through SDL. However, the students have issues on motivation since a large number of them reported that they do not know what they are doing in their learning. The validity and reliability test confirmed that the survey instrument is reliable with Croanbach Alpha more than 0.70 whereas One-Sample T-Test proved that all hypotheses were considered significant, $p < 0.005$. This study is expected to help educators to improve highlighted elements that need attention in SDL approach via CIDOS.

Keywords : Self-Directed Learning, initiative, control, self-efficacy and motivation.

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INTRODUCTION

Self-Directed Learning (SDL) is a growing education instructional method in the education of Polytechnics of Malaysia in compliance with the launching of National e-learning Policy (Dasar e-Pembelajaran Negara, 2011)by The Higher Education Ministry. For decades, Polytechnics have implemented traditional learning method or in another word "Educator-Dependent Learning" in their teaching process. It is a predominant fact that traditional learning approach is the foundation of teaching and learning paradigm in all educational organization including polytechnics (Conradie, 2014). However, The Higher Education Ministry has consigned in (Malaysian Education Blueprint, 2015) that *globalized online learning* as one of an imperative shifts to catalyze the transformation of the education system to spur continued excellence in the education system. Hence, since SDL approach is associated with online learning, it could route the teaching and learning process into technology-enabled innovations with more personalized learning experiences to all students.

Correspondingly, SDL has been discovered to provide greater impacts on academic credentials and professional performance, knowing the fact that, it is a reliable pedagogical approach to develop students to learn independently with the help of technologies and with minimal help of educators. Adding to this, engineering courses in tertiary education system are expected to develop efficient, autonomous and

competent future engineers (Direito *et al*., 2012). In pursuant to this, SDL is found to be very suitable, interesting and attractive for polytechnic students as they are adult learners and according to the founder of SDL, Knowles (1975) in (Annuar & Shaari, 2014) adult learners are self-directed learners, but their ability to self-direct their own learning are different. The different learning abilities are actually dependent on their acquired learning attributes. However, in the previous researches, learning attributes that contribute to self-directed learning were not studied extensively and as a result, the efficacy of the approach was unraveled and herein, it is adopted with less confidence in teaching and learning process.

The aim of this research is to study the impacts of SDL approach among Mechanical Engineering students in explores four learning attributes (initiative, control, self-efficacy and motivation) that influence the self-directed learning approach by responding to 25-items of the questionnaire which called "Self-Directed Learning (SDL) Questionnaire". The results are expected to be the key parts to augur transformation of the education system in polytechnics by understanding the students' problem regarding SDL, identifying rooms for improvements and implement coherent measures to help students with SDL.

Prior research

Self-Directed Learning

Self-Directed learning is an instructional method of process orientation that involves activities of planning, implementing, and evaluating learning. (Saks& Leijen, 2014) have stated in literature that, Knowles (1975) described SDL as a process that coerce the individuals to take initiative with or without the support of anybody, determine their learning requirements, develop learning goals with identified human and material resources, choose and implement appropriate learning strategies, and evaluate learning outcomes. (Kim *et al*., 2014) mentioned that the fundamental of SDL is students take charge of their learning and able to transfer the acquired knowledge and skill in the working environment. Also, (Dynan *et al*., 2010) reported that knowledge enrichment and skill development in pursuant to the course content is achievable through SDL and it is best acquirable via organizing their SDL learning activities systematically to determine the targeted knowledge and skill, the suitable learning strategies, and evaluate the learning outputs (Kim *et al*., 2014).

According to (Cremers *et al*., 2014), the capacity of SDL is divided into five sub skills: diagnosing, setting goals, planning, monitoring and evaluating.

(i) *Diagnosing*. Identifying what it is to be learned.
(ii) *Setting goals*. Translating perceived learning needs into concrete learning goals.
(iii) *Planning*. Investigating possible ways of achieving the goal.
(iv) *Monitoring*. Engaging in practice and monitoring one's performance. Seeking and responding to feedback from different sources.
(v) *Evaluating*. Judging on the basis of evidence the extent to which the learning goal has been attained according to appropriate standards and criteria.

