



Effectiveness of *Project-Based Learning* Models in Vocational Schools: A Study on Productive Subjects

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A B S T R A C T

One of the lessons that can improve every student's skills is Project-Based Learning (PjBL). PjBL itself can help students acquire knowledge by solving real-world problems in project tasks. This learning phase can gradually increase students' motivation. At first, students will have difficulty with this, but over time they will gain experience to get used to solving different problems in each part of the project. Therefore, students' competence will continue to increase in the final phase as more and more of them put learning theory into practice. To determine to what extent the students' learning success increases through the use of PjBL in class, the use of joint project tasks in several subjects is examined. The study was conducted using Classroom Action Research (PTK) consisting of 2 cycles. The research location is at SMKN 1 Blitar with the research sample being type XII PPIB 1. The tools used are observation forms for quantitative data and interview forms for qualitative data. Observation of student learning activities is carried out during the teaching and learning process. The general project task topics covered are Software Application and Building Interior Design (APLPiG), Construction Cost Estimation (EBK), and Building Utility Construction (KUG). The observed results show that in cycle 1 the average value of student learning activities is 69.19%, while in cycle 2 the average value of student learning activities is 78.82%. Based on the results of hypothesis testing in each subject, it was found that the average score of each student increased from cycle 1 to cycle 2. In addition, through observing 7 types of learning activities, we also found that each student increased in each subject. type of learning activities in PTK. In summary, learning activities increased when PjBL was implemented

Abstrak

Salah satu jenis pembelajaran yang dapat meningkatkan kemampuan individu setiap siswa adalah pembelajaran berbasis proyek (PjBL). PjBL sendiri dapat membantu siswa memperoleh pengetahuan dengan memecahkan masalah kehidupan nyata dalam proyek. Fase pembelajaran ini memungkinkan motivasi siswa berkembang secara perlahan. Pada awalnya siswa akan mengalami kesulitan dalam mengerjakan, namun seiring berjalannya waktu, mereka akan memperoleh pengalaman dan terbiasa memecahkan masalah yang berbeda-beda di setiap bagian proyek. Pada tahap akhir keterampilan siswa akan terus meningkat karena pembelajaran teori banyak dipraktikkan. Penerapan proyek gabungan pada beberapa mata pelajaran akan diteliti untuk mengetahui sejauh mana peningkatan aktivitas belajar siswa ketika penerapan PjBL di kelas. Penelitian dilakukan dengan menggunakan Penelitian Tindakan Kelas (PTK) yang terdiri dari 2 siklus. Lokasi penelitian di SMKN 1 Blitar, sampel penelitiannya adalah tipe XII PPIB 1. Alat yang digunakan adalah lembar observasi sebagai data kuantitatif dan formulir wawancara sebagai data kualitatif. Observasi terhadap aktivitas belajar siswa dilakukan pada saat proses belajar mengajar. Sedangkan mata pelajaran yang ditugaskan pada proyek gabungan adalah aplikasi perangkat lunak dan desain interior (APLPiG), estimasi konstruksi (EBK), dan konstruksi utilitas (KUG). Hasil observasi menunjukkan bahwa pada siklus 1 nilai rata-rata aktivitas belajar siswa sebesar 69,19%, sedangkan pada siklus 2 nilai rata-rata aktivitas belajar siswa sebesar 78,82%. Berdasarkan hasil uji hipotesis pada setiap mata pelajaran diketahui bahwa rata-rata skor mengalami peningkatan dari siklus 1 ke siklus 2. Selanjutnya melalui pengamatan terhadap 7 jenis kegiatan pembelajaran juga terlihat bahwa setiap siswa mengalami peningkatan pada

setiap jenis kegiatan pembelajaran. aktivitas belajar. kegiatan pembelajaran di PTK hari ini. Kesimpulannya, terjadi peningkatan aktivitas pembelajaran selama pelaksanaan PjBL.

