An Analysis of Application of Project-Based Learning to Improve Writing Skills of Mechanical Engineering Students
(Analisis Penerapan Project-Based Learning untuk Meningkatkan Keterampilan Menulis Mahasiswa Teknik Mesin)

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Abstract
Based on previous research, students' writing skills are considered too low especially in conveying ideas, choosing vocabularies, and arranging the vocabularies to build sentences. And then arrange the sentences as a complete paragraph. This research is motivated by the students' low writing skills which significantly impacting the students' skills to write research abstract, job applications, class presentations, and presentations for thesis defense in front of the board examiners. It is a descriptive-qualitative research that conducted with the research subject of 2nd semester students of Department Mechanical Engineering State Polytechnic of Malang. The method used for the research is writing some paragraphs using different tenses and then analyzing the basic writing mistakes of the written paragraphs. After that, students' writen a set of instruction consisted of six or more sentences that indicate a process. The results are satisfying because the students' writing skills are increased compared to before conducting this research using project-based learning, even though there are still mistakes both in terms of language and from a grammatical point of view.
Keyword : Project Based Learning, Writing Skill, Improving Writing

INTRODUCTION

Students hold an important role in determining learning outcomes, especially nowadays where technology advances are developing very rapidly. In teaching and learning processes, there are several factors that must be considered to determine the education quality, such as: 1. Teacher, 2. Students, 3. Curriculum, 4. Facilities and Infrastructure, Faculty etc.[1,2] Teachers should show the ability or proficiency of the teaching materials, methods, techniques, and the attitude of learners themselves.[3] Students bring attitude, intrinsic and extrinsic motivations, meanwhile curriculum contains matters related to

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[1] Umrzokova, Guljakhon, and Shakhodat Pardaeva. "Developing teachersprofessional competence and critical thinking is a key factor of increasing the quality of education." *Mental Enlightenment Scientific-Methodological Journal* 2020, no. 2 (2020): 66-75.

[2] Muilenburg, Lin, and Zane L. Berge. "Barriers to distance education: A factor-analytic study." *American Journal of Distance Education* 15, no. 2 (2001): 7-22.

[3] Retnawati, Heri, Samsul Hadi, and Ariadie Chandra Nugraha. "Vocational High School Teachers' Difficulties in Implementing the Assessment in Curriculum 2013 in Yogyakarta Province of Indonesia." *International Journal of Instruction* 9, no. 1 (2016): 33-48.

planning, syllabus, media, approaches, and assessment. [4]Facilities and infrastructures help learning process running well and smoothly.[5] One of most important examples is the teacher and strategy because strategy is very closely related to the teacher.

In Department of Mechanical Engineering of State Polytechnic Malang, especially study program Automotive Electronics, English course is given in the second semester and seventh semester. So far, the strategies used by the teachers are only determined by reading comprehension in the field of study or by content-subject matter, hoping the students could understand the content of the book being discussed. Whereas at the end of semester, the students' abilities are less developed. On the other hand, writing is very important for the students and they should've got this writing skills from an early age. By teaching writing skills, the main goal of learning English will be achieved. One of the purposes of giving writing lesson is so that the students will understand how to write in English properly, which one is subject, predicate, object, etc.

One of the four main language skills, listening, speaking, reading and writing, in study program automotive electronics where majority of the students come from vocational high school, their skills are very low especially in terms of writing. This happens maybe because of several reasons, such as the teachers have difficulties in understanding the students' English skills, teaching using conventional methods, and not trying to use various teaching strategies. The explained problems motivated us to improve students' writing skills by implementing project-based learning technique in teaching strategies.

