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THE EFFECT OF PEER-ASSISTED LEARNING (PAL) METHOD ON VISUAL PROGRAMMING KNOWLEDGE OUTCOMES IN EDUCATIONAL TECHNOLOGY STUDENTS

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ABSTRACT

This study aims to evaluate the effect of the Peer-Assisted Learning (PAL) method on differences in student knowledge outcomes in the Visual Programming course in the Educational Technology Study Program. This study used a quasi-experimental design with two groups, namely the experimental class that applied the Peer-Assisted Learning (PAL) method vertically and the control class that used conventional learning methods. The research participants totaled 50 students, drawn from the four class offerings randomly and divided into 2 class groups of 25 learners each. Data were collected through learning motivation questionnaire and knowledge test measured by Likert scale and Bloom's Taxonomy-based test on cognitive domain. The results of statistical analysis with Two-Way Anova test showed that there was no significant difference in knowledge outcomes with a value of 0.331>0.05 based on learning motivation. However, the study showed a value of 0.036 <0.05, meaning that there was a significant difference between the Peer-Assisted Learning (PAL) method and conventional learning on student knowledge outcomes. In addition, the value of 0.972>0.05 means that there is no significant interaction between the level of student learning motivation and learning methods on knowledge outcomes. Despite the data, this study found good responses from students where they prefer and are enthusiastic about learning with the Peer-Assisted Learning (PAL) method compared to the conventional method, because the method is considered more flexible and comfortable to use for learning. This study suggests further evaluation related to the use of the Peer-Assisted Learning (PAL) method by improving tutor skills and setting the duration of learning to increase effectiveness in achieving student learning outcomes.

KEYWORDS *Peer-Assisted Learning (PAL), Learning Motivation, Knowledge Outcomes, Visual Programming, Higher Education.*

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INTRODUCTION

The learning process plays a role in the suitability of the learning method and the conditions of the learner. This conformity is one of the optimal learning process planning standards (Nuraini, 2021). Learning is designed to meet certain achievements. The way to meet these achievements can, of course, be by providing special learning, assignments, or practicums with the aim of improving the results of learners' knowledge.

At the university level, learning is expected to continue to innovate to increase participation, creativity, and innovation in learners by carrying out interesting and enjoyable learning for learners (Laili et al., 2024), especially in courses with the demands of developing multimedia learning products, namely Visual Programming. This Visual Programming course requires a learning method that provides a space for learners to participate more actively according to their characteristics in terms of *learning motivation* learners.

The Visual Programming course is compulsory in the second semester for undergraduate students in Educational Technology with a total of 3 credits (Semester Credit Units). Through Visual Programming learning, students are given basic provisions to develop an application program for a multimedia learning context. However, in the implementation of Visual Programming lectures, many learners consider that this course is difficult and requires a lot of sacrifice of thinking in learning. Of course, this is based on the background of learners who previously did not come from the computer science department. This foundation and background make many lay learners have experience with programming (Soepriyanto & Kuswandi, 2021).

Apart from that, the learning process seems tense and rigid. This feeling makes many learners feel uncomfortable and less free or flexible in learning. This condition is a challenge for learners. With this, a learning method is needed as an effort to create fun learning and foster *learning motivation* in students.

The basis of this problem is the effectiveness of learning that is fun and grows *learning motivation. L*earners are needed openly with the accuracy of learning methods. *Learning motivation* and learning are whole, complementary, and influential (Uno, 2021). This is because *learning motivation* arises from several factors, both intrinsically in the form of a desire to succeed and the encouragement of learning needs in achieving the mind and extrinsically in the form of interesting learning activities, a conducive environment, and awards. Fundamentally, learning will also affect learning outcomes by paying attention to several things, where learning outcomes are a result of learners' interaction with the environment (Driscoll, 1994).

Learning requires a learning method, in this case, it plays a role in a way of learning that is arranged to achieve learning goals in the condition of the learner (Degeng & Degeng, 2018). Based on the learning problem, the learning method is proposed as a solution to create a learner's learning experience with an interesting and flexible concept, namely *Peer-Assisted Learning* (PAL). There is assistance, teaching, and attention to students through *Peer-Assisted Learning* (PAL), which is a solution to learning problems in the Visual Programming course. *Peer-assisted learning* (PAL) is an innovative learning method because it is a flexible learning method, can be determined independently, and can be done in formal or non-formal situations (Puspita et al., n.d.). Based on the theory of *Peer-Assisted Learning* (PAL), it is a learning method for an equal social group and is not a professional learner, has a strong desire to help others in learning, and provides valuable learning to themselves by teaching (Topping et al., 2017). In learning activities with *Peer-Assisted Learning* (PAL), there are students as *tutees*, and a teaching companion is called a *Tutor*. When compared to conventional learning, *Peer-Assisted Learning* (PAL) has benefits in terms of academics and social. In Deep *Peer-Assisted Learning* (PAL), the *tutee* can confidently and freely interact with the *Tutor* to acquire knowledge (Andriani, 2018).