In the literature reported by (Dynan *et al*., 2010) claimed that, Bloom's taxonomy integrates higher order reasoning skills via SDL activities. The reasoning skills are:

(i) *Application*. The ability to apply the basic concepts to real-world problems or situations.
(ii) *Analysis*. The ability to recognize and explain major underlying assumptions.
(iii) *Synthesis*. The ability to build simple models based on principles
(iv) *Evaluation*. The ability to compare and contrast the costs and benefits of simple models.

(Zhong, 2008) mentioned in the literature that, (Thomson, 1995) outlined several recommendations that SDL curriculum should have to transform the learning culture to SDL. These recommendations are:

(i) Set up a favorable climate of learning by promoting collaboration between peers, instructors, and resource persons.
(ii) Diagnose individual students' needs separately and realistically.
(iii) Translate the learning needs into individualized learning objectives.
(iv) Select and utilize tasks and effective strategies to achieve the individualized objectives.
(v) Assess individual students' achievement in order to improve the next cycle of learning

Apart from this, SDL develops awareness of effective strategies to attain goals which is known as metacognition. Metacognition is an effective process of strategic planning, progress monitoring and result evaluation and simultaneously restraint the students' thinking and emotions (Khodabandehlou *et al*., 2012). Consequently, this makes the students to accomplish their educational goals independently and they are responsible for their own learning approach and outcomes (Suknaisith, 2014).

In Netherlands, the education system introduced National Action Plan which focuses on independent learning in vocational courses to fill the gap between labor market and education. The literature also reported

that a similar trend is observed in the USA and other European countries actively participating in independent learning by challenging the students' capabilities to acquire knowledge and skills (Jossberger, 2010). (Spiro, 2012) reported that in UK universities, the Quality Assurance Agency drew a benchmark that it is a requisite for graduates to acquire the ability to direct their own learning. Thus, this clearly shows that the current labor market demand and expect the students to be able to direct, monitor and evaluate their learning output. In short, every learning should be on-going, practical and challenging.

(Yang, 2015) mentioned that students are challenged and directed to develop their desired learning outcomes and explore the scarce resources primely to achieve their learning goals. Besides technological tools, peers are also considered as one of the available resources for students to improve their learning. Additionally, a separate literature reported that SDL is a proven and reliable method to improve adult students, work and society and to produce graduates with professional skills that required by the employees to explore the competitive global markets (Annuar & Shaari, 2014).However, (Yang, 2015) believes that graduates nowadays lack in the required professional skills and contemporarily, this scenario requires extensive amount of initiatives among educators to nurture their professional skills through SDL. On the other hand, educators are reported to be less motivated to implement SDL in their teaching because they are skeptical about the effectiveness of SDL and also students' performances. The educators are paying too much of attention on the pulling factors that could affect their teaching such as time management, feedback students, knowledge of facilities and resources and, control (Lai *et al*., 2013). Hence, educators must modify their teaching with extra mile creativity and initiative to uplift the students' professional skills. It is also supported by (Brook & Upitis, 2015) that, nowadays, many educators are modifying their teaching approach with digital technology as a new resources to conduct learning activities immensely that primarily to improve students' learning engagement.

It is already a known fact that SDL brings new dimension in the learning process, however, it is mandatory for the educators and students to work collaborately in parallel to the digitalized world. Figure 1 (Silen & Uhlin, 2015) depicts the students and educators in faculty collaboration in regard of SDL approach. Certainly, this can only become reality if the educators share technological tools, encourage student participation in utilizing technological tools and aid students in developing their skills (Lai *et al*., 2014).

SDL Technological Tools

In the digital age, the learning space created by technology makes the educator and learning interaction closer, adult learners are more independent and interactive in their learning, the availability of information is scarce, and provide a new dimension of learning method (Ponti, 2014). Digital technologies have become utmost important for everyone since tablets, computers and smart phones have transformed our daily life easier and smarter with applications to find, organize, and exchange information, for communication and play games (Brook & Utipilis, 2015).