Fisher, D., Y. S. Kusumah, and J. A. Dahlan. (2020) described project as complex tasks, based on challenging themes which involving students in designing, solving problems, decision making, or investigating; provides the opportunity to work in the scheduled time period to make the product.[6] Thitivesa, Duangkamol, and Abigail Melad Essien (2013) proposes three types of projects based on the nature and sequence of activities, 1) structured projects, where the teacher determines and arranges the topics, materials, methodologies, and presentation, 2) unstructured projects, defined by students themselves, 3) semi-structured projects, defined and arranged by both teachers and students.[7] Further, Project-Based Learning as learning that uses projects as medium in learning process to achieve competence in attitudes, knowledge, and skills.[8] [9] Emphasizing in students' activities to produce products by implementing research skills, analyzing, producing, and presenting learning products based on real experience. The product is the result of project in the form of written works. By implementing Project-Based Learning, students practice planning, doing activities based on the plan,[10] and presenting or reporting the result.[11] Project-Based Learning is designed to be used on complex problems which needs to be investigated and understood by students. meanwhile the teacher holds the role of facilitator, advisor, and medium to obtain optimum result in accordance with students' creation and innovation. Since each student has different way of learning, Project-Based

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[4] Ikhwan, Afiful. "Management Of Learning Assessment Using Curriculum 2013 (Case Study In Islamic Primary School (MI) Muhammadiyah 5 Wonoasri Ponorogo-East Java-Indonesia)." *MUADDIB: Studi Kependidikan Dan Keislaman* 8, no. 2 (2019): 108-123.

[5] Siswanto, Edy, and Dian Hidayati. "Management Indicators of Good Infrastructure Facilities to Improve School Quality." *International Journal on Education, Management and Innovation (IJEMI)* 1, no. 1 (2020).

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[10] Tseng, Sheng-Shiang, and Hui-Chin Yeh. "Fostering EFL teachers' CALL competencies through project-based learning." *Journal of Educational Technology & Society* 22, no. 1 (2019): 94-105.

[11] Cazorla-Montero, Adolfo, Ignacio de los Rios-Carmenado, and Juan Ignacio Pasten. "Sustainable development planning: Master's based on a project-based learning approach." *Sustainability* 11, no. 22 (2019): 6384.

Learning lets them to explore the materials using their own way and doing experiments collaboratively.

The characteristics of Project-Based Learning are:
1. Students make decision on the framework.
2. Giving problems and challenges to students.
3. Evaluating continuously.
4. Final products of learning activities will be evaluated qualitatively.
5. Learning situation is tolerant of mistakes and changes.

The advantages of Project-Based Learning are:
1. Increases motivation to learn and encourages their ability to do important tasks and giving rewards.
2. Increases problem solving ability
3. Makes students more active and successfully solve complex problems.
4. Encourages students to develop and practice communication skills.
5. Provides learning experiences which engage students in a complex manner and designed to adapt with the real world.
6. Creates fun learning atmosphere, so that students and teachers will enjoy the learning process.

There are several steps to implement Project-Based Learning, those are:
1. Start with the essential question.
   Start the learning process from essential questions that can motivate students to do some activities. Questions about real life and relevant topics that will lead them to investigate it.
2. Design a plan for the project.
   Planning should be conducted collaboratively between teacher and students, so that students will feel attached to the project. The plan should support in answering the essential questions by integrating various subjects and learn the tools that can be used to finish the project.
3. Create a schedule
   Teacher and students collaboratively create schedule and arrange the activities to finish the project. The activities are; create timeline to finish the project, determine the deadline, motivate students to make solutions, guide students to the proper solutions, and ask the students to make explanations about choosing the solutions.
4. Monitor the students and the progress of the project
   Teacher is responsible to monitor the students' activities when they are completing the projects. Monitoring is performed by facilitate the students in each process, also called mentoring. To make mentoring easier, teacher makes rubric that records overall important activities.
5. Assess the outcome
   Assessment is performed to help teacher to measure the achievement of standards that taking role in evaluating each student's improvement, also helps teacher to make strategy for next learning process.
6. Evaluate the experience
   Teacher and students reflect on the performed activities and project results. The reflection process is carried out individually or in a group. In this step, students will be asked to express their feelings and tell their experiences on completing the project. Next, both teacher and students will discuss how to improve the performance during the learning process, so that new inquiry is discovered in order to solve the problems raised in the first step of the learning process.