A learning activity worth saying is well influenced by a learning strategy in the form of a method to see the learning outcomes of the learner (Riauwati et al., 2024). Method implementation *Peer-assisted learning* (PAL) in learning also pays attention to the selection of tutors. In this study, the activities of *Peer-Assisted Learning* (PAL) are carried out vertically, meaning involving more senior students to be assigned and act as tutors (Simorangkir, 2015). *Peer-Assisted Learning* (PAL) emphasizes social interaction between students as *tutee* and senior students as tutors with the hope of increasing *learning motivation* and improving student learning outcomes in terms of knowledge in Visual Programming lectures. In line with the research conducted by Santhanalakshmi and Prof. Naomi regarding *Impact of Peer Assisted Learning Strategy (PALS) for Learning Enhancement of Students at the Secondary Level*, it was explained that *Peer-Assisted Learning* (PAL) in science learning shows that the method influences learning so that there is a difference in performance scores between experimental classes using *Peer-Assisted Learning* (PAL) and control classes (Santhanalakshmi & Naomi, 2021). The results of this previous study showed an increase in reading and learning science concepts as a whole.

Looking at academic improvement, on the other hand, there is research on *Peer-Assisted Learning* (PAL) reviewed from the side of *learning motivation*. Research on *Peer Assisted Learning: A New Look at the Good Old Monitoring and Its Motivation from the Perspective of Student Monito*r (Morais et al., 2020) shows a positive influence of *Peer-Assisted Learning* (PAL) on the learning process in terms of motivation and helping to develop student skills. Learning is not only carried out offline. In some learnings, it is often also carried out online, where this learning requires special attention in terms of learning methods. Research on *Peer-Assisted Learning Online Peer Leader Motivations and Experiences* (Rawson & Rhodes, 2022) shows that the method can help motivate learners intrinsically to learn easily and well *offline* and *Online*, and extrinsically motivation includes the potential to become a leader by improving self-learning skills supported by appreciation and recognition for involvement and activeness.

Learning Visual Programming is not just about understanding a concept. Also, applying this understanding is realized by project assignments, namely in the form of a multimedia learning program application. Judging from the background of students, the application of knowledge becomes difficult if it is only overcome by conventional learning that is rigid (inflexible). Therefore, the selection and application of *the Peer-Assisted Learning* (PAL) method in this study is aimed at finding out the difference in knowledge results in the form of students' applicative abilities. This research is expected to be a consideration to create a more effective, fun, and flexible learning atmosphere in the scope of education.

RESEARCH METHOD

The research design design aims to provide an explanation of the differences between conventional learning methods and Peer-Assisted Learning (PAL) on the results of students' knowledge of Visual Programming with the division of control classes and experimental classes. The study was conducted with a quasi-experimental design, in this case where the research subjects was chosen at random (Setyosari, 2020). This research was conducted in even semesters by taking random samples to be divided into two groups of different learning method classes. The first group conducts learning using the Peer-Assisted Learning (PAL) method vertically, which in this case is called the experimental class group with a total of 25 students. The second group uses the conventional learning method, in this case, it is called the control class group with a total of 25 students. The variables in this study include independent variables in the form of learning methods, Peer-Assisted Learning (PAL) and conventional (X1), the moderator variable is in the form of learning motivation (X2), and the dependent variable is a measurement of knowledge about Visual Programming learning for Learning Multimedia (Y) material. The chart of this research design is found in **Figure 1**.

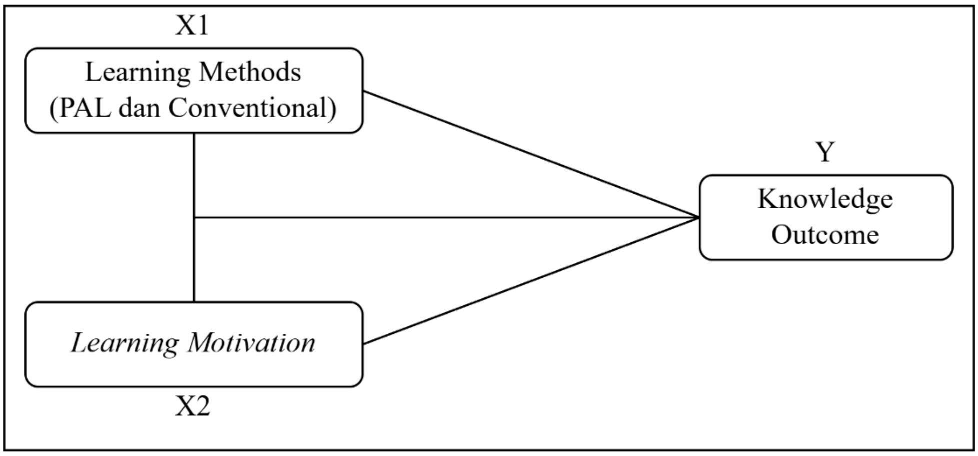

Figure 1. Research Design

The learning design in this study is needed to provide an overview of the learning process. Each class group has a different learning design. Learning activities in the experimental class group contain *Peer-Assisted Learning* (PAL) activities where students are divided into several groups, and each group is given one learning assistant. Learning assistants are students at a higher level who are considered competent in the field of Visual Programming. Learning assistants provide teaching (*peer tutoring* and *peer modeling*) material according to meetings, both theoretically and practically. In the group, learning assistants conduct *peer mentoring*, namely guiding and observing discussions so that students build and share knowledge. After learning in the classroom, *Peer-Assisted Learning* (PAL) activities are still carried out when students complete the task of working on a product where the learning assistant conducts *peer monitoring* and *peer assessment* to grow students' cognition. Meanwhile, learning activities in the control class group are carried out by lecturers providing theory and practice. After learning, students are asked to complete product work independently.