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1. Introduction

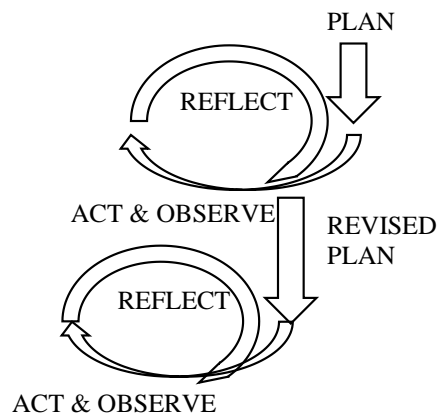
The learning activities that take place in secondary vocational schools (SMK) make it difficult for some teachers to teach students how to solve problems because very few teachers can master this ability (Chiang et al. Lee, 2016). As early as middle school, students are used to absorbing knowledge in textbooks and receiving orders from teachers one by one (Chiang & Lee, 2016). To improve each student's abilities, Chiang and Lee (2016) found that by implementing project-based learning (PjBL), the use of a learning model can gradually enhance the motivation of students. This opinion is supported by Jalinus, et. Al (2017) believes that three different steps need to be taken to see the success of PjBL in SMK.

The PjBL form of learning considers that students need opportunities to build knowledge through real problem-solving by asking and completing questions, organizing and carrying out investigations, analyzing, collecting, and presenting data and information, drawing conclusions, and conveying findings (Kokotsaki, et al. 2016). Unfortunately, the disadvantages of the Project Based Learning (PjBL) learning model include that it takes a lot of time when problems occur. In addition, because this learning system is student-centered, other possibilities that can occur are difficulties in collecting information and a lack of student activity when doing assignments. Both of the above can make students unable to understand the topic or learning material as a whole (Muniarti, 2017). This view is reinforced by Baysura et al. (2016) suggested that students may not focus on the topic being taught because the boundaries of the project are unclear.

The use of PjBL certainly has a positive impact on some vocational schools, but the shortcomings of these learning methods cannot be ignored. According to Baysura et al. (2016), teachers must also be able to create and manage their projects to be able to support students. Furthermore, similar views were also expressed by Baysura et al. (2016), who stated that a competent teacher has the opportunity to lead projects at different educational levels. However, no research has been conducted on the application of PjBL using combined projects on several topics. Therefore, further research is needed to evaluate the effectiveness of applying the implemented learning methods. Thus, the effectiveness of the method can be measured if it is applied to effective learning through students' learning activities.

2. Research Method

This study used classroom action research (PTK) to determine the effectiveness of using project-based learning (PjBL) in effective learning in vocational schools. The 3 linked subjects have a continuous homework structure, so it will greatly affect the homework of other subjects if the homework of one subject is not completed. This research will be carried out in collaboration between researchers and educators from relevant agencies. Researchers will serve as observers and educators will serve as teachers. Classroom action research (PTK) used follows several stages according to Octafia (2013), including planning, action, observation, and reflection. The PTK model used as a reference in this study is the Kemmis and McTaggart model as shown in the following table:



Figures 1. Kemmis and McTaggart Version of the Classroom Action Research Model

The subjects used were students of class XII PPIB from SMK Negeri 1 Blitar with samples from class XII PPIB 1. SMK Negeri 1 Blitar was chosen because it is one of the best vocational schools in Blitar City according to Puspendik data of the Ministry of Education and Culture and can therefore be used as a research site. Data collection techniques were used using student observations and interviews, documents, and field notes. Quantitative data analysis techniques are performed, descriptive analysis, normality testing, homogeneity testing, and hypothesis testing. While reducing qualitative data (the process of simplifying data), presenting data (organizing data), and drawing conclusions.

3. Finding and Discussion

3.1. Findings

The research was conducted at SMK Negeri 1 Blitar in the Building Department on 35 students of grade XII DPIB 1. In an interview with the Head of the Building Department, Mr. Eko Purwantoro, S.Pd. on August 29, 2022, stated that there are large task demands for DPIB class XII students so they need a more appropriate learning model so the task can be completed properly. Therefore, researchers assisted by subject teachers will apply the Project Based Learning (PjBL) learning model to overcome these problems.

