Tersedia secara online
http://journal.um.ac.id/index.php/jptpp/
EISSN: 2502-471X
DOAJ-SHERPA/RoMEO-Google Scholar-IPI

Jurnal Pendidikan:
Teori, Penelitian, dan Pengembangan
Volume: 7 Nomor: 8 Bulan Agustus Tahun 2022
Halaman: 325—334

Identifying Basic Aircraft Structures Using Project-Based Learning in ESP Context: Is It Effective?

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ARTICLE INFO

History Article:

Accepted: 20-07-2022
Approved: 25-08-2022

Keywords:

effective;
PjBL;
aircraft structures;
mechanical engineering;
industrial engineering

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ABSTRACT

Abstract: English for specific purposes (ESP) is a branch of English instruction prepared to facilitate the students master English used in a particular field. In aerospace field, one of the objectives of ESP is mastering basic aircraft structures as the fundamental knowledge for further development such as aircraft maintenance and management. Mastering a number of technical terms in aerospace is challenging since they are not commonly used in daily life. Thus, a strategy is needed. Project-based learning (PBL) is proposed as an appropriate technique for engineering students due to its advantages; facilitating communication, creativity, collaboration, and critical thinking. Nevertheless, identifying whether it really gives any impact and how much it gives impact are important. Therefore, an experimental study was carried out with one experimental group in mechanical engineering class and one controlled group in industrial engineering class. To investigate the effects, the achievement from the pre-test and post-test of employing the PBL in the experimental group and employing the conventional technique in the controlled group were investigated using t-test of SPSS. Based on the data analysis, the score in each group depicted the achievement increases however in comparing both groups the significant value of the experimental group was higher than in the controlled group. In conclusion, PBL is more effective in increasing the students' achievement in identifying basic aircraft structures.

English for Specific Purposes (ESP) instruction is distinct from General English instruction. The ESP teacher's distinctiveness stems from his or her participation in technical context responsibilities as a teacher, researcher, collaborator, and evaluator in order to address the needs identified by need analysis of learner and learning needs (Krauss & Boss, 2014). Because this study was undertaken in an academic context, especially in the subject of Engineering, it is categorized as English for Academic Purposes (EAP). Due to the fact that students learn English for a specific practical purpose, curriculum designers conduct research on target language characteristics in specific academic contexts, and teachers place a premium on these characteristics in their lessons (Charles, 2013; Hyland, 2016). The ESP area ranges in various scopes from fairly universal such as English for academic writing to exceedingly specific such as English for mechanical engineering department (Basturkmen, 2010). Based on the need analysis in Institut Teknologi Dirgantara Adisutjipto (ITDA), the mechanical engineering students need to learn basic aircraft structures (Pertiwi & Kusumaningrum, 2019). In line with it, since the industrial engineering is under the same institution, the curriculum also includes basic aircraft structures.

Identifying basic aircraft structures is essentially categorized in vocabulary mastery skill. Woodward-Kron in Coxhead (2018) states that vocabulary is important in ESP because the knowledge of vocabulary is tightly related to the content knowledge of the discipline to share the same concept and understanding in the same discipline. In the classroom context, vocabulary is necessary to set learning goals, monitoring the program of study progress before and after starting a course and help future's vocabulary learning easier. In general, the three basic components are cockpit, body, and tail which are classified into more specific parts. The cockpit is the room located at the front for windshield, flight instruments, overhead panel, instrument panel, yoke, and pedestal. Meanwhile, the body is located at the centre part and has the widest area including wings, main landing gear, and fuselage. The last, the tail body is located at the back for exhaust, vertical stabilizer, and horizontal stabilizer (Billet, 2000; Ellis & Gerighty, 2008; Evans et al., 2012).

The characteristic of engineering work is mostly conducted in practical project work. It affects the engineering students' learning atmosphere to be facilitated by not only paper-based learning but also project-based learning (PBL). It has aided students in developing holistically acceptable solutions to engineering challenges by allowing them to comprehend engineering basics together and construct their own understanding (Jeon et al., 2014; Stewart, 2007). In terms of the project media, PBL has flexibility either it will be developed using audio, graph, or video. In addition, PBL is potential to develop 4C skills; communication, critical thinking, collaboration, and creativity. Project-based Learning (PBL) is considered an extended task in connection to task-based language teaching (TBLT), which strives to create the circumstances for effective language acquisition by providing learners with the chance to execute real-world tasks in the target language. PBL has been promoted in ELT for various reasons; learners negotiate plans, analyze data, and discuss ideas determined by genuine communicative needs through an extending task that typically integrates language skills work through a variety of activities such as information gathering problem-solving, or written reporting. Through the use of a variety of extended activities, projects may help learners improve their creativity (the capacity to utilize their imagination to create new results) and their ability to organize and cooperate in the target language (Thomas & Reinders, 2010).