According to (Rahimi *et al*., 2014), diverse technology enhanced learning tools are available for SDL, in terms of creative and collective contribution (Twitter, Facebook), knowledge (co-) producing (wikis, YouTube, Google Docs), communication (Skype), knowledge management and organizing (Delicious, Diigo), self-expressing (blogs), creating and managing personal pages (Netvibes), analysing and developing new concepts and ideas (Mind Meister), and sharing and exchanging documents (Google Docs, Dropbox).

In accordance, in the effort of implementing technology in the learning process, the Department of Polytechnics has launched and widely implemented, Curriculum Information Document Online System (CIDOS) in the education system (Portal.Cidos.edu.my). CIDOS is an online learning platform for teaching and learning process for educators to share lecture notes and videos, implement assessments, launch forums, send reminders, and link to Facebook. While students attempt course, participate in forum by viewing threads and add post, submit assignments, view resources, view URL and access notes via CIDOS. Hence, with the usage of CIDOS, classroom activities could be continued outside classroom as learning can be done "from anywhere" and "at anytime". Hence, the educator has to be creative and hardworking to encourage and support students in using CIDOS for learning outside classrooms as a medium for continues learning.

CIDOS is developed interactively to bring enormous benefits to the educator and students, particularly in developing independent learning culture. CIDOS is found to be an efficient use of resources and teaching spaces, is proven to be more effective than single method of instruction, allow sharing with other learners, be adaptable and flexible for educators and students and cope with non-traditional learners better-fit in with other commitments, be student centred at own pace, suit individual learning styles and increase autonomy, use a wide range of educational activities (online web minars, video, chat rooms and discussion boards) and increase popular as growing ease of use and familiar with information technology, can save time, effort and cost and can be linked to Facebook and have healthy social networking with students.

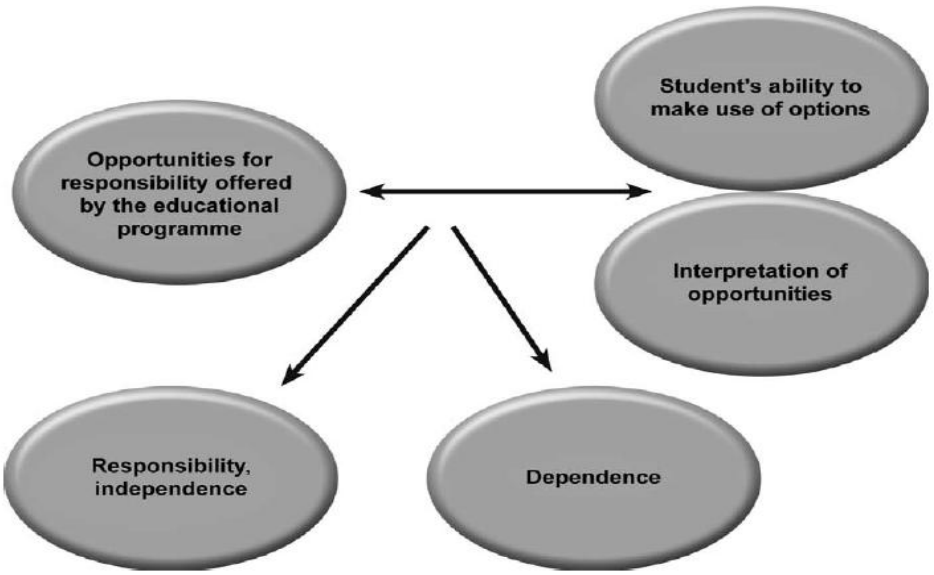

Figure 1: Students and educators in faculty collaboration in regard of SDL approach (Silen & Uhlin, 2015).

METHODOLOGY

Data collection

This study adopted convenient sampling (non-random sampling technique) by Creswell as reported in (Conradie, 2014). This research focused on 82 Mechanical Engineering students from second year course of Material Science and Engineering Management as they are exposed to SDL approach by the faculty since year one.