Writing is an activity to express ideas using written language as medium of delivery (Tarigan, 1986:15). Writing can be considered as process or a result. It is also an activity that produce an article. In the other words, writing is an activity to express ideas using complex ability in the form of letter and numbers symbols systematically so that they can

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be understood by others. Wwriting skills as productive language skills which means that writing skills is an ability that produces something.[12] According to Bourke et. al (2014), writing skills isn't a skill that is obtained automatically, it is obtained through learning process.[13] Writing skills is an active and productive skills in producing articles obtained through learning process and continuously practicing.

According to Bochner, Arthur, and Carolyn Ellis (2016) M. Atar Semi the purposes of writing are: 1) to express or tell something, 2) to give instructions or directions, 3) to explain something, 4) to convince and 5) to summarize.[14] Writing also requires particular steps in its process, for instance:

1. Pre-writing stage
   In this stage the author determines the topic and considers is the topic attracting the readers or not.
2. Writing stage
   Making writing draft. The author prioritizing on the content rather than the writing grammars, so the author can express the idea.
3. Revision stage
   The purpose is to perfect the draft so that it remains focus on the goal by adding or removing some parts of it, adding supported information, improving writing formulation, rearrange the main ideas, removing irrelevant information, etc.
4. Editing stage
   Reread the draft to reexamine mistakes and weakness of the draft by reviewing its focus on main idea, main goal, target readers and publishing criteria.
5. Publication stage
   In this last stage, author publishes his writings by submitting it to publisher, magazine editors, etc.

Students nowadays have low skills and interest to master writing skills. They feel that it is enough to understand their own writings, and not improving it. They are not motivated to learn more about it. So, the teacher should make a move to encourage students and show that writing is an important skill to achieve success in life. Teachers should emphasize more the main goal of writing and help them explore more on grammars, vocabularies and writing techniques. Choosing the right teaching techniques and medium will help students understand and learn better. Determining effective evaluation to evaluate tasks done by the students will help teachers to understand the skills of each student objectively. So, by implementing Project-Based Learning as teaching method we aim to improve students English writing skills and help teachers finding the right teaching strategy for writing skills.

METHOD

The research is conducted with students of 1A D4 TOE class from program study of automotive electronics department of mechanical engineering State Polytechnic Malang who are currently taking English course. We performed a case-study analysis to obtain better result of students' achievement in studying English using Project-Based Learning with the materials prepared by the teachers. This study is conducted by a descriptive and qualitative approach. To implement Project-Based Learning, firstly we give the materials and teach the students how to write in English according to the right and proper grammars. We teach the students from the simplest grammar and slowly leveling up to the most complex one. After that every week, we ask students to write about the given topic that will be analyzed by the teachers. After analyzing the students' writings, we also distributed

[12] Suhono, S., M. Zuniati, W. Pratiwi, and U. A. A. Hasyim. "Clarifying Google Translate Problems Of Indonesia-English Translation Of Abstract Scientific Writing." (2020).

[13] Bourke, Lorna, Simon J. Davies, Emma Sumner, and Carolyn Green. "Individual differences in the development of early writing skills: Testing the unique contribution of visuo-spatial working memory." *Reading and Writing* 27, no. 2 (2014): 315-335.

[14] Bochner, Arthur, and Carolyn Ellis. *Evocative autoethnography: Writing lives and telling stories.* Routledge, 2016.

questionnaire and ask them few questions regarding the conducted experiment and about the importance of English class for them.

RESULT AND DISCUSSION

In this section, we will present students' writings for each grammar tense and topic, followed by our analysis and correction on it.