The emerges of PBL brings the classroom activities closer to the students' experiences to foster change and innovation based on their natural growth. Heyworth (2002) describes a project as an endeavour to assess current practice, propose improvements, and monitor progress. Apel and Knoll in Andersen & Kjeldsen (2015) add the features of a project as it will transmit the desires and knowledge of the students and signify something meaningful. The strategy is centred on applying knowledge to real-world settings and encouraging the study by cooperation of students, pedagogical content knowledge, creativity, critical thinking and inventiveness (Bastola, 2021; Ngadiso et al., 2021; Potter & Louati, 2016; Tan & Chapman, 2016). Additionally, PBL helps the Freedom of Learning-Independent University initiative advocated by the Ministry of Education and Culture, which holds several activities under the projects (Dikti, 2020).

The PBL in this study involved ICT since it is critical for improving English teaching and learning. ICT integration aims to satisfy students' requirements and language levels, boost instructors' creativity, facilitate access to teaching resources, promote collaborative work, instill a good attitude toward learning in students, and assist them in the learning-teaching process. They must, however, consider some obstacles, such as time management, technical support, technical knowledge, and teachers' self-confidence, because the purpose of utilizing technology devices in education is not simply to provide media but to empower students to have better learning experiences and skills (Sari et al., 2018; Hadijah & Shalawati, 2020). However, there are primarily four challenges of using ICT on PBL. The first, providing a framework is firstly required to convince and monitor the PBL goes on the track. The second, selecting an accessible application is required to direct the students. Even if the students cannot access the application, a brief intensive training is required so that all students are able to use the selected application. The third is supervising and conducting PBL online. Progress work feedback to meet the best quality is often addressed in a PBL with a particular revision deadline too. The last challenge is exploiting ICT to present the report project as the final step of PBL assessment. To prepare the best achievement, a rubric is necessarily discussed and agreed at the beginning either by creating, adapting, or adopting (Heilesen, 2015).

Research studies on the effectiveness of PBL were carried out in various levels, starting from junior high school until university level. Natalia (2016) analysed the effectiveness of PBL to the junior high school students' descriptive text writing ability that indicated significant effect. In the senior high school level, PBL was implemented for the experimental group and problem-based learning was implemented in the control group. Both showed effective to teach highly and lowly motivated students in writing biography texts (Wachyu & Rukmini, 2015). Furthermore, students in accounting department were taught 'making complaint' in English with experimental treatment. Even though PBL was effective, there was a slight increase occurred due to short period of study, short preparation, and unfamiliarity project procedures (Hudiananingsih et al., 2019). Similarly, (Yamada, 2021) investigated the teachers' and students' perception towards the application of PBL with the results as contributive technique in English instruction. Nevertheless, he suggested for further research to explore the experimental design to see clear effects of PBL. Considering the prior studies, it seems that the effect of PBL in ESP for engineering context was least scrutinized. Thus, this study aims to find: (1) whether the PBL affects the students' mastery in identifying basic aircraft structures and (2) how much the PBL affected the students' mastery in identifying basic aircraft structures.

METHOD

An experimental research study was employed where it investigated to identify a particular treatment influencing an outcome in a study. The effect was measured and excluded from another group in a particular treatment to one group and then calculated if all groups score on an outcome (Creswell, 2014). Specifically speaking, by taking advantage of natural environments or groups, a quasi-experimental design was involved, and participants were also randomly allocated (Leavy, 2017). There were two variables controlled this study; Independent variable: project-based learning and Dependent variables: basic aircraft structure mastery.

The study was conducted in mechanical and industrial engineering study program, Institut Teknologi Dirgantara Adisutjipto (ITDA), Yogyakarta. It involved two classes of students taking English 2 (2020 academic year) which consisted of 87 students. The mechanical engineering class was the experimental group and the industrial was the controlled group. Based on the curriculum, basic aircraft structures in the mechanical engineering are taught at the 9th and 10th meeting. Meanwhile, in the industrial engineering is at the 2nd and 3rd meeting. In this emergency remote teaching, every instruction was held online. In the experimental group, the PBL was held online as well so a digital project was assigned. The procedures of the experimental research were described as follows.