The procedure for this research starts from the preparation stage by conducting a preliminary research study regarding problem identification, discussion with the course lecturer, and classroom observation. The results of the preliminary study are continued by determining the problem, hypothesis, and research objectives. In this preparation stage, learning motivation questionnaire instruments, learning designs, test questions to measure knowledge, learning content materials, and provisions for the development of Multimedia Learning products are also prepared. Then, we continued with the research implementation stage by carrying out learning according to the design, test questions, and *learning motivation* questionnaires. The last stage is data processing and analysis to then be interpreted based on hypotheses.

The use of data analysis in this study was conducted by conducting *a two-way statistical test of Anova* to test hypotheses regarding the difference and influence of *Peer-Assisted Learning* (PAL) and *learning motivation* on student knowledge outcomes. In this statistical test, there is a prerequisite test that must be passed in the form of a normality test to find out whether the data is distributed normally. Furthermore, a homogeneity test was carried out to determine the similarity of data variants in each class group. All tests in this data analysis were carried out using the IBM SPSS Statistics 27 application.

Then, related to research instruments using questionnaires. Data collection using this instrument is based on the Likert measurement scale or *a summated rating scale* With five scores, it is a scale used to measure attitudes about things expressed through a series of statements about a tendency (Setyosari, 2020). The research instrument is made based on the aspects of *learning motivation* (Uno, 2021) and test questions to measure the results of learners' knowledge. *Learning motivation* is an internal and external encouragement to learners, so in this case, there are several indicators, including 1) the existence of a desire and desire to learn, 2) the existence of encouragement and need in learning, 3) the existence of hopes and aspirations in the future; 4) there is an appreciation in learning; 5) the existence of interesting activities in learning; 6) and the existence of a conducive learning environment. To determine the level of *learning motivation* categorization by looking at the Likert scale and the number of questionnaire statements, which is 20. It is hereby found that *Xmin* 20, *Xmax* 100, *Mean* 60, *Range* 80, and Standard Deviation 13. So, the criteria of the level of *learning motivation* Using Ratings in **Table 1**.

Table 1. Criteria for Learning Motivation Level

Criterion	Category
$73 \leq X$	*High Learning Motivation*
$47 \leq X < 73$	*Medium Learning Motivation*
$47 \leq X$	*Low Learning Motivation*

To find out and measure the results of learners' knowledge of the Visual Programming course through test questions. The development of test questions is guided by Bloom's Taxonomy in the cognitive domain at the level of C-1 knowledge, C-2 comprehension, C-3 application, and C-4 analysis. The test questions that have been developed are first carried out by FGD (*Forum Group Discussion*) to determine the validity of the distribution of questions. The following is a complete distribution of questions in **Table 2**.

Table 2. Distribution of Bloom's Taxonomy on Test Questions

Taxonomists Bloom	Number of Questions
C1 – Knowledge	8 questions
C2 – Understanding	8 questions
C3 – Applicative	12 questions
C4 – Analysis	2 questions
Number of questions	**30 questions**