The students and lecturers use CIDOS as their learning interactive tool in their teaching and learning process. The rational for the CIDOS implementation in these two classes are for the faculty to have a 'trial' to observe the students' responses, students and lecturers communication and also to identify the challenges that students face through CIDOS.

Before outset with the questionnaire survey, students were briefed with the purpose of the study. Prior to data collection, students were equipped with information on the items on the questionnaire to avoid misconception. The 25-items of questionnaire with 5-Likert scale was adopted from (Chou, 2012), revised and generated in Google Form. Thereafter, the URL of the Google Form was uploaded in CIDOS for the students to participate in the survey. Through CIDOS, 100% participation was attained because students were available online at their convenience, aware of what to do and how to answer the questionnaire with less supervision of their educators and certainly, this made the data collection very much easier. Subsequently, the obtained raw data in the excel format were imported to SPSS for further analysis to study impacts of SDL in the participants' learning.

Participants

Descriptive statistic in Table 1.0 shows students' voluntarily participations in the questionnaire survey. Students were requested to provide demographic information as gender, age range and subjects taken in the SDL mode. Gender was a nominal category with code, male = 1 and female = 0. Total 82 students comprising of 53 (65%) Material Science students and 29 (35%) Engineering Management students with 100% participation, voluntarily participated in the survey. Of the 82 participants, 61 (74%) of them were male and 21 (26%) of them were female. In general, the majority (N=79, 96%) of them are from the age range of 19-20, while 3 (4%) of them are from the age range of 21-22. The minority group of 4% is the senior students who were repeating the courses.

RESULTS AND DISCUSSION

This section draws the results of student responses to the Self-Direct Learning questionnaire, validity and reliability, and hypothesis test to reveal the impacts of SDL approach in participants' learning.

Student responses to the Self-Directed Learning Questionnaire

This section studies the students' responses on the impacts of SDL approach in their learning. Table (2)-(5) depict the mean, standard deviation and percentage of students who responded with 1= strongly disagree; 2= disagree; 3= neutral; 4= agree; 5= strongly agree. Table (2) shows the students' responses towards factor 1= initiative. Students were found to be overly positive with 25.9%initiative to learn new things, 17.3% collect additional information about interesting topics, and use materials I have found. However, there were 1.2% of students feel they do not use the materials they have found and discontinue to spend time learning. Also, 46.9% agreed that they rely on the instructor to tell them what to do.

Table 3 focuses on issues related to factor 2= control. 16% of students strongly agreed that they effectively organize their study time and 14.8% of them take responsibility of their own learning and motivate themselves. In general, all the students agreed that they are taking control of their learning process and the majority of them agreed that they are independently making the changes and take responsibility for their own learning. Contradicaly, this result suggested that 1.2% students feel that SDL is not motivating themselves, making them struggle in class and unsuccessful at prioritizing. Adding to the list, 13.6% disagreed that SDL is not motivating themselves and they are struggling in class.

Table 4 shows that the majority of the students fairly agreed that their self-efficacy has improved. The result suggested that the students showed highly positive responds with 13.6% in confident in their ability to prioritize, 12.3% in confident in their ability and 8.6% are confident that they are able to take personal control. On the other hand, a group of students have issues on their self-efficacy because4.9% are not confident of their ability, and not confident in their ability to take personal control,13.6% are uncertain about their capacity, 27.2% are unsure about their ability and 21% are not much confident in them. This explains that this group of students believed that SDL does not enhance their confidence level and certainly these students need attention of their educators to resolve the issue effectively.