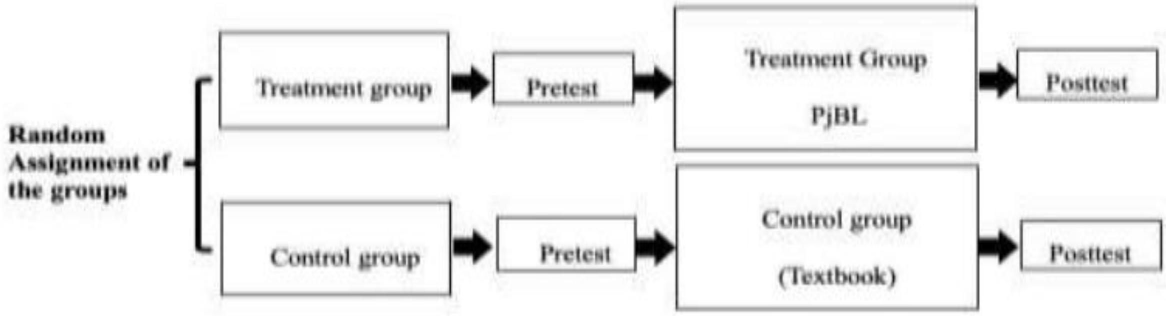


Figure 1. Experimental Research Procedures

The primary instruments are pre-test and post-test. All students were given a pre-test that was firstly validated by an expert. To follow up, the experimental group was given a treatment in the form of PBL whereas the controlled group was taught conventionally without PBL. After accomplishing the whole meetings, a post-test was given to all students. The mark of the two groups was tested in normality distribution using histogram or Kolmogorov-Smirnov formula. If the data were normally distributed, it would be continued by analysing using t-test. If the Sig.(2-tailed) is lower than 0.05, the mark between pre and post-test is significant. Meanwhile, if the data were not normal, Wilcoxon would be used. On the contrary, in Wilcoxon, if the Sig.(2-tailed) is higher than 0.05, the mark between pre and post-test is significant.

In maintaining the tests instrument appropriately, an expert from the department of aerospace ITDA was involved to give judgement. He has been in the field of aviation for 28 years as a lecturer, engineer, flight trainer, and flight operation officer. Based on the consultation, close ended questions were recommended to get objective score, quick result and easy scoring analysis. First of all, the researcher selected the questions bank from the three basic aircraft components; cockpit, body, and tail. Then, close-ended questions as a summative evaluation in the form of multiple choice and matching were selected due to the rapid and easy scoring (Rachmat & Arfiandhani, 2019; Sabila et al., 2020).

There were two revisions before the final established tests. While the first revision focused on the composition between multiple choice and matching questions, the second revision was about some inappropriate choices. After the final revision, the researcher input the questions into the campus Learning Management System (LMS) called Elena. The LMS was employed since it has become a critical component of the teaching-learning process which encompasses a wide range of applications, procedures, and learning approaches (Azimi, 2014; Gurmak Singh, John O'Donoghue, Harvey Worton, 2005; Rossi, 2009). Then, three times trials were conducted to convince the test run smoothly.

FINDING AND DISCUSSION

To elaborate the results systematically, this part is divided into the description of the controlled group followed by the experimental group and finally comparing the quantitative data from both groups in statistical data analysis.

Controlled Group

The controlled group in this research was the Industrial Engineering (IE) class of ITDA. Controlled group means the class in natural setting without any intervention or manipulation (Cohen et al., 2018; Johnson & Christensen, 2014; Leavy, 2017). All of the tests and materials delivery were conducted online. The online classroom activity was divided into asynchronous and synchronous. Asynchronous online learning is a sort of methodology that gives learners a lot of flexibility over when, how, and what they learn by making information available as soon as they need it. Students can work whenever and wherever they want, at their own pace, allowing them to spend more time reflecting on their ideas and encouraging critical thinking (Dada et al., 2019; Diaz and Entonado, 2009.). On the other hand, synchronous employs a variety of digital tools and materials, such as phone calls and video conferencing, as well as voice over internet protocol (VoIP) and internet video broadcasting. In voice or text chat rooms, teachers and students can communicate with one another (Simonsom, Smaldino, Albright, Zvacek, 2012).

Before conducting the teaching and learning process on the basic aircraft structures, the students were pre-tested. In the material delivery, the class was taught using a conventional technique. In the asynchronous mode, the lecturer used the LMS to provide shared e-book, article, and related URL which might support the understanding on basic aircraft structures before the synchronous mode. In the synchronous mode, a video conference was conducted to discuss basic aircraft structures. Following the discussion, the post-test was conducted with the same instruments. Overall, the result of the pre-test (IE PRE) and post-test (IE POST) was presented on Table 1.

