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STUDENTS' INTEREST IN LEARNING MATHEMATICS THROUGH AQUASCAPE PROJECT-BASED LEARNING AT VOCATIONAL HIGH SCHOOL

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ABSTRACT

The low interest in learning mathematics for vocational students is still a problem in the world of education. The orientation of vocational education emphasizes the application of knowledge in practical and real contexts. Therefore, the relevance of each subject to the competence of students' expertise is important. This study aims to determine the interest in learning mathematics of grade X APAT students at SMK PPN Tanjungsari in aquascape project-based learning. The research method used is qualitative descriptive. Data was collected through observation sheets, student interest questionnaires, interviews, and documentation. Data analysis was conducted using the average percentage of student learning interest. The results showed that students' interest in learning mathematics in aquascape project-based learning reached a high level, which was 67.32%. These results can make a positive contribution to learning practices and provide a foundation for further research in the fields of mathematics, science, and Landscaping and Gardening. The implications of these results could be the basis for the development of more effective and interest-oriented learning strategies for subsequent students.

Keywords : Aquascape, Interest in Learning Mathematics, Project-based Learning.

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PRELIMINARY

Education is a key pillar in shaping a generation that is ready to face the challenges of the future. Schools, as educational institutions, play a crucial role in establishing the foundation of knowledge, skills and dispositions of students through daily learning processes, including in the context of mathematics learning (NCTM, 2000). The idea of learning mathematics itself basically refers not only to mastery of mathematical techniques or symbols, but also to have a mathematical perspective and the ability to understand the structure of meaning through the process of solving problems (Schoenfeld, 2016). However, in reality, the views and ways of learning mathematics in most students are still not in harmony with the essence of the idea of learning mathematics.

Based on the results of previous researchers, it was found that there was a tendency to decrease students' confidence in solving complex and time-consuming mathematical problems along with the increase in the complexity of the mathematical material that was studied (Dewi et al., 2022; Muhtarom et al., 2018; Prendergast et al., 2018). In this case, students generally view mastery of complex mathematical material associated with the ability to solve problems in a fast time compared to the process of making meaning (Prendergast et al., 2018). Moreover, students view an increase in the weight of the complexity of the mathematical material being studied as well as an increase in the load of mathematical formulas that must be memorized (Dewi et al., 2022; Muhtarom et al., 2018). In this context, Akhter and Akhter (2018) show that nearly half of all students who were sampled showed a tendency to have a low tendency to strive more deeply to understand mathematical concepts and prepare for exams. This reflects the low enthusiasm of students in facing mathematical challenges so that it becomes the cause of the tendency to give up easily when encountering obstacles during learning mathematics (Robas et al., 2020). Therefore, when viewed as a whole, these results indicate a phenomenon of low interest in learning mathematics where students tend to experience decreased attention, effort, and an innate tendency to re-engage with the process of solving mathematical problems over time (Harackiewicz et al., 2016).

The phenomenon of low interest in learning mathematics is usually followed by a decrease in student involvement in the learning process (Wang et al., 2021). Low interest in learning mathematics decreases the potential for the formation of a source of encouragement for perseverance and cognitive ivolvement of students, leading to the formation of avoidance attitudes towards mathematics (Song et al., 2019). This condition is a serious problem because low interest leads to refusal of students to learn more about mathematics and internalize the mathematical concepts taught in class.

Interest in learning mathematics has a crucial role in the educational context. This is not just an additional aspect, but a fundamental element that makes up the overall learning experience of students. Based on the results of Fitzmaurice, et al. (2021), factors such as negative experiences in mathematics learning, lack of support, or perceptions that mathematics is irrelevant to everyday life can contribute to the decline in interest. The relevance of the subject matter (including mathematics) is very important for students, particularly in Vocational High Schools (SMK), as it has a direct impact on their preparation to enter the workforce in a particular vocational field. This is also emphasized in the results of Indrawati and Kuncoro (2021), where the main problem for vocational

high school graduates in Indonesia is the mismatch of what is obtained in school with what is needed at work. For this reason, in response to the problems that have been described, researchers realize the urgency to explore learning approaches that can trigger interest in learning mathematics for vocational students while providing skills that are relevant to the real world. One approach that is seen as interesting to explore is project-based learning, where students engage in real projects that allow them to apply mathematical concepts in the context of everyday life.