RESULT AND DISCUSSION

Validity and Reliability Test Results

Table 3. Results of the Validity Test of *the Learning Motivation Questionnaire*

Correlations

		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20	TOTAL
P1	Pearson Correlation	1	,450**	,393**	,425**	,309*	,629**	,473**	,541**	,612**	,531**	,308*	,239	,604**	,352*	,506**	,474**	,236	,356*	,139	,376**	,718**
	Sig. (2-tailed)		,001	,005	,002	,029	<,001	<,001	<,001	<,001	<,001	,030	,095	<,001	,012	<,001	<,001	,098	,011	,336	,007	<,001
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
P2	Pearson Correlation	,450**	1	,310*	,419**	,270	,368**	,167	,470**	,330*	,449**	,006	,323*	,463**	,165	,370**	,207	,273	,160	,043	,396**	,565**
	Sig. (2-tailed)	,001		,028	,002	,058	,009	,247	<,001	,019	,001	,968	,022	<,001	,252	,008	,149	,055	,268	,764	,004	<,001
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
P3	Pearson Correlation	,393**	,310*	1	,200	,533**	,453**	,707**	,367**	,726**	,701**	,171	,377**	,627**	,094	,519**	,425**	,262	,648**	,451**	,346*	,733**
	Sig. (2-tailed)	,005	,028		,164	<,001	<,001	<,001	,009	<,001	<,001	,235	,007	<,001	,515	<,001	,002	,066	<,001	,001	,014	<,001
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
P4	Pearson Correlation	,425**	,419**	,200	1	,371**	,377**	,190	,451**	,314*	,234	-,081	,249	,401**	,210	,246	,193	,350*	,046	-,108	,191	,488**
	Sig. (2-tailed)	,002	,002	,164		,008	,007	,186	,001	,026	,101	,577	,081	,004	,143	,086	,179	,013	,752	,453	,184	<,001
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
P5	Pearson Correlation	,309*	,270	,533**	,371**	1	,303*	,416**	,181	,487**	,397**	,161	,228	,310*	,164	,295*	,422**	,267	,472**	,321*	,199	,552**
	Sig. (2-tailed)	,029	,058	<,001	,008		,032	,003	,209	<,001	,004	,263	,112	,029	,254	,037	,002	,061	<,001	,023	,167	<,001
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
P6	Pearson Correlation	,629**	,368**	,453**	,377**	,303*	1	,574**	,553**	,662**	,782**	,193	,410**	,611**	,266	,508**	,459**	,260	,501**	,245	,134	,736**
	Sig. (2-tailed)	<,001	,009	<,001	,007	,032		<,001	<,001	<,001	<,001	,178	,003	<,001	,062	<,001	<,001	,068	<,001	,087	,353	<,001
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
P7	Pearson Correlation	,473**	,167	,707**	,190	,416**	,574**	1	,273	,757**	,651**	,220	,472**	,514**	,075	,354*	,515**	,271	,514**	,522**	,084	,681**
	Sig. (2-tailed)	<,001	,247	<,001	,186	,003	<,001		,055	<,001	<,001	,125	<,001	<,001	,603	,012	<,001	,057	<,001	<,001	,563	<,001
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
P8	Pearson Correlation	,541**	,470**	,367**	,451**	,181	,553**	,273	1	,378**	,504**	-,082	,497**	,599**	,251	,441**	,239	,306*	,312*	,022	,516**	,658**
	Sig. (2-tailed)	<,001	<,001	,009	,001	,209	<,001	,055		,007	<,001	,573	<,001	<,001	,078	,001	,094	,031	,027	,877	<,001	<,001
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
P9	Pearson Correlation	,612**	,330*	,726**	,314*	,487**	,662**	,757**	,378**	1	,793**	,382**	,473**	,642**	,163	,550**	,501**	,462**	,688**	,447**	,243	,834**
	Sig. (2-tailed)	<,001	,019	<,001	,026	<,001	<,001	<,001	,007		<,001	,006	<,001	<,001	,258	<,001	<,001	<,001	<,001	,001	,089	<,001
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
P10	Pearson Correlation	,531**	,449**	,701**	,234	,397**	,782**	,651**	,504**	,793**	1	,254	,493**	,718**	,233	,582**	,407**	,398**	,566**	,390**	,299*	,824**
	Sig. (2-tailed)	<,001	,001	<,001	,101	,004	<,001	<,001	<,001	<,001		,076	<,001	<,001	,103	<,001	,003	,004	<,001	,005	,035	<,001
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
P11	Pearson Correlation	,308*	,006	,171	-,081	,161	,193	,220	-,082	,382**	,254	1	-,142	,101	,245	,063	,321*	,114	,367**	,004	-,003	,265
	Sig. (2-tailed)	,030	,968	,235	,577	,263	,178	,125	,573	,006	,076		,324	,484	,087	,665	,023	,429	,009	,978	,982	,063
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
P12	Pearson Correlation	,239	,323*	,377**	,249	,228	,410**	,472**	,497**	,473**	,493**	-,142	1	,389**	,199	,328*	,265	,491**	,351*	,326*	,406**	,613**
	Sig. (2-tailed)	,095	,022	,007	,081	,112	,003	<,001	<,001	<,001	<,001	,324		,005	,165	,020	,063	<,001	,012	,021	,003	<,001
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
P13	Pearson Correlation	,604**	,463**	,627**	,401**	,310*	,611**	,514**	,599**	,642**	,718**	,101	,389**	1	,324*	,671**	,437**	,288*	,498**	,218	,383**	,787**
	Sig. (2-tailed)	<,001	<,001	<,001	,004	,029	<,001	<,001	<,001	<,001	<,001	,484	,005		,022	<,001	,001	,043	<,001	,129	,006	<,001
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
P14	Pearson Correlation	,352*	,165	,094	,210	,164	,266	,075	,251	,163	,233	,245	,199	,324*	1	,332*	,386**	,451**	,185	,001	,221	,441**
	Sig. (2-tailed)	,012	,252	,515	,143	,254	,062	,603	,078	,258	,103	,087	,165	,022		,018	,006	,001	,197	,992	,123	,001
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
P15	Pearson Correlation	,506**	,370**	,519**	,246	,295*	,508**	,354*	,441**	,550**	,582**	,063	,328*	,671**	,332*	1	,352*	,345*	,510**	,423**	,478**	,702**
	Sig. (2-tailed)	<,001	,008	<,001	,086	,037	<,001	,012	,001	<,001	<,001	,665	,020	<,001	,018		,012	,014	<,001	,002	<,001	<,001
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
P16	Pearson Correlation	,474**	,207	,425**	,193	,422**	,459**	,515**	,239	,501**	,407**	,321*	,265	,437**	,386**	,352*	1	,304*	,585**	,380**	,249	,629**
	Sig. (2-tailed)	<,001	,149	,002	,179	,002	<,001	<,001	,094	<,001	,003	,023	,063	,001	,006	,012		,032	<,001	,006	,081	<,001
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
P17	Pearson Correlation	,236	,273	,262	,350*	,267	,260	,271	,306*	,462**	,398**	,114	,491**	,288*	,451**	,345*	,304*	1	,322*	,291*	,313*	,585**
	Sig. (2-tailed)	,098	,055	,066	,013	,061	,068	,057	,031	<,001	,004	,429	<,001	,043	,001	,014	,032		,022	,040	,027	<,001
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
P18	Pearson Correlation	,356*	,160	,648**	,046	,472**	,501**	,514**	,312*	,688**	,566**	,367**	,351*	,498**	,185	,510**	,585**	,322*	1	,583**	,270	,686**
	Sig. (2-tailed)	,011	,268	<,001	,752	<,001	<,001	<,001	,027	<,001	<,001	,009	,012	<,001	,197	<,001	<,001	,022		<,001	,058	<,001
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
P19	Pearson Correlation	,139	,043	,451**	-,108	,321*	,245	,522**	,022	,447**	,390**	,004	,326*	,218	,001	,423**	,380**	,291*	,583**	1	-,004	,424**
	Sig. (2-tailed)	,336	,764	,001	,453	,023	,087	<,001	,877	,001	,005	,978	,021	,129	,992	,002	,006	,040	<,001		,975	,002
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
P20	Pearson Correlation	,376**	,396**	,346*	,191	,199	,134	,084	,516**	,243	,299*	-,003	,406**	,383**	,221	,478**	,249	,313*	,270	-,004	1	,512**
	Sig. (2-tailed)	,007	,004	,014	,184	,167	,353	,563	<,001	,089	,035	,982	,003	,006	,123	<,001	,081	,027	,058	,975		<,001
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
TOTAL	Pearson Correlation	,718**	,565**	,733**	,488**	,552**	,736**	,681**	,658**	,834**	,824**	,265	,613**	,787**	,441**	,702**	,629**	,585**	,686**	,424**	,512**	1
	Sig. (2-tailed)	<,001	<,001	<,001	<,001	<,001	<,001	<,001	<,001	<,001	<,001	,063	<,001	<,001	,001	<,001	<,001	<,001	<,001	,002	<,001	
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 4. Results of the Reliability Test of the Learning Motivation Questionnaire