Table 1. Post-test and pre-test score in industrial engineering (IE)

IE POST			IE PRE		
35	84	50	23	20	67
35	68	80	23	63	77
50	94	94	33	68	67
43	68	67	40	74	39
50	49	70	50	74	46
49	50	90	50	47	90
49	72	70	84	64	57
78	90	90	57	70	87
59	27	74	70	90	90
55	74	74	43	20	80
40	53	43	77	64	50
57	39	50	50	50	74
49	59	72	57	74	60
59	84	61	77	60	84
57	60		40	84	

Experimental Group

The experimental group in this research was the Mechanical Engineering (ME) class of ITDA. An experimental group means the class in the setting with a treatment of intervention or manipulation (Cohen et al., 2018; Johnson & Christensen, 2014; Leavy, 2017). Similar to the controlled group, all of the tests and materials delivery were conducted online and the online classroom activity was divided into asynchronous and synchronous. After the first step of getting the pre-test score on the basic aircraft structures mastery, the class was taught using treatment, project-based learning (PBL). The assigned project was describing basic aircraft components in the form of flip book.

There were three stages occupied in this treatment. The first one was creating infographic about airplane components. In this stage, the students designed the infographic using Canva application and then submitted the infographics to Padlet application. After the teacher assessed the project, the students were allowed to revise based on the teacher's feedback in a scheduled deadline. The stages of the PBL were illustrated as follows. The second step was creating flip book. After the students finished revising the infographic, they continued to put the works into the next application, online Flip Book Maker and sent the flip book link to Padlet again. After the teacher did the second assessment to the project, the students were allowed to revise based on the teacher's feedback in the second scheduled deadline. Eventually, the last process was submitting the link of the final project to the Padlet and the teacher would assess the final mark.

In the asynchronous mode, the lecturer used the LMS to provide shared e-book, article, and related URL which might support the understanding on basic aircraft structures before the synchronous mode. Additionally, the lecturer provided a submission platform, Padlet, since this application is easier to access than the LMS. In the synchronous mode, a video conference was conducted to discuss basic aircraft structures. Following the discussion, a project was assigned within three weeks completion. The first week was allocated for reporting the infographic progress, the second week was for the flip book, and the third week was for the final project as well as the post-test with the same instruments as the pre-test. Overall, the result of the pre-test (ME PRE) and post-test (ME POST) was presented as follows.

Statistical Data Analysis

Controlled group data analysis

The data analysis presented the comparison between the pre-test and post-test score of the controlled group in industrial engineering class (IE). The first step in analysing the data was testing the normality with the hypothesis as follows:

H_0 : The data are from normally distributed population.

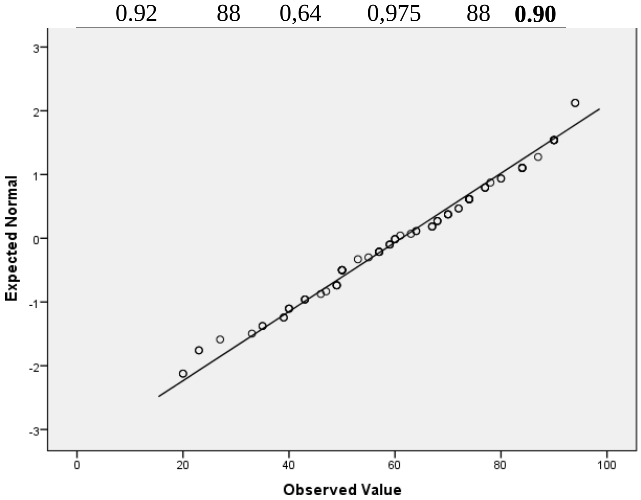
H_1 : The data are not from normally distributed population.

Table 2. Post-test and pre-test score in mechanical engineering (ME)

ME POST			ME PRE		
70	97	90	63	84	87
77	73	94	70	90	77
90	70	73	90	80	67
80	77	85	67	83	54
83	87	43	90	80	74
67	73	94	64	94	94
94	90	90	68	74	47
94	74	94	50	84	83
90	84	94	85	80	77
70	90	97	74	87	93
77	94	94	37	73	70
100	90	84	93	44	77
95	60	87	70	90	84
87	94		77	74	
100	90		90	74	

Table 3. Test of normality in industrial engineering

Tests of Normality					
Kolmogorov-Smirnov			**Shapiro-Wilk**		
Statistic	**df**	**Sig.**	**Statistic**	**df**	**Sig.**
0.92	88	0,64	0,975	88	**0.90**



Based on the test of normality above, it indicated that the $p - value$ = 0,064 for Kolmogorov-Smirnov and the $p - value$ = 0,09 for Shapiro-Wilk normality tests. Both $p - value$ > the α = 0,05 therefore the H_0 was accepted. In conclusion, the data were from normally distributed population. It was supported by the dots gathered around the lines in the Plot diagram. Due to the condition that the data were normal and derived from the same population, t-test was conducted (Bain & Engelhardt, 1992).