Project-based learning is an active, student-focused form of learning, characterized by student autonomy, constructive inquiry, goal setting, collaboration, communication, and reflection in the context of real-world practice (Kokotsaki et al., 2016). Involving students in projects provides an engaging and meaningful learning experience as it encourages students to solve actual problems encountered in industry or daily life (Sudjimat et al., 2021). During the project completion process, students can realize the need to understand and apply mathematical concepts in depth. Thus, the project becomes a means / medium for forming bridges that connect phenomena in the classroom with real-life experiences and industry (Blumenfeld et al., 1991).

Furthermore, learning mathematics through project completion can lead students to be actively involved in designing, implementing, and evaluating solutions to complex problems. This condition has the potential to raise deep questions because it is set by itself as an agenda for student inquiry (Blumenfeld et al., 1991). On the other hand, a question manifests intrinsically from the student's curiosity and desire to understand the environment or mathematical concepts through cognitive exploration (Peterson & Cohen, 2019). This places the role of the project in learning not only to facilitate new ways of understanding the material that has been / is being studied, but also to be a means of forming new knowledge of students (Jacques, 2017; Puspitasari & Wahyuni, 2023). For this reason, students' interest in learning mathematics that can be aroused through project-based learning has the potential not only to be limited to necessity or schoolwork, but also in the form of a real interest in internalizing concepts learned on the basis of personal needs (Telegina et al., 2019).

The greatest strength of project-based learning lies in its potential to form collaborative mathematics learning communities in an interdisciplinary learning environment. While previous research has explored this approach, particularly within STEM (Science, Technology, Engineering, and Mathematics) contexts (Çevik, 2018; Fahrurrozi & Wardi, 2020; Lee et al., 2019; Sinurat et al., 2022; Yudha et al., 2023),

there remains a significant gap in the literature, especially concerning its application in vocational education programs focused on freshwater fisheries agribusiness.

Our study addresses this gap by introducing aquascape project-based learning, which uniquely embraces three subjects: mathematics, natural and social sciences (IPAS), and local landscaping content. This holistic approach not only enhances students' understanding of mathematical concepts but also fosters their interest in learning mathematics by integrating mathematical concepts into broader contexts, including environmental sciences and local landscaping practices. By delving into this underexplored area, we aim to determine the interest in learning mathematics of students of APAT SMK PPN Tanjungsari in aquascape project-based learning. Through this study, we seek to contribute to the broader understanding of project-based learning's effectiveness in vocational education settings, particularly in stimulating students' interest in learning mathematics within practical, real- world contexts.

METHODS

The method used in this study is descriptive research with a qualitative approach. This study was conducted at SMK PPN Tanjungsari, Sumedang Regency, West Java in the academic year 2023/2024. The subjects of the study were 32 students of grade X APAT 1 SMK PPN Tanjungsari with 19 male students and 13 female students. Data collection techniques in this study use observation sheets, student interest questionnaires, interviews, and documentation.

This study was carried out in September-October 2023 using aquascape project-based learning through lesson study. This learning is a collaborative project of three subjects, namely mathematics, science and landscaping and gardening in the APAT Study Program of SMK PPN Tanjungsari. The project-based learning stages in this study include identifying fundamental questions, formulating project plans, creating a schedule, overseeing the progress of both students and the project, evaluating outcomes, and conducting assessments based on experience.