With the existence of subjects whose material is interrelated, a large joint project of 3 subjects can be planned, namely APLPIG, EBK, and KUG. This combination of large tasks aims to make it easier for students to do assignments, so there is no need for each mapel to have its big task. For example, students draw floor plans in APLPIG subjects, then the drawings can be used as references for assignments in EBK and KUG subjects. These interrelated tasks will later be made into a single unit in the final project as a result of DPIB products. Therefore, its implementation needs to be observed through observation of student learning activities because there is a possibility that there is a delay in working on assignments in one subject which will affect the performance of other subjects. However, there is also the possibility of students becoming motivated to gather information and complete assignments immediately.

The stage has 2 cycles (2 weeks each) and is carried out in collaboration between researchers and teachers by creating several learning tools such as; RPP by applying the Project Learning (PjBL) model, compiling checklists for sub-sections of project tasks, and preparing teaching materials to be used. The researchers also prepared research tools in the form of observation sheets and interviews with students and teachers as well as field notes.

1. Software Applications and Building Interior Design (APLPIG) – Cycle 1

The implementation for APLPIG subjects by the RPP applies the procedure for making layout drawings. Cycle 1 consists of 6 meetings in 2 weeks with a total time allocation of 16 x 45 minutes each week. The schedule on Monday consists of 6 x 45 minutes, Tuesday 6 x 45 minutes, and Friday 4 x 45 minutes. Currently, students are focused on working on SketchUp drawings imported into layout applications to create working drawings. The first meeting is held by the teacher by gives directions to students regarding the project assignments to be carried out. Students are directed to work on plan drawings from 3D SketchUp drawings that have been made. This plan drawing is done in the layout application. Students take a long time to prepare files and learning devices (laptops, mice, etc.). When starting to work on a project assignment, the majority of students discuss it with friends or ask the teacher about the terms of the assignment. In addition, at the end of the lesson, students completed the plotting floor plan and looked at only 20 students. In the second, it is still the same as the first day, this is because students are still collecting references through the internet and discussing with friends and teachers. Every day, teachers monitor the progress of student progress by providing suggestions and input. On the third day, as many as about 20 students had printed out the progress of working on the floor plan, visible, and cut drawing projects.

In this second week, At the fourth meeting, about 25 students started working independently while the others were still adjusting. However, solving problems when working on projects is still a long time. For example, there is still a lack of enthusiasm and a long time in finding the information needed to do it. On the fifth day, there was an increase in progress, some who had difficulty working on certain parts, began to try other parts such as roof plans. On the sixth day, the teacher said most of the students' work mistakes were not being careful about elevation, dimensions, space names, and some mistakes on cut drawings. In addition, the average error is also found in the lack of completeness of the image. Overall total progress for cycle 1 is 30%.

2. Construction Cost Estimation (EBK) – Cycle 1

The implementation for EBK cycle 1 subjects by the RPP calculates the percent of labor and materials, as well as energy needs. The implementation is from 4 meetings in 2 weeks with a total time allocation of 16 x 45 minutes each week. The schedule on Monday consists of 4 x 45 minutes and Wednesday 8 x 45 minutes. In the first week, students work on a percentage of labor and materials. Then the second week students work on energy needs. The reference images used are images from APLPIG subjects.

The first meeting is held by the teacher by gives direction to students regarding the project tasks to be carried out. Students are directed to calculate the percent of labor and materials in the first week, and then calculate the energy needs in the second week. Calculations are done in the Microsoft Excel application. The teacher explains the related material then students ask about the provisions of the task to the teacher, then exchange opinions between friends. At the second meeting, the teacher submitted a form to fill in the progress of student project assignments. In general, in the first week, there are still many students who need a long time when preparing files to be used.