Table 5 presents the findings of the factor 4: Motivation and the findings showed that students are not positive about their motivation during SDL. 70.4% (agreed) and 11.1% (strongly agreed) that they really do not know what they are doing, 35.8% (agreed) and 4.9% (strongly agreed) feel that it's their primary reason to complete course requirements and 66.7% (agreed) and 11.1% (strongly agreed) that they do the course activities avoid guilty. Additionally, 17.3% (strongly agreed) that they did not complete most of their class activities. However, 69.1% (agreed) and 13.6% (strongly agreed) that the course is personally enjoyable. Undoubtedly, the students' motivation is not built and drained during SDL and now, this particular issue needs a serious action to engage the students into SDL effectively and completely to strengthen their motivation.

In sum, the average mean score of respondents' perception on SDL confirmed that the highest average mean score is obtained by initiative with 3.88 (S.D = 0.666) and followed by control, 3.75 (S.D = 0.741), self-efficacy, 3.56 (S.D = 0.769) and motivation, 3.51 (S.D = 0.786). From these data, it could be interpreted that, respondents believed through SDL they are more initiated to collect diverse course materials and utilize the obtained materials for their learning. Implicitly, they are more independent in their learning process by being more responsible without depending on the educator completely. However, the majority of them lack in uplifting their motivation and merely participating in SDL as a course requirement and to avoid feeling guilty. Also, a minority group among them is very poor in self-efficacy because the results confirmed that they have difficulties in building their self-confidence. Hence, several concomitant changes need to be made in the SDL approach to improve the students' motivation and self-efficacy.

Validity and reliability

The survey instruments were tested for validity and reliability.These study instruments were tested for validity and reliability. Validity is the amount of systematic or built in error in measurement and reliability indicates the accuracy or precision of the measuring instrument (Norland,1990).

The findings showed that all factors have Croanbach Alpha of more than .70. Hence, the findings confirmed that this survey instrument is reliable. Table 6 depicts the Cronbach's alpha value for all factors: initiative, control, self-efficacy and motivation.

Hypothesis

This study answers the question: Does factor (1) initiative (2) control (3) self-efficacy (4) motivation influence students' self-directed learning competency in their learning process? The following hypotheses were tested:

H1 : Initiative will have influence on Self-Directed Learning.
H2 : Control will have influence on Self-Directed Learning.
H3 : Self-efficacy will have influence on Self-Directed Learning.
H4 : Motivation will have influence on Self-Directed Learning.

Table 1. Descriptive statistic of students

Demographic variables	N	%
Gender		
Male	61	74
Female	21	26
Age range		
19-20	79	96
21-22	3	4
Subject		
Material Science	53	65
Engineering Management	29	35

Table 2. Students' responses on factor 1: Initiative

Item	Mean	S.D	Likert scale response (%)				
			1	2	3	4	5
Do extra work in course	3.84	0.601	0	2.5	19.8	69.1	8.6
Initiative to learn new things	4.16	0.601	0	1.2	7.4	65.4	25.9
Use materials I have found	4.00	0.671	1.2	1.2	11.1	69.1	17.3
Continue to spend time learning	3.84	0.697	1.2	3.7	1.4.8	70.4	9.9
Collect additional information about interesting topics	4.01	0.622	0	2.5	11.1	69.1	17.3
Rely on the instructor to tell me what to do	3.42	0.804	0	14.8	33.3	46.9	4.9
Overall	**3.88**	**0.666**					

1= strongly disagree 2= disagree 3= neutral 4= agree 5= strongly agree

Table 3. Students' responses on factor 2: Control

Item	Mean	S.D	Likert scale response (%)				
			1	2	3	4	5
Independently make the changes	3.88	0.556	0	2.5	14.8	75.3	7.4
Take responsibility for my own learning	3.94	0.695	0	6.2	8.6	70.4	14.8
Motivating myself	3.73	0.922	1.2	13.6	11.1	59.3	14.8
Not struggling in class	3.44	0.777	1.2	13.6	32.1	49.4	3.7
Successful at prioritizing	3.54	0.837	1.2	11.1	27.2	53.1	7.4
Effectively organize my study time	3.96	0.660	0	3.7	12.3	67.9	16
Overall	**3.75**	**0.741**					