Table 1. Project Material Components

Project Component	Material
Mathematics	System of Linear Equation in Three Variables (SLETV)
IPAS	Identification of Aquatic Plants
Landscaping and Gardening	Hard and Soft Materials based on Aquascape Style
Technology	Aquascape

Based on the components of the project material, the learning objectives to be achieved are students able to prepare hard materials and soft materials for making aquascape materials through SLETV and identify soft materials to be used using PlantNet application. Model teachers in learning as many as three people consisting of mathematics, science, and Landscaping and gardening teachers. Students are divided into 8 groups with four students in each group.

Observation of student activities during learning was carried out by 13 observers, consisting of mathematics and science teachers from middle schools and vocational high schools in Sumedang Regency, as well as lecturers of Mathematics Education at Sebelas April University. The observation was conducted using lesson study observation sheets. Subsequently, a reflection session took place after the learning session with the observers. Furthermore, students were provided with a questionnaire to assess their interest in learning mathematics, followed by interviews.

The questionnaire is prepared based on four indicators of interest in learning, such as 1) feelings of enjoyment; 2) interest in learning; 3) show attention while studying; 4) involvement in learning (Lestari & Yudhanegara, 2018). The questionnaire in this study refers to the 4-point Likert scale consists of the below points Strongly Disagree, Disagree, Agree, and Strongly Agree. The questionnaire used included 23 statements consisting of 12 positive statements (1, 3, 5, 7, 9, 11, 13, 15, 17, 18, 20, and 22) and 11 negative statements (2, 4, 6, 8, 10, 12, 14, 16, 19, 21, and 23). The questionnaire has been validated by mathematics and aquascape education experts using expert judgment. The interviews conducted in this study were unstructured interviews, namely free interviews, researchers did not use systematic and perfectly arranged interview instructions. This interview serves as a continuation of the results of students' answers on filling out the learning interest questionnaire. Interviews were conducted with six students selected from the group of student learning interest criteria. Data analysis techniques using data triangulation include data reduction, data display, and conclusion drawing (Sugiyono, 2023). Furthermore, the questionnaire data was analyzed using the average percentage of student learning interest for each statement item, each indicator and overall. To determine the level of students' interest in learning mathematics overall, the criteria for the level of learning interest as presented by Lestari (2018) are used, as shown in Table 1. The calculations are performed using the following formula in Figure 1.

$$P = \frac{\text{average score}}{\text{ideal maximum score}} \times 100\%$$

Figure 1. The formula of Interest Score Percentage

Table 2 . The Criteria of Student Learning Interest Percentage

Interest Score Percentage (%)	Criteria
76 – 100	High
56 – 75,9	Medium
0 – 55,9	Low

Meanwhile, to interpret students' interest in learning mathematics per indicator, proportion calculation techniques are used as shown in Table 2 (Lestari & Yudhanegara, 2018). The calculations are performed using the following formula in Figure 2.

$$P = \frac{\text{frequency of answers}}{\text{the number of respondents}} \times 100\%$$

Figure 2. The Formula of Interest Proportion

Tabel 3. The Proportion of Students' Interest in Learning Mathematics

Kriteria (%)	Interpretation
P = 0	No one
0 < P < 25	Small part
25 ≤ P < 50	Nearly half
P = 50	Half
50 < P < 75	Majority
75 ≤ P < 100	Almost all
P = 100	Whole

RESULT AND DISCUSSION

Aquascape Project-Based Mathematics Learning

Aquascape project-based learning is carried out based on six stages, including: determining fundamental questions, preparing project planning, preparing schedules, monitoring students and project progress, assessing results, and evaluating experience. At the stage of determining the basic questions, students were given a lighter in the form of a Top Nusatic 2023 video and photos by students of SMK PPN Tanjungsari as the 2nd winner in *Kamp Kreatif SMK Indonesia* (KKSI) competition in the field of aquascape at the national level and presented the constituent materials of aquascape such as aquariums, various types of stones and sand, and various types of aquatic plants. At this stage students are enthusiastic in starting the learning process.