At the third meeting, the teacher gave material on how to calculate the correct labor needs. Students pay attention and record the material, then continue to work. In general, because the first and third meetings are during the day, there is a possibility that students are sleepy and tired so the work is not optimal. Until the fourth meeting, the average obstacle experienced by students was confusion in choosing templates, file errors, and not responding devices as many as approximately 7 students. Meanwhile, the average student progress is around 55%.

3. Building Utility Construction (KUG) – Cycle 1

The implementation for EBK cycle 1 subjects is by the RPP planning lightning rods and sprinkles. The implementation is from 4 meetings in 2 weeks with a total time allocation of 15 x 45 minutes each week. The schedule on Thursday consists of 8 x 45 minutes and Friday 7 x 45 minutes. In the first

week, students work on a lightning rod plan. Then the second week students work on a sprinkle plan. The working drawings used are images from APLPIG subjects.

The first meeting is held by the teacher by gives directions to students regarding the project tasks to be carried out. Students are directed to do sanitation work first. At the first meeting, about 25 students focused on working, but after the afternoon break the focus decreased. Because previously in the APLPIG subject, there was project progress, students only need to make KUG drawings according to the provisions. At the meeting, the two teachers delivered material on lightning rods. After the noon break, students worked on the lightning rod plan and sanitation work. As many as 85% of students do learning activities well, but it decreases to 70% when approaching 15.00 WIB.

At the next meeting after interviewing some students, when they are still in the early stages the intention to do the project assignment is only a little, and will increase as the deadline approaches. Teachers also actively provide advice and input regarding pipe and connection placement errors. The fourth meeting of teachers explained a little material about fire protection and directed students to plan the placement of sprinkles in 2-story houses. At this meeting, students focus on doing as much as 80%. Overall total progress for cycle 1 is 20%.

4. Reflection of Cycle 1

The average result of the percentage of student learning activities according to the indicator when cycle 1 observation was carried out was 58.06%, while the target achievement of cycle 1 was 53.57%. According to the percentage contained in Table 3.9, it can be concluded that student learning activities have met the target of cycle 1 so that they can continue to carry out cycle 2 by increasing teacher activities to support student learning activities so that the target in cycle 2 is achieved. Through the findings and observations in cycle 1, things that need to be addressed include:

- a) Lack of enthusiasm of students when solving the problem of the given project task, because some students lack enthusiasm during the process.
- b) Students who are constrained by hardware do not immediately ask questions so a lot of time is wasted.
- c) When teachers and friends ask about a problem at hand, certain students just keep silent and do not respond.

Based on these field notes, several kinds of actions that are felt to be taken to improve learning activities in the implementation of learning in class in Cycle 2 include:

- a) Teachers and researchers play an active role in motivating students during the learning process. This is expected to be able to influence and increase learning activities.
- b) Teachers try to convince students to instill positive things in themselves so that they are confident, and do not need to feel afraid and embarrassed in discussions so that project work is faster.
- c) Researchers and teachers discuss and reflect on the implementation of the Project Based Learning (PjBL) learning model by correcting shortcomings to be applied in cycle 2.

5. Software Applications and Building Interior Design (APLPIG) – Cycle 2

The implementation for APLPIG subjects by the RPP applies the procedure for making layout drawings. Cycle 1 consists of 6 meetings in 2 weeks with a total time allocation of 16 x 45 minutes each week. The schedule on Monday consists of 6 x 45 minutes, Tuesday 6 x 45 minutes, and Friday 4 x 45 minutes. To complete the big project assignment, students continue to sketch up drawings imported into the layout application to create working drawings.

The first meeting begins with the teacher giving students directions on project assignment submission deadlines. In addition, teachers evaluate student performance to better utilize time during assignments. At this stage, students are used to preparing what they need to work on project assignments. 70% of students also actively ask questions and discuss with friends when they get problems. Before printing out, students check first to minimize errors (paper size, placement of dimensions and descriptions, needs needed in drawings). On the second day, students ventured to work on unfinished drawings. Usually, students wait for other friends to get referrals, but this time about 40% started trying to do it on their own while consulting with the teacher. In general, in the first week, students focus on doing as much as 80%.

