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Enhancing Numeric Literacy of Students at SMAN 1 Gunungsari Lombok, Indonesia through Pascal Programming

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Abstract: Numerical literacy skills according to the PISA and TIMSS assessments shows that Indonesia scores low, even lower than Vietnam. Pisa mathematics exam of Vietnam received 495 points (with an average of 490), while Indonesia achieved 387 points. TIMSS findings, Indonesia received 395 points out of a possible 500. The purpose of this training activity is to enhance the numerical literacy of students at SMA Negeri 1 Gunungsari, Lombok, Indonesia within the context of physics education. Pascal programming is introduced as a tool to assess students' progress in understanding numerical literacy. The training results indicate a significant figures in students' numerical literacy, with an average numerical literacy 8.94 out of 10. These findings reflect the positive contribution of integrating Pascal programming into physics education toward enhancing numerical literacy.

Keywords: Numerical literacy, Pascal programming, Physics education

Introduction

Numerical literacy is the ability to understand and use numerical concepts in everyday life. It involves (a) using numbers and symbols to solve practical problems in a variety of contexts and (b) interpreting information presented in graphical, tabular, or chart form to make predictions and decisions (Han,2017). Numerical literacy is related to the ability to comprehend and utilize mathematical concepts in programming, while critical thinking is required for analysis, evaluation, and problem-solving in code development (Westwood, Peter 2008).

In connection with numerical literacy skills, according to the PISA and TIMSS assessments, both conducted by the OECD (Organization for Economic Co-operation and Development), shows that Indonesia scores low, even lower than Vietnam, a small Southeast Asian country that recently gained independence. The results of the PISA mathematics exam between Vietnam and Indonesia are significantly disparate. Vietnam received 495 points (with an average of 490), while Indonesia achieved 387 points. Meanwhile, according to the TIMSS findings, Indonesia received 395 points out of a possible 500. Singapore received the highest score of 618 points (50% higher than Indonesia) (OECD,2018).

The School Numeracy Literacy Movement's core goal is to emphasize cross-curricular numeracy. This means that numeracy is interwoven throughout all subject areas rather being taught as a distinct topic. This method is predicated on the notion that numeracy is a fundamental ability required in all facets of life.

The cross-curricular numeracy method has several benefits. For starters, it helps students understand the importance of numeracy in their daily lives. Second, it assists pupils in developing a thorough comprehension of numeracy principles. Third, it assists kids in developing problem-solving abilities.

The fact that students frequently cannot immediately apply their mathematical knowledge in other subjects is a difficulty that educators have to overcome. This problem can be solved by employing a cross-curricular numeracy strategy. By

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incorporating numeracy into all subject areas, educators can help students realize the value of numeracy and acquire the skills needed to apply it in real-world scenarios.

Here are some concrete examples of how to integrate cross-curricular numeracy in schools: Students in scientific classes can utilize numeracy to measure and evaluate data. Students in social studies can utilize numeracy to comprehend graphs and charts. Students in English class can utilize numeracy to compute word counts and statistics. Students in the arts can utilize numeracy to produce works of art based on geometric forms or mathematical concepts. Educators can assist guarantee that all students learn the numeracy skills they need to thrive in school and in life by employing a cross-curricular numeracy strategy.

A programming language is a language that allows computers to interact with one another. The connection between numerical literacy and computer programming may be seen from two perspectives: necessity and application. A fundamental grasp of numerical concepts such as numbers, mathematical operations, and expressions is required for programming. To properly understand and generate precise and efficient computer code, programmers must have high numerical literacy. Numerical notions may be applied in a wide range of applications using programming. Programming, for example, may be used to develop physical simulations, evaluate data, and optimize issue solutions. As a result, excellent numerical literacy can assist programmers in creating more sophisticated and valuable programs. One of the most popular programming language is Pascal.

Pascal is a programming language that is often used when learning algorithms and programming, especially in academic settings. It is a programming language that is written in a style that is very similar to the structure of English algorithms (Nugroho,2023).

Pascal is a structured programming language, which means that it uses a top-down, modular approach to programming. This makes it a good choice for developing large, complex programs. Pascal is also a statically typed language, which means that the type of each variable must be specified before it is used. This helps to prevent errors and makes the code easier to read and understand. Pascal is a powerful language that can be used for a variety of applications, including: System programming, Data processing, Scientific computing, and Education.

PASCAL programs have three parts: Program and variable specification section; Subordinate procedure declarations; and Main program executable code (Schmalz, 2023).