At the planning stage, students determine the title of the project based on the aquascape style. The aquascape style chosen by students consists of natural style, jungle style, iwagumi, biotope and mountain style. The process of determining the aquascape style is carried out by students in groups.

At the stage of preparing the project schedule, students in groups create a project plan table to manage the allocation of time in determining the project title, identifying hard and soft material needs, searching for market names and soft material scientific names using the PlantNet application, determining plant prices using SLETV, compiling hard materials into an aquascape and presenting project results.

At the stage of monitoring students and project progress, students carry out the planned project. The teacher guides and monitors students on discussion activities during project completion. The teacher performs scaffolding if there is a group of students who experience obstacles in completing the project.

At the results assessment stage, each group presents the results of the project, then is responded to by the other groups. The results of the student's aquascape project are shown in Figure 1. Furthermore, the teacher assesses project performance by asking questions that are analytical. For example, analyze the number of plants that can be obtained based on a particular case and analyze the type of hard material and soft material used in the chosen style.

At the project experience evaluation stage, students reflect on the activities and results of projects that have been carried out with teacher guidance. Things that are reflected are the difficulties experienced and how to overcome them and the feelings felt when result solutions to the problems faced. Then another group was asked to respond.

Figure 3. Aquascape

Students' Interest in Learning Mathematics

The results of the questionnaire answers based on the four indicators of learning interest of grade X APAT 1 SMK PPN Tanjungsari students obtained an average percentage

of student interest in learning of 67.32% so that it was included in the high criteria. It appears that 17 out of 32 students have a high interest in learning. While 15 students had moderate interest in learning and there were no students with low interest in learning criteria. For this reason, interviews were conducted on six students who came from the criteria of interest in learning high and medium mathematics. In the criteria of high interest in learning, the three students selected for interview are S2, S20, and S27. While in the criteria of moderate learning interest, the three students selected to be interviewed were S6, S18, and S24.

The results of students' answers based on indicator items can be interpreted as listed in Table 4.

Table 4. Students' Interest in Learning Mathematics

Learning Interest Indicators	Percentage Average	Interpretation of Interest
Feeling of enjoyment	48.29 %	Nearly half
Interest in learning	49.01 %	Nearly half
Show attention while studying	57.47 %	Mostly
Involvement in learning	55.53 %	Mostly

Based on the interpretation of the four interest indicators provided, it was found that nearly half of the students express feelings of enjoyment and interest in learning project-based aquascape mathematics. Moreover, a significant majority of students demonstrate attention and engagement during project-based aquascape mathematics learning. The highest average percentage is observed in the indicator reflecting attention during learning, reaching 57.47%. Meanwhile, the lowest average percentage is found in the indicator measuring enjoyment in learning, amounting to 48.29%.

The results of the questionnaire of student learning interest in the first indicator, namely feelings of enjoyment towards mathematics learning based on aquascape projects, can be seen in Table 5.

Table 5. Percentage of Student Answers on the Feeling of Enjoyment Indicator

Statement Item	Item Average	Item Percentage (%)	Criteria
5	2.56	50.78	Mostly
7	3.13	52.93	Mostly
2	2.28	38.48	Nearly half
8	2.41	50.98	Mostly

In the feeling of enjoyment indicator, the largest percentage value belongs to statement 7 at 52.93%, with the interpretation that most students feel happy if the learning process is carried out based on an aquascape project. While the smallest percentage is found in statement 2 of 38.48% with the interpretation that nearly half of students have a fear of mathematics especially when combined with other subjects.

The results of the questionnaire of student learning interest in the second indicator, namely interest in learning mathematics based on aquascape projects, can be seen in Table 6.