Reliability Statistics

Cronbach's Alpha	N of Items
,909	20

As explained, the questionnaire for *learning motivation* amounted to 20 statements, and the validity and reliability tests were carried out. The questionnaire was tested for validity with the result that 20 statements had r_{counts} more than r_{tables}. For 50 subjects, it was found that the r_{table} was 0.2787 (DF = n-2), while the results of the $r_{calculation}$ in **Table 3** for all statement items was more than the r_{table}. So, in this case, the entire item of *the learning motivation questionnaire* statement was declared valid. Then, the result of the reliability test for 20 statements are shown in **Table 4**, which is 0.909, meaning that the *learning motivation* questionnaire is reliable and can be used.

Prerequisite Test Results

Prerequisite testing is a prerequisite before hypothesis testing with *Two Way Anova*. The researcher conducted a prerequisite test in the form of a normality test, shown in **Table 5,** and a homogeneity test in **Table 6**. The results of the two prerequisite tests in this study are considered eligible and can be used further to test the hypothesis in the next statistics.

Table 5. Results of the Normality Test Prerequisites Test

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Standardized Residual for Hasil	,112	50	,163	,957	50	,064

a. Lilliefors Significance Correction

Based on the table above shows evidence that the results of the normality prerequisite test on the data on the knowledge results of 50 respondents are standardized *residual* in the *Shapiro-Wilk column* with a significance value of 0.064. Of course, it is clear that, in this case, the significance is greater than 0.05, which means that the results of the research data are said to be distributed normally.

Table 6. Results of the Homogeneity Test Prerequisite Test

Levene's Test of Equality of Error Variances[a,b]

		Levene Statistic	df1	df2	Sig.
Hasil	Based on Mean	1,467	3	45	,236
	Based on Median	,914	3	45	,442
	Based on Median and with adjusted df	,914	3	35,787	,444
	Based on trimmed mean	1,382	3	45	,260

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Dependent variable: Hasil

b. Design: Intercept + L.Motivation + K.Kelas + L.Motivation * K.Kelas

The results of the homogeneity test in this prerequisite test using *Levene's Test of Equality of Error Variances* table by looking at the *line based on mean* showed that the result of the significance value was located at 0.236. This figure proves that the significance value is more than 0.05. This means that the data obtained in this study are distributed homogeneously, or it can be said that there is a significant difference in the variants of the same test group.