Present Tense

Today is Wednesday. I must study English in the class at 07.00 AM. But this morning after I pray subuh, I sleep again, Im so tired since yesterday because my time is divided for college, work and organization. So I wake up again at 06.30 AM. I am surprised and rushed to take a shower and have breakfast. Finally I go to campus at 07.00 and amved at 07.08. fortunately my teacher has a policy for the students coming class at the latest is 15 minutes from 07.00. But I rushed to the class from the ground floor. Unfortunately the elevator takes very long time to get to the ground floor. So I decided to go up through the stairs and my teacher allowed me to enter the classroom.

There are few incorrect tenses used in the paragraph above, for example "since yesterday" should use Present Perfect Tense, also "decided" that should be used for Simple Past Tense.

No	The improper sentences/words	The proper ones
1	I m so tired sice yesterday	I have been so tired…..
2	I decided to…	I decide to…
3	So (in last sentence)	It doesn't have to be present in the sentence

Daily activity I am from Monday to Friday are every day I am wake up at 04.30 AM. Then I pray subuh after that I clean up bathroom after I take a bath after take abath I change clothes then go to the campus. After to the campus I follow the lesson starting from hour at 07.00 – 11.30 at the campus I study starting from tune up, engine *disasemly and lesson Fisika and English. I am student majoring in DIV Otomotive Electronik. The hardust part of my course is disassembling the engine. After I come home from campus at night I used to do the assignments given to day. That's my activity from me waking up to sleep again.*

No	The improper sentences/words	The proper ones
1	Daily activities….	My daily activities
2	I am wake up	I wake up
3	…then….	Can be replaced using next, after that

The sentence arrangement isn't following the rule of *Subject-Verb-Object*. He also use confusing tenses like "I am wake up".

Present Continuous Tense

I am student in State Polytechnic of Malang. I entered mechanical engineering. Now I semester 2. I am have friend this name X, Y, Z, A, B, C, D. We in class TOE . I am life in Malang town. I am like playing musik, I can play gitar and piano my hobby is futsal. I part time work is futsa coach. I train children aged 8 to 15 years. In addition to college I also take coaching courses. Right now I am worried about the corona virus that is sweeping the world. It makes me maintaince my lifestyle.

No	The improper sentences/words	The proper ones
1	I am student	I am a student
2	Now I semester 2	Now I am in the second semester
3	Iam have	I have…
4	I am life	I live
5	I am part time work	Futsal coach is my part time work

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I am come form Tulungagung city. I am student in collage <u>poor state polytecnik</u> malang. I am like mechanical engineering about mechanical car, truck, and other. Because that I am enter in major mechanical engineering in autronica. Authronita including mathematics, science fisika, chassis, English thermo AC (air conditioner), etc. My hobby futsal and my favorite player fulcao from Brazil player. My dream headmister in the company. Today in wedneday I am wake up from sleep for goiung my class. To day I have Englsih class on the L3T-O2 mechanical engineering buld. I am studying about reading and answer question in English lesson because the theacher good in the educate and happy full. English lesson I like about reading, speaking, but I don't like writing because in write I don't have many alfabet.

No	The improper sentences/words	The proper ones
1.	I am come from	I come from
2	Poor state polytechnic	Polytechnic Negeri Malang
3.	I am enter	I was admitted
4.	The writing autronica	Autotronics
5.	My dream headmaster	My dream is to be headmaster
6.	English lesson I like	I like English lesson such as…
7.	I don't have many alfabet	I don't have many vocabularies

Hello, My name is X. I am going to have a long holiday two month only. It will be about two month. My family and I are going to go to Bandung. In Bandung we plan go to the tourist. We are going to spend five days there. The tourist I will photo and enjoy view.
After of Bandung, I will go to the brother home in Probolinggo, in the Probolinggo I will stay four days. There I dont just to the brother home, but also visit the tourist. There's some of the tourist nice for example is Bromo mountain and the water fall Madataripura, the second it was anice place to visit after four days there. I will go home to my home town in the Sumenep.