Table 6. Percentage of Student Answers on Indicators of Interest in Learning

Statement Item	Item Average	Item Percentage (%)	Criteria
1	2.38	44.82	Nearly half
17	2.88	44.53	Nearly half
18	2.84	52.93	Mostly
10	2.75	67.77	Mostly
21	2.53	39.65	Nearly half
23	2.25	44.34	Nearly half

In the indicator of interest in learning, the largest percentage value belongs to statement 10 at 67.77%, with the interpretation that the availability of aquascape constituent materials triggers the curiosity of most students about the relation to the SLETV material to be studied. While the smallest percentage is found in statement 21 of 39.65% with the interpretation that nearly half of students feel challenged to use three-variable linear equations in modeling crop prices by type.

The results of the questionnaire of student learning interest on indicators showing attention when learning mathematics based on aquascape projects can be seen in Table 7.

Table 7. Percentage of Student Answers on the indicator Indicates Attention While Learning

Statement Item	Item Average	Item Percentage (%)	Criteria
3	2.88	49.80	Nearly half
9	2.94	72.27	Mostly
4	2.31	67.97	Mostly
6	2.31	39.84	Nearly half

In the indicator showing attention while learning, the largest percentage value belongs to the statement 9 of 72.27%, with the interpretation that through the provision of Top Nusatic 2023 videos at the beginning of learning, it is able to provoke most students to imagine an aquascape style plan that will be made with the group. While the smallest percentage is found in statement 6 of 39.84%, interpreted with nearly half of students not paying attention to the instructions given by the teacher or the instructions listed in the student worksheets (LKPD).

The results of the questionnaire of student learning interest on indicators of involvement in learning showed attention when learning mathematics based on aquascape projects can be seen in Table 8.

Table 8. Percentage of Student Answers on Learning Ivolvement Indicators

Statement Item	Item Average	Item Percentage (%)	Criteria
11	2.94	46.09	Nearly half
13	3.22	59.57	Mostly
15	3.09	65.82	Mostly
20	3.28	83.01	Almost all
22	3.00	59.57	Mostly
12	2.44	59.38	Mostly
14	2.59	49.22	Nearly half
16	2.81	41.99	Nearly half
19	2.13	35.16	Nearly half

In the learning involvement indicator, the largest percentage score belonged to the statement 20 at 83.01%, with the interpretation that almost all students felt that each group member was responsible for completing the project within the agreed time. While the smallest percentage is found in statement 19 of 35.16% with the interpretation that nearly half of students are not involved in the discussion process looking for information needed for project completion.

Discussion

Based on the results of data analysis, the interest in learning mathematics for grade X APAT 1 SMK PPN Tanjungsari students has high criteria (67,32%). This indicates that most students have an interest in learning mathematics in aquascape project-based learning. Aquascape project-based learning in this research is a collaboration of mathematics, science and landscaping subjects. This learning model can provide a new and interesting mathematics learning experience for students. This is also reinforced by the results of interviews with S2 students who said, *"I have become more understanding of the function of mathematics in everyday life. Maths becomes more interesting and easier to learn."* Through the aquascape project, they become aware of aquascape and are able to solve mathematical problems given as a necessity for the implementation of the project they are implementing. This is a new experience for students.

Interest is part of the psychological aspect that does not come from birth, but is formed due to a process (Sitorus et al., 2023). Efforts to foster students' interest in learning need to be well planned by teachers. This is in line with the results of Zulfatunnisa and Maknun's (2022) research, that in addition to preparing lesson plans, teachers must also

have knowledge about the affective aspects of students so that learning objectives can be achieved properly.

The collaboration of several subjects in the aquascape project carried out is an interesting and challenging thing both for students and for teachers. This is because aquascape project-based learning in this study not only facilitates collaboration between students, but also facilitates collaboration between teachers from three subjects. The collaboration is formed when determining the project theme, preparing lesson plans and assessing project results. The determination of the project theme is based on the identification of Learning Outcomes in the three subjects. The project theme must be able to illustrate mathematical real life problems that are not limited to only one subject coverage, but also involve natural and social science studies, as well as landscaping and gardening. The analysis of students' interest in learning mathematics in this study refers to four indicators which include feelings of enjoyment, interest in learning, showing attention while learning, and involvement in learning. Here is a discussion of each indicator.