Anova Two-Way Test Results and Hypothesis

Table 7. Test Results for Two-Way Anova *Descriptive Statistics*

Descriptive Statistics

Dependent Variable: Hasil Pengatahuan

Learning Motivation	Metode Pembelajaran	Mean	Std. Deviation	N
Rendah	Kls.PAL	48,00	.	1
	Total	48,00	.	1
Sedang	Kls.Konvensional	39,60	10,968	5
	Kls.PAL	48,67	9,460	9
	Total	45,43	10,603	14
Tinggi	Kls.Konvensional	45,70	11,987	20
	Kls.PAL	55,07	16,307	15
	Total	49,71	14,557	35
Total	Kls.Konvensional	44,48	11,833	25
	Kls.PAL	52,48	13,980	25
	Total	48,48	13,440	50

Table 7 shows the statistical descriptive results to find out the average value (*mean*) of student knowledge results with *Peer-Assisted Learning* (PAL) and Conventional learning methods reviewed from the level of *the learning motivation category*. At the low level of *learning motivation*, there was only one respondent in the experimental class with

a *mean* of 48.00. The medium category for *learning motivation* in the control class had a *mean* of 39.60 for five respondents, and the experimental class had a *mean* of 48.67 for nine respondents, so the total *mean* for both class groups in the medium *learning motivation* category was 45.43. Meanwhile, the high category of *learning motivation* in the control class had a *mean* of 45.70 for 20 respondents, and the experimental class had a *mean* of 55.07 for 15 respondents, so that the total *mean* for the two class groups was 49.71. Looking at the total from the table, it means that students with high *learning motivation* are superior in the average score of knowledge outcomes, especially for the experimental class of 52.48.

Table 8. Results of Statistical Tests with *Two-Way Anova*

Tests of Between-Subjects Effects

Dependent Variable: Hasil Pengatahuan

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1200,147[a]	4	300,037	1,765	,153
Intercept	26289,333	1	26289,333	154,636	<,001
L.Motivation	384,808	2	192,404	1,132	,331
Kls.Metode	794,309	1	794,309	4,672	,036
L.Motivation * Kls.Metode	,210	1	,210	,001	,972
Error	7650,333	45	170,007		
Total	126366,000	50			
Corrected Total	8850,480	49			

a. R Squared = ,136 (Adjusted R Squared = ,059)

The *Two-Way Anova* test on the *Tests of Between-Subjects Effects* table to see the difference in the level of *learning motivation* of learners towards the results of Visual Programming knowledge of Multimedia Learning materials in control and experimental class groups. Looking at the significance value in the *learning motivation* row (L.Motivation), the value of 0.331 is shown as more than 0.05, and the value of $f_{calculation}$ is 1.132, less than f_{table} 3.20. It is interpreted that there is no significant difference between the results of knowledge on Visual Programming in terms of the level of learning motivation (variable X2 has not yet given an influence to explain the difference to variable Y). Furthermore, in the row of the class group (Kls.Metode), the significance value of 0.036 did not exceed 0.05, and the value of $f_{calculation}$ is 4.672, greater than the value of f_{table} 3.20. So, it its interpreted that there is a significant difference in the results of learners' Visual Programming knowledge reviewed from the learning class group both in control and experiment (variable X1 variable influences explaining the difference in variable Y). Then, looking at the row of variable in *learning motivation* category and class group, a significance value of 0.972 was obtained more than 0.05, and the f value $_{\text{was calculated as}}$ 0.001 less than f_{table} 3.20. Thus, there has been no significant interaction between the *learning motivation* category and the class group, both control and experiment, in determining the results of learners' knowledge in the Visual Programming of Learning Multimedia material.

Discussion

Learning methods *Peer-Assisted Learning* (PAL) is a pedagogical approach that involves learners in the learning process using social interaction between tutors and tutees (Lisnawati, 2020). This method becomes a learning method by combining several theories to provide a foundation related to this method. Lev Vigotsku's theory of constructivism explains that the cognitive development of learners becomes a result of the learner's interaction with the environment and the people around him (Suryana et al., 2022). Vygotsky's theory also emphasizes that it is related to the *Zone of Proximal Development* (ZDP), which is a reference that learners can achieve higher cognitive knowledge with peer help (Lutfiyah & Putra, 2021).

Learning to use *Peer-Assisted Learning* (PAL) needs an experienced tutor, in this case, an S1-2022 student as a learning assistant or *Tutor* has a helpful role *tutee*. S1-2023 students achieve maximum knowledge results through appropriate support with models from *Peer-Assisted Learning* (PAL), such as *tutoring*, *modeling*, *monitoring*, and *assessment* (Topping & Ehly, 2009). *Peer mentoring:* Explain that the Learning Assistant is responsible for providing teaching and learning to the *tutee* to acquire new skills and knowledge. *Peer modeling:* Give the assistant responsibility in demonstrating directly about the material. *Peer monitoring* emphasizes observation and checking to know developments. *Peer assessment* It is carried out to evaluate and provide reflection on learning outcomes to provide input and suggestions to grow learners' knowledge.

Application *Peer-Assisted Learning* (PAL) involves the active help and support of peers who, in this case, can be vertically or horizontally to acquire knowledge and develop skills (Sartipa, 2020) where the activities are carried out through mutual interaction, mutual discussion, or counseling, collaborative work projects and developing communication until new knowledge and skills are built (Guraya & Abdalla, 2020). The use of this method is often used in learning with learning activities in the laboratory regardless of the role of the lecturer in the learning process in the hope that this method can grow *learning motivation* to increase learners' knowledge of Visual Programming because of its more convenient learning process.