The second step was analysing the comparing the pre-test and post-test score with the Hypothesis as follows:

μ_1 : *Mean* Post-Test (IE POST)

μ_2 : *Mean* Pre-Test (IE PRE)

Hypothesis:

H_0 : $\mu_1 \geq \mu_2$ (Post-Test score is higher than Pre-Test score, meaning that the conventional teaching affects the students' achievement in identifying basic aircraft structures)

H_1 : $\mu_1 < \mu_2$ (Post-Test score is lower than Pre-Test score, meaning that the conventional teaching does not affect the students' achievement identifying basic aircraft structures)

Table 4. Paired samples statistics in industrial engineering

Paired Samples Statistics				
Test Type	**Mean**	**N**	**Std. Deviation**	**Std. Error Mean**
IE POST	61,84	44	17,273	2,604
IE PRE	60,55	44	19,699	2,970

The paired samples statistics investigates the average score (mean) of certain population. From the paired samples statistics above, it indicated that the mean of pre-test score is 60,55 while the mean of post-test score is a slightly higher with 61,84. It means, there is a small increase as 1,29 at the mean score in the industrial engineering class after the conventional technique delivery. The following step of checking the correlation between two parameters using Paired Samples Correlations.

Table 5. Paired samples correlations in industrial engineering

Paired Samples Correlations			
	N	**Correlations**	**Sig.**
IE PRE & POST	44	,712	,000

The hypotheses are $H_0 = 0$ (there is no correlation) and $H_1 \neq 0$ (there is a correlation). The above data indicated that the r = 0,712 and the p Sig. = 0,000. Since the p = 0 < α = 0,05, therefore, H_0 was rejected. In conclusion, there is a correlation between students' achievement in identifying basic aircraft structures and the conventional teaching. The next step is weighing the Sig value of paired differences using Paired Samples Test.

Table 6. Paired samples test in industrial engineering

Paired Samples Test (Paired Differences)								
IE PRE & POST	**Mean**	**Std. Deviation**	**Std. Error Mean**	**95% Confidence Interval of the Difference**		**t**	**df**	**Sig. (2-tailed)**
				Lower	Upper			
	1,295	14,219	2,144	-3,027	5,618	,604	43	,549

From the Paired Samples Statistics, it showed that the mean of the post-test in the industrial engineering ($\mu 1$) = 61,84 and the mean of pre-test in the industrial engineering ($\mu 2$) = 60,55, so the range is $\mu D = \mu_1 - \mu_2 = 61,84 - 60,55 = 1,29 \geq 0$.
Meanwhile, the value of $sig.(2 - tailed)$ in the Paired Samples Test= 0,549, so that value of $p = \frac{sig.(2-tailed)}{2} = \frac{0,549}{2} = 0,2745$.

In this case, α = 0,05. Since the p = 0,2745 ≥ α = 0,05, so H_0 was accepted (Post-Test sc meaning that the conventional teaching affects the students' achievement in identifying basic aircraft structures). In conclusion, the post-test score was higher than the pre-test and the conventional teaching affected the students' achievement in identifying basic aircraft structures. The finding is on the other way of the data from the study about PBL in Indonesian EFL learning (Ngadiso et al., 2021). The students preferred PBL to traditional methods of learning and the teachers stated that implementing PBL will allow them to gain more expertise with diverse teaching approaches while also allowing them to be more creative when producing teaching and learning resources.

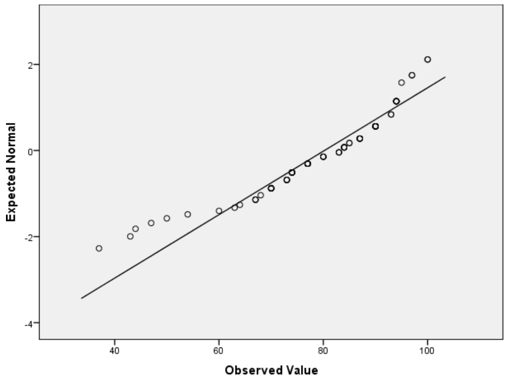
Experimental group data analysis

The data analysis presented the comparison between the pre-test and post-test score of the experimental group in mechanical engineering class (ME). The first step in analysing the data was testing the normality with the hypothesis as follows:

H_0 : The data are from normally distributed population.
H_1 : The data are not from normally distributed population.