1= strongly disagree 2= disagree 3= neutral 4= agree 5= strongly agree

Hypothesis test is defined as a systematic method to test claims or assumptions about the tested population. In this investigation, One-Sample T-Test was adopted as the methodological approach to test the hypotheses. The

Table 4. Students' responses on factor 3: Self-efficacy

Item	Mean	S.D	Likert scale response (%)				
			1	2	3	4	5
Confident in my ability	3.90	0.668	1.2	4.9	12.3	69.1	12.3
Confident in my ability to prioritize	3.93	0.628	0	2.5	16	67.9	13.6
Confident that I have the ability to take personal control	3.80	0.714	1.2	4.9	14.8	70.4	8.6
Certain about my capacity	3.41	0.818	0	13.6	39.5	39.5	7.4
Sure about my ability	3.10	0.889	1.2	27.2	35.8	32.1	3.7
Have much confidence	3.20	0.897	3.7	21	38.3	30.9	6.1
Overall	**3.56**	**0.769**					

1= strongly disagree 2= disagree 3= neutral 4= agree 5= strongly agree

Table 5. Students' responses on factor 4: Motivation

Item	Mean	S.D	Likert scale response (%)				
			1	2	3	4	5
Do not see any connection	3.11	0.962	3.7	25.9	29.6	37	3.7
Complete most of my class activities	3.40	0.851	17.3	30.9	44.4	6.2	1.2
Really do not know what I am doing	3.91	0.574	0	1.2	17.3	70.4	11.1
My courses is personally enjoyable	3.94	0.619	0	2.5	14.8	69.1	13.6
The primary reason is to complete course requirements	3.26	0.848	1.2	17.3	40.7	35.8	4.9
Do the course activities to avoid guilty	3.83	0.721	1.2	3.7	17.3	66.7	11.1
Classes are not really personally useful	3.14	0.93	1.2	28.4	27.2	37	3.7
Overall	**3.51**	**0.786**					

1= strongly disagree 2= disagree 3= neutral 4= agree 5= strongly agree

Table 6. Croanbach alpha of the instrument

Factors	Croanbach's Alpha
Initiative	.743
Control	.722
Self-efficacy	.728
Motivation	.745

significance level was typically set at 5%. If the probability (*p value*) of the sample mean is less than 5%, the hypothesis is accepted as considering it reached significance. However, if *p value* of the sample is greater than 5%, the hypothesis is rejected assuming it did not reach significance. In short, the decision to retain or reject the hypothesis is dependent on the *p value*. Table (7) – (10) present the summary of t-test results. The

Table 7. One-Sample T-Test result for initiative

N= 82	Test value = .23					
					95% Confidence Interval of the Difference	
	t	df	Sig.(2-tailed)	Mean Difference	Lower	Upper
Do extra work in course	54.036	81	.000	3.610	3.48	3.74
Initiative to learn new things	58.841	81	.000	3.930	3.80	4.06
Use materials I have found	50.580	81	.000	3.770	3.62	3.92
Continue to spend time learning	46.578	81	.000	3.610	3.46	3.76
Collect additional information about interesting topics	54.696	81	.000	3.782	3.64	3.92
Rely on the instructor to tell me what to do	35.701	81	.000	3.190	3.01	3.37

Table 8. One-Sample T-Test result for control

N= 82	Test value = .23					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
Independently make the changes	58.986	81	.000	3.647	3.52	3.77
Take responsibility for my own learning	47.990	81	.000	3.708	3.55	3.86
Motivating myself	34.145	81	.000	3.498	3.29	3.70
Not struggling in class	36.925	81	.000	3.208	3.03	3.38
Successful at prioritizing	35.609	81	.000	3.313	3.13	3.50
Effectively organize my study time	50.874	81	.000	3.733	3.59	3.88