Feeling of Enjoyment

Based on the results of data analysis, it is known that out of 32 students nearly half have feelings of enjoyment towards learning mathematics based on aquascape projects. This means that most of them still have negative feelings about maths based aquascape projects. This can be seen from most students feel happy with learning mathematics based on aquascape projects. But nearly half still feel afraid of maths. This is also supported by the interview results of S2, S6, S20 students. S2 students said, *"it is my first time learning a project. It turns out to be fun and not bored. It feels like I am practicing productive lessons"*. The S6 student said, *"I hate maths more and more. I get dizzy. Maths is difficult, but interesting. I feel challenged."* The S20 student said, *"I do not like math from junior high school, Ma'am, because it is dizzy and the materials are difficult. Moreover, the way my mathematics teacher teach in junior high school is boring. It is not fun, Ma'am. It is sleepy, hehe."* Based on the results of data analysis and interviews, it was detected that there was a tendency that students felt happy to participate in mathematics learning based on aquascape projects because it was different from usual. Aquascape is a deepening of the material from the APAT Study Program itself, so that the learning process feels more enjoyable. The results of this study are in line with the results of research by Lee, et al. (2019), where feelings of enjoyment over project-based learning are the main factors driving student learning involvement in the learning process. Moreover, it also supports the results of research by Utami, et al. (2021), that a fun and interesting learning process

makes students more interested in learning. Furthermore, the causes of the fear of mathematics still appear, including feelings of dislike of mathematics lessons, the view that mathematics is difficult, and negative experiences with previous mathematics learning. This is also in line with the results of the research that was conducted by Çevik (2018), the cause of low student interest in exploring the field of mathematics is a dislike for mathematics lessons. The results of this study are also in line with the results of Ndraha et. al. (2022) research, which makes students more interested in learning mathematics is students' enjoyment in learning mathematics. In other words, if students do not like mathematics lessons, then interest in learning mathematics will decrease.

Interest in Learning

Based on the results of data analysis, it is known that out of 32 students, nearly half, have an interest in learning mathematics based on aquascape projects. This means that most of them are not interested in learning mathematics based on aquascape projects. This can be seen from the curiosity of most students to follow the learning triggered by the availability of aquascape constituent materials. Yet, nearly half were challenged to use a three-variable linear equation in modeling crop prices by type. This is supported by observations, it was found that when the teacher gave perception, students had shown an enthusiastic attitude to follow the learning process. At the beginning of learning, students can already see the aquarium on the group table and there are various aquascape constituent materials such as stones, sand, branches, and various aquatic plants. Moreover, tablets are also provided as a medium to use the geogebra application as a mathematical solution tool and the use of plant.Net applications to identify plants in science subjects. The results of interviews with S20, S27, S6 students also showed that they were triggered by the availability of aquascape constituent materials. The S20 student said, *"Previously told by Mr Suhara* [Landscaping and Gardening Teacher], *he wanted to make an aquascape for the next meeting. So when I entered the room, I immediately saw that there was an aquarium and there were many stones and branches. I thought, then how is the math to make an aquascape? It turns out that the price uses SLETV. It was fun, Ma'am."* During the observation, it was found that a student (S18) looked ignorant when the teacher gave instructions for project implementation. But based on the results of the interview, the S18 student said, *"I heard it, Ma'am, I cannot wait to make it quickly."* The results of this study are in line with the results of Friantini and Winata (2019) research that mathematics learning that is connected in students' real lives makes students more interested in learning.

In addition, it also supports the results of Sholihah and Listanti (2022) research that before students have an interest in learning, they must first be interested.