No	The improper sentences/words	The proper ones
1.	….visit the tourist…	…visit the touristm places
2.	…in the Probolinggo	.there
3	In the Sumenep	In Sumenep

Future Tense

The last semester holiday will be the moment that I will wait for. Because as long as I sit in first level collage. I spend more time to learn than doing something activities associated with myhobby. My last holiday will classify as a very simple holiday. I will only at home for doing my hobby such as play music, draw something and spend my time with family and friends in the new year. I will go together with my friend to celebrate the new years together. We imagine that when the count down will arrive. The sky will colorfull decorated by fire works. We will watch the fire works lightening in the sky in the night, That what I will remember during my holiday.

No	The improper sentences/words	The proper ones
1.	Tha last semester holiday	The next semester
2.	I will only at home	I will be only
3,	The sky will colorfull	The sky will be colorfull

Many of my friends say that they will be an employee after graduation, But I have different plan. I want to open my own workshop and I will be the boss. Besides, I want to be a bussinessman. I will make a product and I will market it. I will make products by targeting middle and lower grade to be affrodable for all people, one day I belive will be a succesful bussinessman.

Even though the paragraph is short, but the sentences have proper grammar and lexical point. The sentences are coherent with each other, and easy to understand.

Hi my name is X. I will going to village I have a long holiday next month. I can look view beautiful mountain in Bromo. I went driving car with roads going up and down which can carse us dizzy with a long enough travel time. We can see the sunrise and brathe fresh air that's what I dramed of in the next 2 years.

No	The improper sentence/words	The proper ones
1.	I will going	I will go
2	Can look view beautiful	Can look beautiful view
3	What I dramed of	I deamt of

Past Tense

Last year. I went to Makkah and Madinah with my brother. We arrived in Djuanda International Airport at December. Our departured are in Jeddah Airport by Saudi Arabia airplane. I ate a strange food but the taste is very delicious in the airplane. After, we took our stuff in airport, we went to the hotel in Madinah by big bus. The scenery is very beatiful in the way to the hotel. Our time in Madinah are 5 days. We took many time to prayed in Nabawi Mosque, but smetimes I bought a very delicious kurma. The people are very nice when I talked with on of them by used an English language.

I started umroh before came to Mekkah. I started with intention, tawaf, sa'i, tahallul, and orderly. My brother and I are very had and experience in our life. In Makkah we had 3 days and we came back to Indonesia with Saudi Arabia airlines again in Jeddah Airport. Alhamdulillah we went to our home safely.

No	The improper sentences/words	The proper ones
1.	At december	In ….
2	Many time to…..	Many times
3	By used	By using

Writing Instructions

In this task, students are asked to write a set of instructions related to how operate machines. There are 4 groups with different topics for each of them. Below presented how they write the instructions, followed by the analysis and corrections.

Group 1: How to turn on the computer
1. Find the 'on' button
2. Make sure the plug is in
3. Push the button
4. Computer will boot for sometimes
5. After that you can use the computer

'After that' in instruction number 5 is not necessary, remove it and straightforward to 'use the computer' is okay.

Group 2: How to start a motor
1. Take the key remote
2. Press the key
3. Wait for the remote to turn green
4. Press on the lock lever on the motorbike
5. Turn on the lock lever twice
6. Start the motorbike

Group 3: How to change the batteries of the flashlight
1. Unscrew the flashlight
2. Dump the ola batteries
3. Put them aside

4. Find the + and – signs on the batteries
5. Put the two batteries in the flashlight
6. Screw the flashlight back
7. Turn the flashlight on

Group 4: How to make the study table from wood
1. Prepare a wood
2. Measure the wood according to the size
3. Cut the wood
4. Staking the wood according to the shape
5. Paint the wood
6. Ready to use the table

Instruction number 4 should not use verb in present continuous tense. It should've been present simple tense. In instruction number 6, the word 'ready' should be removed and just 'use the table'.

Questionnaire

After conducting the experiment, we distributed a questionnaire to evaluate their English writing skills and to know their opinion about it. The scale used in this questionnaire is: 4 means very important, 3 is important, 2 is less important and 1 means not important.