At every meeting, the teacher always gives perception to students to increase enthusiasm for learning. In the fourth week, the average student can focus on doing about 85% in the morning. However, when entering the time after the first rest hour, focus is reduced by 70%. In addition, students are responsive when working, do what they can do first, can prioritize heavy and light parts of the project, and are enthusiastic about working. Through interviews with students, they feel that deadlines are approaching so that when working on project assignments under pressure can make them more focused and fast. Overall total progress for cycle 2 is 85%.

6. Construction Cost Estimation (EBK) – Cycle 2

Implementation for EBK cycle 2 subjects by RPP calculates material needs and compiles reports. The implementation is from 4 meetings in 2 weeks with a total time allocation of 16 x 45 minutes each week. The schedule on Monday consists of 4 x 45 minutes and Wednesday 8 x 45 minutes. In the third week, students work on material needs. Then the fourth week students work on the report and complete the unfinished work of the previous week.

In the third week, the teacher directs students to calculate energy needs, then compiles reports and completes the unfinished parts of the assignment to be collected by the end of the fourth week. On the first day. The teacher explains the material by directly exemplifying calculations using the Excel application. After explaining the related material, students exchange opinions with friends. About 10% of students listen while taking notes, the rest just pay attention and then work as directed. The second meeting is mostly for teachers monitoring the progress of student project work. In general, teachers give advice and input to students who have problems (the use of AHSP by the work of each student, how to use formulas in Excel applications).

At the third meeting, the teacher gave directions on project assignments that must be printed out and collected along with the APLPIG and KUG maple project assignments. Students immediately work on and revise work that is still wrong. At the beginning of the fourth meeting, about 10 students began to print out assignments. Until the fourth meeting ended, students who had not had time to print out printed outside of class hours. Overall total progress for cycle 2 is 90%.

7. Building Utility Construction (KUG) – Cycle 2

The implementation for the EBK cycle 2 subjects is to perfect the plumbing layout drawing and plotting in the third week and perfect the plotting drawing and electrical layout in the fourth week. The implementation is from 4 meetings in 2 weeks with a total time allocation of 15 x 45 minutes each week. The schedule on Thursday consists of 8 x 45 minutes and Friday 7 x 45 minutes. In the third week, students complete plumbing drawings. Then the fourth week students complete electrical drawings. Students are required to complete the drawings to be collected by the end of the fourth week.

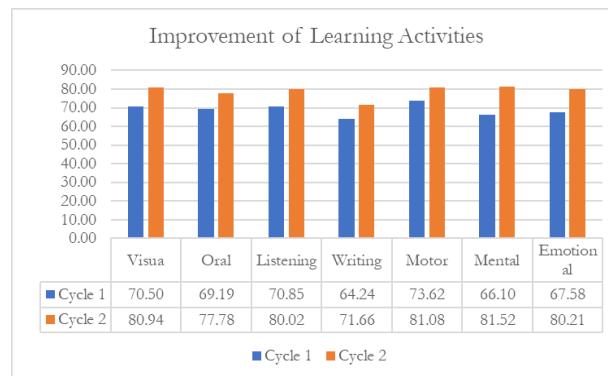
At the first meeting, the teacher briefs the students on the deadlines for submitting project assignments. Students are directed to do sanitation work first. In addition, as many as 11 students have completed plumbing work and are allowed to continue with electrical tasks, while others continue to work while consulting with teachers. Meanwhile, at the second meeting, the teacher

checked the students' assignments. The teacher evaluates student performance by giving suggestions and input on the results of the drawings (dimensional and description patterns, the use of pipes and joints, and giving notes on the drawings).