Table 7. Test of normality in mechanical engineering

Tests of Normality					
Kolmogorov-Smirnov			Shapiro-Wilk		
Statistic	df	Sig.	Statistic	df	Sig.
,125	86	,002	0,912	86	,000



Based on the test of normality above, it indicated that the $p-value$ = 0,002 for Kolmogorov-Smirnov and the $p-value$ = 0,000 for Shapiro-Wilk normality tests. Both $p-value$ < the α = 0,05 therefor the H_0 was rejected. In conclusion, the data were not from normally distributed population. It was supported by the dots spread around the lines in the Plot diagram above. Due to the fact that the data were not normal and derived from the same population, Wilcoxon test was conducted. The second step was analysing the comparing the pre-test and post-test score with the Hypothesis as follows:

μ_1 : *Mean* of Post-Test (ME with PBL)
μ_2 : *Mean* of Pre-Test (ME non PBL)
H_0 : $\mu_1 = \mu_2$ (There is no difference between the mean of PBL and the mean of non-PBL class, meaning that PBL does not affect the students' achievement in identifying basic aircraft structures)
H_1 : $\mu_1 \neq \mu_2$ (There is difference between the mean of PBL and the mean of non-PBL class, meaning that PBL affects the students' achievement identifying basic aircraft structures)

Table 8. Wilcoxon signed ranks test in mechanical engineering

Wilcoxon Signed Ranks Test			
Ranks	N	Mean Rank	Sum of Ranks
Negative Ranks	29[a]	21,66	628,00
Positive Ranks	9[b]	12,56	113,00
Ties	5[c]		
Total	43		

a. ME Non-PBL < ME PBL
b. ME Non-PBL > ME PBL
c. ME Non-PBL = ME PBL

After getting the value of pre-test and post-test score comparison, testing the statistics was carried out to find the significance value of the ranks test as follows.

Table 9. Test statistics in mechanical engineering

Test Statistics (ME Non-PBL & ME PBL)	
Z	-3,739
Asymp. Sig. (2-tailed)	,000

Asymp sig. (*2 – tailed)* = 0 so $p = Asymp\ sig.(2-\ tailed) = 0$.
α = 0,05

Since the p = 0 < α = 0,05, so H_0 was rejected. In conclusion, there is difference between the mean of PBL and non-PBL class and the PBL affected the students' achievement in identifying basic aircraft structures. This seems to be in agreement with the findings that the PBL-educated students outscored students who received instruction from student textbooks. The data support the idea that PBL might help students improve their writing skills (Sadeghi et al., 2016).

Controlled and experimental group data analysis

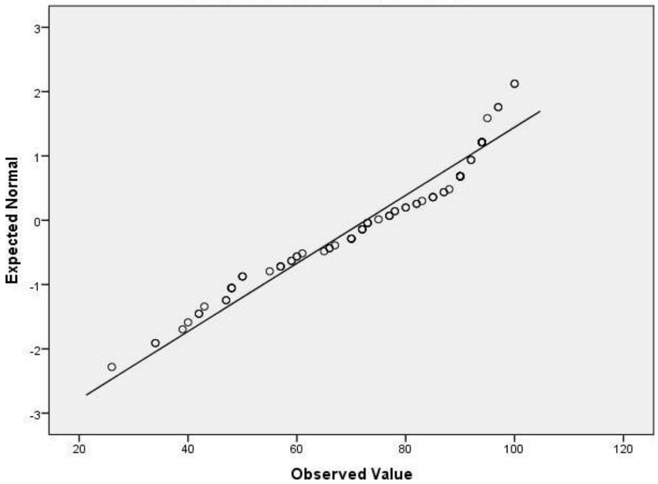
Based on the data analysis in the controlled group (Industrial Engineering=IE) and the experimental group (Mechanical Engineering=ME), both groups indicated an increase score. In this part of discussion, further analysis investigated which group achieved higher score. The same as the two previous analyses, the first step to do was normality testing with the following hypothesis:

$H0$: Data were from normally distributed population

H_1 : Data were not from normally distributed population

Table 10. Test of normality in industrial engineering and mechanical engineering

Tests of Normality					
Kolmogorov-Smirnov			Shapiro-Wilk		
Statistic	df	Sig.	Statistic	df	Sig.
,127	88	,001	0,934	88	,000



The normality testing showed $p - value$ = 0,001 for Kolmogorov-Smirnov and $p - value$ = 0 Shapiro-Wilk. Both $p - value$ were lower than α = 0,05, so H_0 was rejected. In conclusion, the data were not from normally distributed population. It was supported by the dots spread around the lines in the Plot diagram.