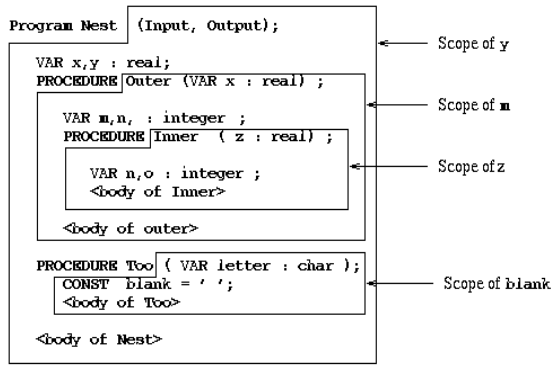

Figure 1. Scope of variables in a PASCAL program

Object Pascal has been designed to work hand-in-glove with its Integrated Development Environment. It is through this powerful combination that Object Pascal can match the ease of development speed of programmer-friendly languages and at the same time match the running speed of machine-friendly languages (Cantu, 2016).

```
program HelloConsole;

{$APPTYPE CONSOLE}

var
  strMessage: string;

begin
  strMessage := 'Hello, World';
  writeln (strMessage);
  // wait until the Enter key is pressed
  readln;
end.
```

Figure 2. Example of Simple Sascal Programming

Method

The service activity opened with speeches from the Head of Physics Education at Mataram University, the school principal, and the chief

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executive, who provided a brief overview of the training.

The training program at SMAN 1 Gunungsari, West Lombok, Indonesia, targets 25 students from XII IPA 1, 2, 3, and 4 classes. Selection was based on demonstrated interest in physics and a willingness to actively participate. To foster diverse perspectives, students from various classes were chosen. The program comprises three stages: Introduction to Pascal, Hands-On Practice, and Evaluation.

Stage 1: Participants will gain an introductory overview of Pascal applications, encompassing their features, functionalities, and connections to the concept of electricity.

Stage 2: This stage emphasizes practical exercises and interactive demonstrations. Students will utilize Pascal to explore various physics concepts through hands-on activities and engaging learning experiences.

Stage 3: This final stage focuses on evaluation. Assessment will be conducted based on post-activity results, eliminating the need for a preliminary test.

Figure 3. An explanation of Pascal applications' features, uses, and connection to electricity.

Result and Discussion

The results of the Pascal programming test for students at SMA 1 Gunungsari following service activities are presented in Table 1 and figure 1. Tabel 1 shows the Pascal programming Post-Test while figure 1 displays statistical analysis using Minitab19.

Table 1. Results of the Pascal programming post-test

Student	Score	Category
1	72	Satisfactory
2	75	Satisfactory
3	60	Below Satisfactory
4	84	Good
5	78	Satisfactory
6	73	Satisfactory
7	66	Below Satisfactory
8	67	Below Satisfactory
9	80	Good
10	94	Very Good
11	85	Good
12	87	Good
13	92	Very Good
14	76	Satisfactory
15	71	Satisfactory
16	81	Good
17	97	Very Good
18	88	Good
19	66	Below Satisfactory
20	74	Satisfactory
21	79	Satisfactory
22	96	Satisfactory
23	89	Very Good
24	97	Good
25	90	Very Good

Analysis of the data presented in Table 1 reveals several key findings. Four students scored below 70, suggesting a need for additional support to grasp the material fully. Seven students scored within the 70-79 range, indicating progress but highlighting areas requiring further refinement. Notably, nine students achieved scores between 80 and 89, demonstrating a strong understanding of both Pascal and the associated physics concepts.

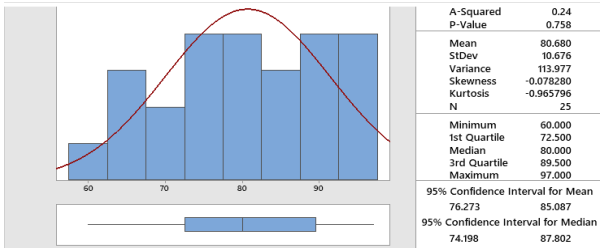

Figure 4. Summary Report for Post-Test

If we observe Figure 1, the results of the analysis of the Minitab 19 software, we can draw several important conclusions. The average score of Pascal programming achieved by students in the community service activity was 80.86 with a standard deviation of 10.676 at a 95% confidence level.

Conclusion

We are thrilled to share the remarkable outcomes of our recent training program in Pascal application at SMAN 1 Gunungsari, West Lombok. Despite the participants' initial limited experience with these technologies, they have achieved a remarkable level of competence.

To gauge their satisfaction, we categorized the students' feedback as "sufficient," "satisfied," or "highly satisfied." This evaluation revealed a clear positive response to the program, highlighting the effectiveness of Pascal programming in equipping them with the ability to perform electrical calculations with ease.

The implementation of this community service activity was carried out smoothly due to the assistance of the curriculum vice principal who prepared the facilities and infrastructure for the activity, including food and drink, and the students who helped to facilitate the activity, including by helping to distribute student worksheets, as well as the role of the physics teachers who directed their students to be enthusiastic in participating in the community service activity.

There were no inhibiting factors in this activity. The activity ran very smoothly. All parties worked together and supported the success of this community service activity.

Suggestion

For service activities incorporating programming literacy training modules, particularly Pascal programming, it is recommended to expand and diversify the training materials and extend the training duration. This will optimize knowledge acquisition and skill development for each student.

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