Futhermore, the low interest of students in the aspects of challenges in SLETV towards the completion of aquascape projects can be explained through interviews with S18 and S24 students. S18 Students said, *"That was easy, Ma'am, I learned it in junior high school. There are only 3 to look for."* The S27 student said, *"when I looked for the price, it was the same as I looked for a linear equation. There was another tablet on the table, so, I used Geogebra again so that it will be finished quickly."* S18 and S27 students felt that there were no obstacles in using SLETV Meanwhile, S24 students said, *"usually, there is only x to y, Ma'am. if there are 3 of them like this, it felt so difficult, Ma'am, it was too long for doing it. So, this one is done by other friend."* S24 felt SLETV was more complex than SPLDV, because of the presence of additional variables that require a longer solution method. As a result, S24 preferred to hand over the work to his group mates who are considered more intelligent. The results of this study suggested that the cause of the difference in students' interest in aspects of the challenges that exist within SLETV is due to differences in perceptions of additional complexity that SLETV has from SPLDV. This result supports the results of research by Robas, et al. (2020), that the low enthusiasm of students in facing mathematical challenges causes students to give up easily when encountering obstacles during learning.

Showing Attention While Learning

Based on the results of data analysis, it is known that out of 32 students, mostly showed attention when learning using project-based learning. This can be seen from most students showing attention while learning when lured through lighters given by the teacher, such as giving videos and pictures, to imagine project plans. However, nearly half did not pay attention to the instructions given by teachers or those stated in the LKPD. This is supported by observations found that most students are able to show active participation by providing responses about various information contained in the videos and images of the aquascape presented. This is also supported by the results of interviews with S27 student that said, *"from the video, there is information that the contents of the aquascape have stones, branches, and plants. I like the third aquascape, which is lush. It is the jungle one. So my group agreed to take jungle style."* Based on the results of this study, it appears that the use of lighters by teachers, such as the use of videos and images, has proven successful in attracting students' attention, especially in the planning stage of the aquascape project. The importance of this lighter is reflected in the active participation of students who are

able to provide valuable responses to the information presented through aquascape videos and images. Students not only receive information passively, but are also actively engaged cognitively in processing material to plan the aquascape style to be adopted by their group. The results of this study support the results of research by Arigiyanti, *et al* (2023), which indicates that students' interest in learning is closely related to their learning attention because it is the main driver in exploring learning. This suggests that students' attention to learning material can strengthen their interest in learning, forming a solid foundation for further exploration and understanding.

Moreover, the lack of student attention to the instructions given by the teacher can be explained from the observation where there are two groups of students who immediately decide to take hard materials, such as stones, sand, and branches, before solving the SLETV problems contained in LKPD. In fact, the completion of SLETV is a reference that must be used by students in determining the amount of materials, both hard materials and soft materials, to be used. In addition, there were also students who only looked at the LKPD held. As a result, the project completion time exceeds the project plan time, so teachers are forced to give additional time. However, as many as six groups of students paid attention to the instructions given by the teacher and those contained in the LKPD. This condition is shown by most students actively asking the teacher when they find obstacles in project implementation, studying the teaching materials provided, discussing with group members, and even some students looking at the project process in other groups. This is also supported by the results of interviews with S2, S20, and S24 students. S24 student said, "*LKPD is about math questions. Moreover, it seems long. I became too lazy to read it. At first, I thought it would not really affect the project as long as it did not run out of materials to make the aquascape. That was why I prefer to take as many ingredients as possible."* Also, S20 student said, *"When given LKPD, I was excited to choose the style. My friends and I agree that the style is natural. But we were confused about what to do, so I saw what other groups to do first."* Otherwise, S2 student said, "*From this LKPD, my friends and I know what to prepare for this project. For example, because I did something about* SLETV *first, I knew I could do the aquascape; I have to know first how much the moss costs and how many aquatic plants."*

Based on the results of observations and interviews in this study, it is indicated that lack of attention to the SLETV completion process in the LKPD, which should be a guide for students in working, seems to be the main cause of completing the aquascape project beyond the planned time. The additional time given by the teacher indicates a constraint in

the implementation of instruction and a significant impact on the efficiency of project implementation time. However, the results also showed that most groups of students were able to pay good attention to teacher and LKPD instructions. In this context, students are seen actively asking, discussing, and even observing the project process in other groups. This reflects students' cognitive ivolvement in understanding and applying instruction, which can help them overcome obstacles and complete projects more efficiently.