Tab1e 1 Summary of the questionnaire

No	Statement	Total Answer			
		4	3	2	1
1	English is an important supporting course for students of mechanical engineering department	3	17		
2	Students of mechanical engineering department need English Writing course		20		
3	Time allocation for English course should be increased	4	16		
4	Basic English course should emphasize more in usage of grammar tenses		18	2	
5	Students are familiar with the topics given in English writing course	20			
6	Students are familiar with the vocabularies and dictions related to machines and daily use	20			
7	Sentences in the paragraph are simple and from students' thoughts related to daily life and machines	20			
8	Courses related to tenses of writing instructions is required		15	5	
9	Instructions related to mechanical engineering is required and useful for students	20			
10	Learning vocabularies in writing instructions are important, because lots of machines instructions are written in English	20			

These findings are supported by several previous findings, explaining that after applying the project-based learning model, students are not ashamed to ask the teacher and discuss with their peers, increasing motivation in learning. [15][16] The application of the project based learning model can increase students' independence in completing assignments,

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[15] Handayani, Lilik. "Peningkatan Motivasi Belajar IPA Melalui Model Pembelajaran Project Based Learning pada Masa Pandemi Covid-19 bagi Siswa SMP Negeri 4 Gunungsari." *Jurnal Paedagogy* 7, no. 3 (2020): 168-174.
[16] Setyosari, Punaji, and Sumarmi Sumarmi. "Penerapan model problem based learning meningkatkan motivasi dan hasil belajar IPS." *Jurnal Pendidikan: Teori, Penelitian, dan Pengembangan* 2, no. 9 (2017): 1188-1195.

cooperation in group discussions has increased.[17] Suhartadi's research concludes that the project-based learning model is proven and proven to be able to foster student independence, especially in learning that allows project work to be carried out. (4) Students' courage in group discussions and presentations. With presentation discussions, students learn to convey what they have learned so that they can add to the knowledge they have learned before. The interactive process with colleagues helps the knowledge construction process because it allows opportunities to convey ideas, listen to other people's ideas, and reflect on their own ideas to others (Vygotsky and Moore in Wena, 20011). From the results of the discussion and discussion above, the position of the findings of this researcher is an affirmation of the existing findings. Because the researchers' findings do not conflict with previous findings. This shows that the application of the project based learning model in learning to write has positive implications for increasing writing skills.

The findings of this study are in line with Minandar's (2013) research which developed a document-based history learning model to improve the explanatory ability of STKIP-PGRI Pontianak West Kalimantan students.[18] Thus, the archive-based learning model is effective in improving students' abilities, both in explanation and writing skills. Meanwhile, Fernandes (2015) explains the function of embedded systems as air temperature control. [19] Students are given the task of making a project in the laboratory regarding industrial driers. Projects implemented with a digital system by 2nd semester students, 2012 in each group consist of four people. The goal is that students can provide solutions to problems in the embedded systems area. Through a project based learning approach, students can complete the assigned tasks well.

CONCLUSION

Based on the results obtained from the experiment and analysis, we conclude that English course plays important role for students as the basic to write thesis abstract and perform thesis defense. In this research, the most important aspect is writing skills. From this research we found that students build sentence only using vocabularies and dictions that are familiar and easy to understand to them, so they need to be introduced to more specific and related ones. Because of that, teachers need to familiarize and introduce students to more proper and specific tenses, instructions and vocabularies that are related to mechanical engineering, because it is very important and widely used in operating machines.

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[18] Minandar, Fandri. "Model pembelajaran sejarah berbasis arsip-dokumen untuk meningkatkan eksplanasi sejarah mahasiswa STKIP-PGRI Pontianak Kalimantan Barat." PhD diss., UNS (Sebelas Maret University), 2013

[19] Fernandes, Marcelo AC. "Project-based learning laboratory for teaching embedded systems." *Mathematical Problems in Engineering* 2015 (2015).

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