Table 9. One-Sample T-Test result for self-efficacy

N= 82	**Test value = .23**					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
Confident in my ability	49.176	81	.000	3.670	3.52	3.82
Confident in my ability to prioritize	52.963	81	.000	3.696	3.56	3.83
Confident that I have the ability to take personal control	45.000	81	.000	3.572	3.41	3.73
Certain about my capacity	34.951	81	.000	3.177	3.00	3.36
Sure about my ability	29.046	81	.000	2.869	2.67	3.07
Have much confidence	29.454	81	.000	2.973	2.77	3.17

Table10. One-Sample T-Test result for motivation

N= 82	Test value = .23					
					95% Confidence Interval of the Difference	
	t	df	Sig.(2-tailed)	Mean Difference	Lower	Upper
Do not see any connection	27.803	81	.000	2.909	2.70	3.12
Complete most of my class activities	44.906	81	.000	3.597	3.44	3.76
Really do not know what I am doing	32.143	81	.000	3.029	2.84	3.22
My courses is personally enjoyable	53.883	81	.000	3.708	3.57	3.85
The primary reason is to complete course requirements	57.716	81	.000	3.684	3.56	3.81
Do the course activities to avoid guilty	33.321	81	.000	3.170	2.98	3.36
Classes are not really personally useful	26.961	81	.000	2.881	2.67	3.09

statistical results showed that the probability of each hypothesis is 0.000, hence all hypotheses were considered significant, $p < 0.005$. The findings confirmed that all four hypotheses that would enhance the Self-Directed Learning competency were supported.

CONCLUSION

Although polytechnic has introduced CIDOS as an approach of SDL, the impacts of this approach towards students' learning attributes were not paid attention nor studied thoroughly. Thus, in the discipline of our study, four learning attributes initiative, control, self-efficacy and motivation were explored to study the students' learning via SDL approach. And the findings demonstrated mixed results revealing that students feel positive in terms of initiative, control and self-efficacy and on the other hand, students feel very low and need a lot more guidance towards building their motivation.

The findings are evident that the aim of this investigation to study the impacts of SDL approach among Mechanical Engineering students' learning has been achieved. The hypothesis (t-one test) dictated that all four attributes are significant with $p < 0.05$ and are contributing towards SDL. In terms of initiative (overall mean: 4.16), students are found to be more interested in finding new things and this stereotype could be due to abundant information availability online. The attractive segment of control (overall mean: 3.94) is, the students agreed that they take responsibility for their own learning. This is an evident that the prime goal of SDL has been attained by the respective students. Also, a large group of students believed that their self-efficacy (overall mean: 3.56) is improved while a small group is still stumbling with their self-ability during their learning. However, sadly, the gain of SDL was not perceived in motivation (overall mean: 3.51)because most of them do not know what they are doing but agreed that they personally enjoy the learning method.

In short, the findings of this investigation will be a great milestone for Mechanical Engineering Department to rectify the highlighted issues. To improve students' learning attributes, SDL should be facilitated and adjusted with students' learning behaviors and learning styles by not compromising their subject content (Premlatha *et al*., 2014).

This study contributes to the existing SDL study by identifying the underlying issues related to SDL approach, thus, polytechnics and the Department of Polytechnics could work together to improvise the issues to make SDL approach as a "culture" in polytechnics. Hence, the difficulties that students facing through CIDOS could be reduced and the CIDOS usage could make the SDL approach as a widespread learning culture in polytechnics. This new concept of learning method is still new in polytechnics, thus it should be improved time to time to make the students adapt the method easily and interestingly.

In the future research, researcher suggests that (i) more learning attributes should be evaluated in order to study the effects of self-directed learning (ii) samples from various engineering departments such as electrical, civil, and marine should be included and (iii) samples from various academic institutions should be included (iv) educator' readiness towards implementing SDL should

be studied. A report claimed that, some educators are not able to promote SDL creatively and innovatively and require training to work on SDL (Lai, 2013). Thus, the polytechnics educators' readiness to implement SDL should be studied as well. The suggested recommendations are believed to help to study the students' experiences on self-directed learning from all fields with wider scope.

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ABBREVIATIONS:

SDL	*: Self-Directed Learning*
CIDOS	*:Curriculum Information Document Online System*

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