The third meeting conducted interviews with some students, with the result that as many as 80% of students were able to do so under pressure as the deadline for submission approached. In addition, the class crowd is also reduced. The state of the class when approaching the afternoon is as many as 60% of students can focus from morning to evening. In the fourth meeting as in the last meeting, the teacher again evaluated the students' assignments regarding electrical drawings (cables used, laying electrical installation points). At this meeting, students focus on doing as much as 70%, but it increases to 90% after the afternoon break. Overall total progress for cycle 2 is 80%.

8. Reflection of Cycle 2

The average result of the percentage of student learning activities according to the indicators when observed in cycle 2 was 85.41%. While the target for achieving cycle 2 is 80.54%. Thus, the study is stopped in cycle 2 because the average has met the recommended requirements, then it will continue to analyze the research data obtained. There was an increase of 4.87% between the average in cycles 1 and 2. Based on these percentages, a provisional conclusion was drawn that student learning activities on the big tasks of APLPIG, EBK, and KUG subject projects by applying the Project Based Learning (PjBL) learning model.



Figures 2. Student Observation Results Cycle 1 and 2

Source: Author's Document

However, there is no reflection for cycle 2 because the study stopped at cycle 2. The reason is that it has already reached the cycle 2 baseline.

Table 1. Success Predictor

Variable	Baseline	End of Cycle I (%)	End Cycle II (%)
a) Visual Activities	68,52	70,0	80,0
b) Oral Activities	2,44	50,0	75,0
c) Listening Activities	55,17	70,0	80,0
d) Writing Activities	79,31	80,0	85,0
e) Motor Activities	0	25,0	50,0
f) Mental Activities	20,69	40,0	70,0
g) Emotional Activities	18,97	53,57	73,57
Average	35,01	53,57	73,57

Source: Author's Document

3.2. Descriptive Statistics of Student Learning

3.2.1. Activity Data

3.2.1.1. Description Data

Data obtained from observations will be processed using IBS SPSS 25.0 software for Windows. Round 1 showed 35 students with average scores of APLPIG 68.00, EBK 61.33, and KUG 70.20. The average score of students' learning activities in semester 1 is 71.21 while the reference score at the end of semester 1 is 53.57. While Cycle 2 averaged 78.15 APLPIG, 77.68 EBK, and 77.68 KUG. The average score of students' learning activities in semester 1 is 76.82 while the reference score at the end of semester 1 is 73.57. 2. Check the normality of student learning activity data.

3.2.1.2. Test the Normality of Student Learning Activity Data

To know whether a piece of data is normally distributed, a normality test is performed. This experiment uses data from Cycle 1 (S1) and Cycle 2 (S2) with the Kolmogorov-Smirnov test. Normality testing is supported by IBS SPSS Statistic 25.0 software for Windows. Make decisions based on sig values. > 0.05 , the test data is normally distributed.

Table 2. Normality Test of Student Learning Activity Data Cycle 1 and 2

	Kolmogorov-Smirnova		
	Statistic	df	Sig.
Cycle 1	.244	35	.000
Cycle 2	.114	35	.376

Source: Author's Document

From Table 3 we can see column Sig. The learning activity of Kolmogorov-Smirnov students in S1 reached a significant value of 0.058. While the learning activities of grade S2 students reached a significant value of 0.127. A value > 0.05 means the data is normally distributed.

3.2.1.3. Test the Homogeneity of Student Learning Activity Data

To know whether the data is homogenous or not, a homogeneity check is performed. Uniformity testing was performed using IBS SPSS Statistic 25.0 software for Windows with decision-making based on sig values. > 0.05 , the data is tested as homogeneous.

We know that the value of sig. student learning activity change is $0.001 < 0.05$. The decision-making in this homogeneity test uses the value 0.05, which means that the variables of students' learning activities in each subject in S1 and S2 are not the same. This may be due to differences in the average data from observations of students' S1 and S2 learning activities.

3.2.1.4. Test the Hypothesis of Student Learning Activity Data

Hypothesis testing allows you to know whether the mean of two populations is the same (in this case, the mean of periods 1 and 2). The data performed for hypothesis testing were data from cycles 1 and 2 with t-tests for paired samples. Hypothesis testing was performed using IBS SPSS Statistic 25.0 software for Windows.