In general, the results of this study indicate that clearer and structured instruction design in LKPD in project-based learning can help improve student learning attention, especially for those who tend to be less focused. This findings supports Herawati's research (2017), indicating that the absence of planning, time management, and effective student guidance will result in inefficiencies in the project implementation timeline. Furthermore, these findings also support the research results of Astra, et al. (2019) which shows that LKPD has a crucial role in increasing the effectiveness of implementing project-based learning models. Through LKPD, project implementation becomes more structured and easier for students to understand.

Involvement in Learning

Based on the results of data analysis, it was found that out of 32 students, most of them showed involvement in mathematics learning based on aquascape projects. This can be seen from how almost all students feel responsible for completing projects on time. However, almost half were not involved in the discussion process looking for the information needed for project completion. Based on observations, all students work together with group members in completing projects. This is also supported by the results of interviews with S6 students who said, *"Each member in our group has their own duties. The leader got the price of plants. I had the task of arranging the sand and stones into the aquarium, then it was glued by my friend. Our group is working on the project seriously. Because we helped each other, so that it was finished quickly".*

Meanwhile, based on observations about student involvement in the discussion process, three groups (4, 7, and 9) were found to divide the project assignment into two parts, namely two students solving mathematical problems given at LKPD and other students looking for references to aquascape styles and hard material choices. This condition resulted in the involvement of a small number of students in the discussion process of completing SPLTV was not optimal. This is also supported by the results of interviews with S24 students who said, "*I did not understand when I did the math, so it was done by friends. When I got the answer, then I worked on the aquascape. I take twigs,*

stones, and sand. I love working on it". Nevertheless, most students are involved in the discussion process of result the information needed for the completion of an aquascape project. Students who are directly involved in learning can apply their initial knowledge when interacting with groups, so that their scientific skills can be improved in carrying out project assignments. This result is in line with the results of Toli and Kallery (2021) research, that when students design and try themselves in project activities, it allows them to participate productively in the learning process.

Direct involvement of students in learning can provide opportunities for students to use the knowledge they already have or students' initial knowledge in interacting activities between groups and can also improve students' scientific skills in doing a project task. Almost all students are involved in learning activities. Students are involved in project planning by determining the time needed at each stage. Students solve problems given at LKPD, determine the chosen aquascape style, determine the plants used according to that style and identify them through PlantNet application. Students focus on timely completion of projects. Observer find persistence in each group to be able to display the best aquascape results.

CONCLUSION

Based on the results and discussions, it can be concluded that grade X students of APAT SMK PPN Tanjungsari have a high interest in learning mathematics in aquascape project-based learning. The aquascape project-based learning process in this study involves collaboration between mathematics, science and landscaping and gardening subjects. This learning model can provide a new, interesting, and relevant mathematics learning experience to students' skill competencies.

In order to more effectively implement mathematics learning based on aquascape projects, there are two factors that must be considered, namely the relevance of the project theme to the competence of student expertise and the role of LKPD in project implementation. For this reason, collaboration between teachers needs to be emphasized so that each teacher can understand the relationship and relationship of teaching materials used in the project theme made. This collaboration is the main key to ensure that each element of learning accommodates the needs and development of students well, while ensuring that the inter-material linkage in the project theme is maintained. In addition, teachers as learning facilitators should be divided into three parts in the preparation of LKPD, including: LKPD planning, LKPD implementation, and LKPD evaluation of project solutions. This is caused by the role of LKPD in project-based learning has

significant differences with other learning models. In project-based learning, LKPD acts as a structured work guide. By breaking it down into three parts, teachers can provide more specific direction for each stage in the project's learning process. Finally, LKPD became the strength of the project in increasing the interest of students in learning mathematics.

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