The next step was testing the effectiveness. Due to the fact that the data were not normal and derived from the different population, Mann Whitney test was conducted (Uyanto & Stanislaus: 2006) followed by Test Statistics with the following hypothesis:

η_1 : Median PBL (ME)

η_2 : Median Non-PBL (IE)

H_0 : $\eta_1 \leq \eta_2$ (Non-PBL is more effective than PBL, meaning that PBL does not affect the students' achievement in identifying basic aircraft structures)

H_1 : $\eta_1 > \eta_2$ (PBL is more effective than non-PBL, meaning that PBL affects the students' achievement in identifying basic aircraft structures)

Table 11. Mann-Whitney test in industrial engineering and mechanical engineering

Mann-Whitney Test Ranks			
Group	N	Mean Rank	Sum of Ranks
PBL	43	60,67	2669,50
Non-PBL	44	28,33	1246,50
Total	87		

Table 12. Test statistics in industrial engineering and mechanical engineering

Test Statistics	
	Students' Mark
Mann-Whitney	256,500
Wilcoxon W	1246,500
Z	-5,949
Asymp. Sig. (2-tailed)	,000

$p = \frac{Exact\ sig.(2-tailed)}{2} = \frac{0}{2} = 0.000$ so the

$\alpha = 0{,}05$

Since $p = 0 < \alpha = 0{,}05$, so H_0 was rejected. In conclusion, PBL is more effective than Non-PBL in improving the students' achievement in identifying basic aircraft structures. The similar result was found at previous two studies; showing that PBL helps students improve their L2 oral performance (Wahyudin, 2017) and a beneficial relationship between the use of PBL and students' reading comprehension abilities (Kavlu, 2015).

CONCLUSION

The research concluded that the project-based learning was able to increase the students' achievement in identifying basic aircraft structures proved in the experimental research between the control group in the industrial engineering class and the experimental group in the mechanical engineering class. Additionally, the result of this study revealed some limitations that could have affected the findings. The different schedule of conducting the research between the group and experimental group might reveal different result compared to when both were conducted at the similar period. It was due to the allocated curriculum discussing basic aircraft structure in both departments were not in the same order. So, further research is expected to carry out a research study in the same schedule.

REFERENCES

Andersen, A. S. & Tinne, H. K. (2015). Theoretical Foundations of PPL at Roskilde University. In A. S., Andersen & S. B., Heilesen (Eds). *The Roskilde Model: Problem-Oriented Learning and Project Work* (pp. 3-16). London, New York: Springer.

Azimi, H. M. (2014). E-Learning Needs Assessment among Students in the Colleges of Education. *Malaysian Online Journal of Educational Technology*, *2*(1), 11–22.

Bastola, G. K. (2021). Project-Based Learning (PBL) in Nepalese EFL Classroom. *Dristikon: A Multidisciplinary Journal*, *11*(1), 43–60. https://doi.org/10.3126/dristikon.v11i1.39133

Billet, C. D. (2000). *Ready for Take-Off: The language of Aeronautics*. Media Training Corporation.

Charles, M. (2013). English for academic purposes. In B. Paltridge, & S. Starfield (Eds.), *The Handbook of English for specific purposes* (pp. 137-153). West Sussex: Wiley-Blackwell.

Cohen, L., Manion, L., & Morrison, K. (2018). *Research Methods in Education* (8th ed.). Routledge Taylor & Francis.

Coxhead, A. (2018). Vocabulary and English for Specific Purposes Research. In *Journal of Chemical Information and Modeling* (Vol. 53, Issue 9).

Creswell, J. W. (2014). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches.* (4th ed.). Sage Publications.

Dada, G., E., H. Alkali, A., & O. Oyewola, D. (2019). An Investigation into the Effectiveness of Asynchronous and Synchronous E-learning Mode on Students' Academic Performance in National Open University (NOUN), Maiduguri Centre. *International Journal of Modern Education and Computer Science*, *11*(5), 54–64. https://doi.org/10.5815/ijmecs.2019.05.06

Diaz, L. A., & Entonado, F. B. (2009). Are the functions of teachers in e-learning and face-to-face learning environments really different?. Educational Technology & Society, 12(4), pp. 331-343.

Ellis, S., & Gerighty, T. (2008). *English for Aviation*. Oxford University Press.

Evans, V., Dooley, J., & Esparza, J. (2012). *Career Paths: Civil Aviation*. Express Publishing.

Gurmak Singh, John O'Donoghue, Harvey Worton, (2005). "A Study into the effects of eLearning on Higher Education", *Journal of University Teaching and Learning Practice*, UK.

Hadijah, S., & Shalawati. (2020). ICT Integration Trends in EFL (English as Foreign Language) Classrooms. *ICoSEEH - The Second International Conference on Social, Economy, Education, and Humanity*, *November*, 45–51. https://doi.org/10.5220/0009058600450051

Heilesen, S. B. (2015). Supporting Project Work with Information Technology. In A. S. Andersen & S. B. Heilesen (Eds.), *IThe Roskilde Model: Problem-Oriented Learning and Project Work* (12th ed.). Springer.