The basis for decision-making based on significance level:

- If the probability/significance level > 0.05 ; then H_0 is accepted
- If the probability/significance level ≤ 0.05 ; then H_0 is rejected

It is known that objects APLPIG -11.078, EBK -10.605, and KUG -18.403. The significance level based on the table is 0.000 (p-value < 0.05), then H_0 is rejected, meaning that the mean value of the two populations is not the same (in this case, the mean value of the period). period 1 and 2). Therefore, it can be concluded that there is a difference in the average value of the learning activities

of grade XII students PPIB 1 SMK Negeri 1 Blitar cycles 1 and 2 when applying the project-based learning model (PjBL).

3.2.2. Student Learning Activities

After conducting interviews with teachers and students, data processing was carried out to obtain several results, including:

- 1) Only some students read the material before doing the project assignment. Most immediately do it with their abilities, but when they find new obstacles they look for good information, in the form of asking questions or discussions, looking for additional references via the internet, or paying attention to the results of friends' projects that are completed first.
- 2) Students often discuss with friends either because of hardware problems or difficulties when working on project assignments. For minor problems, they usually ask friends around their seats. However, when you haven't got a solution from a friend, you usually ask the teacher directly.
- 3) Students often ask teachers and friends about their difficulties. When doing questions and answers, many respond or just make sure to understand.
- 4) Students rarely take notes but become diligent when mapping EBK because they feel that formulas and how to calculate are important. Usually, students also ask for soft files of material or photos of material delivered by the teacher through the blackboard. When it was felt lacking, some took the initiative to borrow friends' notes.
- 5) All students are already working on project assignments at their own pace. Students do what they can either at school or at home. Some feel that home is a more comfortable place so they feel at home overtime to complete project tasks. Overtime carried out outside school hours is carried out in groups and individually. When working at home, they tend to be more relaxed.
- 6) The enthusiasm of students to work on project assignments depends on the ongoing subject. Students tend to prefer drawing subjects over counting. With so many numbers and tables in the Microsoft Excel application program, it is easy to get bored and have headaches. The SketchUp application program is not because it does not look monotonous and attractive.

At the end of Cycle 1, established success metrics were achieved. The average value of students' APLPIG, EBK, and KUG learning activities is 80.54%, while the target of cycle 1 is 53.57%. At the end of cycle 2, the average value of maple syrup learning activities of students APLPIG, EBK, and KUG was 85.78% while the target of cycle 2 was 73.57%. Thus, the average value of learning activities when applying the project-based learning model (PjBL) on major tasks of the APLPIG, EBK, and KUG projects of students has increased by 5.23%. The following is an explanation of the indicators of each student's learning activity obtained from observations and interviews:

1. Visual Activity

Students' learning activities for visual activities increased by 10.44%, from 70.50% to 80.94%. Students who are initially less attentive and inattentive when the teacher or peers present project-related material will become more attentive. Indeed, they feel responsible for their respective tasks in the project and are therefore more motivated to seek as much information and knowledge as necessary.

2. Oral Activity

Students learning and speaking activities increased by 8.59%, from 69.19% to 77.78%. When facing difficulties, students begin to actively express their opinions to teachers and friends. They need a lot of guidance and input to advance their project tasks. Some students are still afraid to ask questions when they encounter difficulties, but gradually they dare to ask questions.

3. Listening Activity

This resulted in students' learning activities for speaking activities increasing by 9.17%, from 70.85% to 80.02%. The increase appears to be due to some students not paying attention to the teacher's explanations or instructions. This behavior is because they are catching up on project tasks. While the cause of their delays is because one of them is not timely when working, or is afraid to ask questions when encountering problems. So when teachers explain, they tend to listen and do it at the same time.