In this study, the use of the *Peer-Assisted Learning* (PAL) method was carried out vertically with learning assistants as *tutors* taken from S1 students of the class of 2022. In its implementation, the assistant is given the responsibility to implement the models of *Peer-Assisted Learning* (PAL) periodically for each *tutee* who is a student of the class of 2023. There are learning activities carried out in the classroom with the assistance of assistants to carry out tutoring, mentoring, and modeling. Then, learners are given the task of developing Visual Programming products in the form of Multimedia Learning, including text, audio, video, animation, and evaluation questions (*message and option*) in accordance with the provisions and regulations given.

Based on the result of the descriptive analysis, the learners' knowledge results provide an overview that there is a difference in the between the two class groups. It was shown that the total average score for the control class group of Conventional method was 44.48, and for the experimental class of *Peer-Assisted Learning* (PAL) method was 52.48. This figure explains that the value of learners' knowledge in Visual Programming for Multimedia Learning materials in the experimental class group with *Peer-Assisted*

Learning (PAL) learning method is superior when compared to the conventional class group.

In addition to examining the results of quantitative analysis using the *Two-Way Anova* method, this study shows that there is no significant difference in the knowledge of students who follow the Peer-Assisted Learning (PAL) method and conventional learning methods in the Visual Programming course seen based on the level of *learning motivation* category at a significance value of 0.331 exceeds a value of 0.05, so that it shows there is no significant difference in knowledge results. Meanwhile, on the other hand, the significance value in the difference test between learning groups (experimental and control) occupies a significance value of 0.036 not exceeding 0.05, indicating that the *Peer-Assisted Learning* (PAL) method has a significant difference in knowledge results compared to conventional methods for learning implementation in the class sample. The existence of a group of learning classes with *Peer-Assisted Learning* (PAL) and conventional methods looks at the significance value in the difference test of 0.972 exceeding the value limit of 0.05, meaning that between the two methods, there is still no significant interaction with *learning motivation* to show the results of student knowledge in Visual Programming in the sample for the current learning process.

Previous research has provided reinforcement and explanation for the method. *Peer-Assisted Learning* (PAL) has advantages over other methods, as described in the research on *Peer-Assisted Learning as Pedagogical Strategy A Remedy for Enhancing Academic Achievement in Secondary Schools* (Ouma et al., 2018). It is written that *Peer-Assisted Learning* (PAL) has a real influence when the method is applied and becomes a recommendation in Chemistry learning at the elementary school level to improve learners' academic achievement. In this context, the *Peer-Assisted Learning* (PAL) method is intended to create an interactive, flexible, and supportive learning experience that supports the development of students' knowledge by involving peer tutors as learning companions (Topping & Ehly, 2009).

However, in this study, it is well demonstrated that the *Peer-Assisted Learning* (PAL) method provides a significant difference when compared to conventional learning methods for knowledge outcomes. However, it was shown that there was no significant difference based on low, medium, and high *learning motivation* levels. This may be caused by various factors, such as the students' initial level of understanding and the initial condition of the learning environment towards programming can also affect *learning motivation* so that learners already have an idea of difficulties, feel afraid and uncomfortable; the tutor's lack of experience in providing guidance in the field of Visual Programming in a flexible or non-rigid manner; the transition of the method lacks preparation in implementation; or even the time of application of the method is less than optimal. Even in this way, the *Peer-Assisted Learning* (PAL) method has received positive feedback because it can realize a more flexible learning process (not rigid), increase social interaction, comfort, freedom of learning, and there is reguler assistance in supporting student learning solutions.

CONCLUSION

The research was conducted on four random offerings in batch 2023 by finding that the *Peer-Assisted Learning* (PAL) method received positive scores from students, where they responded by enjoying the flexibility of the *Peer-Assisted Learning* (PAL) method more than the conventional. However, the data only shows that there is no significant difference in the knowledge outcomes of students in the Visual Programming course in terms of the level of learning motivation, while the data has shown a significant difference in knowledge outcomes between *Peer-Assisted Learning* (PAL) and conventional learning methods. Even so, the interaction between learning methods and *learning motivation* still does not have a significant influence on improving student knowledge outcomes. Therefore, in the future, the use of *Peer-Assisted Learning* (PAL) method involving learning motivation needs to be further evaluated so that it is more effectively applied, for example by designing a more comfortable learning environment, improving the skills of tutor or setting adequate duration. This research contributes to the development of learning methods in the university environment, especially in courses that require technical skills such as Visual Programming. This study also opens up opportunities for further research on the implementation of *Peer-Assisted Learning* (PAL) by paying attention to various external factors that can affect learning outcomes.