Heyworth, F. (2002). *A Guide to Project Management.* Graz: European Centre for Modern Languages.

Hudiananingsih, D., Ardika, D., Sitawati, R., Sentanu, G., Widanta, R. J., & Sadiyani, W. (2019). *Effectiveness of Project-Based Learning (PjBL)*. *354*(iCASTSS), 378–382.
Hyland, K. (2016). General and specific EAP. In K. Hyland, & P. Shaw (Eds.), *The Routledge Handbook of English for Academic Purposes* (pp. 17-29). London, New York: Routledge Taylor & Francis Group.
Johnson, R. B., & Christensen, L. (2014). *Educational Research: Quantitative, Qualitative, and Mixed Approaches* (5th (ed.)). Sage Publications.
Kavlu, A. (2015). The Effect of Project–Based Learning on Undergraduate EFL Students' Reading Comprehension Ability. *Journal of Education in Black Sea Region*, *1*(1). https://doi.org/10.31578/jebs.v1i1.8
Krauss, Jj., & Boss, S. (2014). Thinking Through Project-Based Learning: Guiding Deeper Inquiry. *Library Media Connection*, *32*(4), 94.
Leavy, P. (2017). *Research Design: Quantitative, Qualitative, Mixed Methods, Arts-Based, and Community-Based Participatory Research Approaches*. The Guilford Press.
Natalia, I. (2016). The Effect of Project Based Learning to The Students' writing Ability in Descriptive Text. *Journal of English Teaching and Research*, *1*(February), 59–65.
Ngadiso, N., Sarosa, T., Asrori, M., Drajati, N. A., & Handayani, A. (2021). Project-based Learning (PBL) in EFL learning: Lesson from Indonesia. *AL-ISHLAH: Jurnal Pendidikan*, *13*(2), 1114–1122. https://doi.org/10.35445/alishlah.v13i2.558
Pertiwi, D. R., & Kusumaningrum, M. A. D. (2019). Need Analysis of English for Mechanical Engineering. ADJES (Ahmad Dahlan Journal of English Studies), 6(1), 20–28. https://doi.org/10.26555/adjes.v6i1.12268
Rachmat, N. A., & Arfiandhani, P. (2019). "I Use Multiple-Choice Question in Most Assessment I Prepared": Efl Teachers' Voice on Summative Assessment. *ETERNAL (English, Teaching, Learning, and Research Journal)*, *5*(1), 163–179. https://doi.org/10.24252/eternal.v51.2019.a13
Rossi. P.G. (2009). "Learning environment with artificial intelligence elements". Journal of e-learning and knowledge society, 5(1), 67-75.
Sabila, N. F., Pahlevi, M. R., & Miftakh, F. (2020). Incorporating Edmodo as Learning Management System of Summative Assessment in Efl Classroom. *Journal on English Language Teaching*, *8*(2), 132–145.
Sadeghi, H., Biniaz, M., & Soleimani, H. (2016). The Impact of Project-Based Language Learning on Iranian EFL Learners Comparison/Contrast Paragraph Writing Skills. *International Journal of Asian Social Science*, *6*(9), 510–524. https://doi.org/10.18488/journal.1/2016.6.9/1.9.510.524
Sari, S. N. W., Pertiwi, I., & Sunengsih, S. (2018). The Advantages and Challenges of ICT Integration in EFL Classrooms. *CONAPLIN and ICOLLITE - Conference on Applied Linguistics and the Second English Language Teaching and Technology Conference in Collaboration with International Conference on Language, Literature, Culture, and Education*, 352–358. https://doi.org/10.5220/0007167203520358
Thomas, M., & Reinders, H. (2010). *Task-Based Language Learning and Teaching with Technology*. Continuum International Publishing Group.
Wachyu, M. I., & Rukmini, D. (2015). The Effectiveness of Project Based Learning and Problem Based Learning for Teaching Biography Text Writing to Highly and Lowly Motivated Students. *Journal of Language and Literature*, *X*(1), 61–71.
Wahyudin, A. Y. (2017). *The Effect of Project-Based Learning on L2 Spoken Performance of Undergraduate Students in English for Business Class*. *February*, 1–6. https://doi.org/10.2991/conaplin-16.2017.9
Yamada, H. (2021). An implementation of project-based learning in an EFL context: Japanese students' and teachers' perceptions regarding team learning. *TESOL Journal*, *12*(1). https://doi.org/10.1002/tesj.519