4. Writing Activity

This resulted in students' learning activities for writing activities increasing slightly by 3.73%, from 66.52% to 70.25%. In general, when teachers give documents and explain, only a small part of students take notes, and the rest copy their friends' work later, but this does not greatly affect the research results, because most Writing activities all take place in EBK subjects. , contains information about formulas and how to calculate labor and materials.

5. Motor Activity

Students learning and speaking activities increased by 7.46%, from 73.62% to 81.08%. Movement activities performed by students include practicing sketchup applications in APLPIG and KUG subjects, as well as Excel applications in EBK subjects. Typically, they already can operate both applications. What distinguishes one student from another is the different skill levels of each student. Therefore, this cause will affect the project's work results, completion speed, and accuracy of results.

6. Mental Activity

Students learning and speaking activities increased by 14.98%, from 66.10% to 81.52%. In this brainstorming activity, students can analyze the problems they encountered during the project. They can also make decisions about work steps in their respective project tasks. However, when they have not found a way out, some children tend to be afraid to ask questions because they think that it will hinder the activities of teachers and friends. When friends ask, they respond quickly and provide solutions to the problems their friends are facing.

7. Emotional Activity

Students learning and speaking activities increased by 12.63%, from 67.58% to 80.21%. Students tend to be excited when subjects are taught by teachers they like. In addition, subjects that are considered easy also make students more excited to participate in learning. In this case, EBK is a subject that requires precise and complex calculations. Some students feel lazy because they feel monotonous and do not understand how to complete their projects. But in general, students still actively participate in implementing projects.

3.3. Discussion

The study was conducted by applying the project-based learning (PjBL) model in grade XII PPIB 1 up to 2 cycles. According to Ahlaro (2020), criteria for learning models that can be considered effective include:

- Promote Learners' Curiosity
- Promote Learners' Positive Optimism
- Promote Learners Creativity
- Effectively applicable.

The implementation of PjBL in mission-critical tasks from a combination of subjects is going well. Many students grow according to predetermined academic performance indicators. With the implementation of PjBL, students' curiosity will increase as they try to find information about the reference materials needed to carry out a project. In addition, discussions and consultations with

subject teachers will motivate and enhance students' confidence. At the same time, their creativity will also be honed as they create solutions to problems that arise while carrying out project tasks. Key indicators of learning activities according to (Minarti, 2016) that students achieve include:

(1) Search for information; (2) Ask questions to teachers and other students; (3) Submit comments on the information provided; (4) Provide appropriate responses to learning stimuli; (5) Have the opportunity to self-evaluate work results and correct rough parts; (6) Summarize classroom learning results in your language style; (7) Ability to optimally use various resources as a means of learning.

In line with what Afriana (2015) stated, PjBL is a form of learning in which students will develop their content knowledge independently to demonstrate their newly acquired knowledge. through performance. Furthermore, Africana (2015) added that PjBL is a student-centered learning model and aims to apply and build the concept of project assignments that will be created through problem-solving and independent exploration. Furthermore, the overall learning in the classroom follows the steps/stages that should be achieved when using PjBL in the classroom, according to the theory of the Ministry of Education and Culture (2014).

4. Conclusion

Based on the results of the study, the conclusions that can be drawn are as follows: a. Classroom action research applying the project-based learning (PjBL) model is conducted based on the PjBL learning stages in the classroom. Students' learning activities in class gradually increase according to each indicator. The activities carried out in Cycle 1 showed that many students were less enthusiastic about working on projects. However, in cycle 2, students become more active in asking questions and exchanging opinions with friends or teachers about difficulties encountered when implementing the project. In addition to working on projects at school, some students also work at home in the evenings, alone or in groups. At the end of cycle 2, many students can complete the entire project. b. Based on the observations, PjBL can improve the learning performance of students with a large task of combined subjects in class XII students of PPIB 1 SMK Negeri 1 Blitar. The average value of cycle 1 is 68.9 while the average value of cycle 2 is 79. Although PjBL has been applied, in drawing subjects, students rarely take notes, so writing activities do not meet achievement targets. This is not a problem because other indicators of learning activity continue to increase.

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