REFERENCES

Andriani, W. R. (2018). PENINGKATAN KOMPETENSI AFEKTIF (SOFT-SKILLS) MAHASISWA PERAWAT MELALUI METODE PEMBELAJARAN PEER-ASSISTED LEARNING (PAL). *SEMINAR NASIONAL PENDIDIKAN DAN KEWARGANEGARAAN IV*, 235–242. https://seminar.umpo.ac.id/index.php/SEMNASPPKN/article/view/182

Degeng, I. N. S., & Degeng, P. D. D. (2018). *ILMU PEMBELAJARAN: Klasifikasi Variabel untuk Pengembangan Teori dan Penelitian* (2nd ed.). Yayasan Taman Pustaka Kristen Indonesia.

Driscoll, M. P. (1994). *Psychology of Learning for Instruction*. Allyn & Bacon, A Division of Paramount Publishing, Inc.

Guraya, S. Y., & Abdalla, M. E. (2020). Determining the effectiveness of peer-assisted learning in medical education: A systematic review and meta-analysis. *Journal of Taibah University Medical Sciences*, *15*(3), 177–184. https://doi.org/10.1016/j.jtumed.2020.05.002

Laili, U. F., Umatin, C., & Rahmawati, N. R. (2024). PERBANDINGAN HASIL BELAJAR MAHASISWA MENGGUNAKAN STRATEGI PROBLEM BASED LEARNING DENGAN INKUIRI PADA MATAKULIAH IPS MI/SD. *Research and Development Journal of Education*, *10*(2), Article 2. https://doi.org/10.30998/rdje.v10i2.24915

Lisnawati, L. (2020). Meningkatkan Kemampuan Siswa Kelas V SD Dalam Menyelesaikan Soal-Soal Cerita Melalui Pendekatan Tutor Sebaya. *Jurnal Amal Pendidikan*, *1*(2), 153. https://doi.org/10.36709/japend.v1i2.11800

Lutfiyah, L., & Putra, E. D. (2021). Struktur Berpikir Siswa Pada Zone of Proximal Development dalam Pembelajaran Discovery Learning. *Jurnal Pendidikan Matematika (JPM)*, *7*(2), Article 2. https://doi.org/10.33474/jpm.v7i2.11419

Morais, F. H. D., André, J. C., Santos, E. R. D., Bizotto, T. S. G., Brienze, S. L. A., Lima, A. R. D. A., & Fucuta, P. D. S. (2020). Peer-Assisted Learning: A New Look at the Good Old Monitoring and Its Motivation from the Perspective of Student-Monitor. *Journal of Education and Training Studies*, *8*(4), 27. https://doi.org/10.11114/jets.v8i4.4719

Nuraini, N. (2021). PELAKSANAAN METODE PENGAJARAN VARIATIF PADA PEMBELAJARAN FIQIH DI MADRASAH TSANAWIYAH NEGERI 3 MENDAHARA. *Jurnal Literasiologi*, *6*(2). https://doi.org/10.47783/literasiologi.v6i2.257

Rawson, R., & Rhodes, C. (2022). Peer-Assisted Learning Online: Peer Leader Motivations and Experiences. *Journal of Peer Learning*, *15*(4), 32–47.

Riauwati, M. R. N., Degeng, M. D. K. D., & Aulia, F. (2024). Pengaruh Delivery Strategy yang Berbeda Terhadap Hasil Belajar Pengetahuan Prosedural. *Wacana Akademika: Majalah Ilmiah Kependidikan*, *8*(1), 113–119. https://jurnal.ustjogja.ac.id/index.php/wacanaakademika/article/view/17085/6567

Santhanalakshmi, M. P. C., & Naomi, G. V. (2021). Impact of Peer Assisted Learning Strategy (PALS) for Learning Enhancement of Students at Secondary Level. *Turkish Journal of Computer and Mathematics Education (TURCOMAT)*, *12*(10), 7333–7336. https://doi.org/10.17762/turcomat.v12i10.5625

Sartipa, D. (2020). Peer Assisted Learning Strategy.: Peer Assisted Learning Strategy. *Edukasi Lingua Sastra*, *18*(1), Article 1. https://doi.org/10.47637/elsa.v18i1.225

Setyosari, P. (2020). *METODE PENELITIAN PENDIDIKAN DAN PENGEMBANGAN* (VI). KENCANA.

Simorangkir, S. J. V. (2015). Metode Pembelajaran Peer Assisted Learning pada Praktikum Anatomi. *Jurnal Pendidikan Kedokteran Indonesia: The Indonesian Journal of Medical Education*, *4*(2), Article 2. https://doi.org/10.22146/jpki.25282

Soepriyanto, Y., & Kuswandi, D. (2021). Gamification Activities for Learning Visual Object-Oriented Programming. *2021 7th International Conference on Education and Technology (ICET)*, 209–213. https://doi.org/10.1109/ICET53279.2021.9575076

Suryana, E., Aprina, M. P., & Harto, J. (2022). Teori Konstruktivistik dan Implikasinya dalam Pembelajaran. *JIIP - Jurnal Ilmiah Ilmu Pendidikan*, *5*(7), 2070–2080. https://jiip.stkipyapisdompu.ac.id/jiip/index.php/JIIP/article/view/666

Topping, K., & Ehly, S. (2009). *Peer-assisted Learning*. Routledge.

Uno, H. B. (2021). *Teori Motivasi dan Pengukurannya: Analisis di Bidang Pendidikan*. Bumi Aksara.