Analysis Of The Impact Narrative Algorithm Method, Pseudocode And Flowchart Towards Students Understanding Of The Programming Algorithm Courses

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Abstract. The definition of an algorithm is to describe a problem into a sequence of systematic steps in solving problems. Arranging the algorithm in sequence from beginning to end so that it can solve the problem. The results of the implementation of the algorithm are programs. So the purpose of making an algorithm is to facilitate the making of the program. There are 2 types of algorithms, 1) Text (narration and pseudocode), 2) Visual / image (flowchart). Comparison between the two, students understand it which is higher between the text or visual model. This study aims to see how much influence the value of students understands the algorithm in text or in an image. In conclusion, students are easier to understand the types of algorithms in an image. The test uses the Paired Sample T test, with a 5% significance level obtained value = 0.05. This means that the t count is greater than t table of 2.06390 and P Value (0.06211 > 0.05) or T-stat smaller than T-critical two tile, it means H1 can be accepted or T-count < T-table (-1.95597<2.06390), so H0 can be accepted.

Keywords: Algorithm, Paired Sample T test

1. Introduction
Algorithms and Programming is one of the basic courses in the field of informatics engineering that must be taken by students in semester one. The algorithm is very important because it is used as a basic foundation in learning programming for beginners. Therefore, algorithmic is said to be the heart of informatics, (kujangcode.com, 2017). Many branches of computer science are referred to in algorithm terminology. But don't assume that algorithms are always identical to computer science, (dictio.id). For example, the steps in a food recipe are an algorithm, starting from reading one by one the manufacturing steps and then working on the process (taking action) as read. In general, those who work on the process are called processors. Processors can be humans, computers, robots, electronic devices, etc. Implementing an algorithm means working on the steps written in the algorithm, (Saniman and M. Fatoni, 2008)/ In order for an algorithm to be implemented on a computer the algorithm must be converted into a programming language notation so that it can be called a program. The program is written in one of the programming languages, the activity of writing the program is called programming. The person who writes the program is called a programmer. Therefore algorithms with programming cannot be separated, interrelated with each other, (ilmukomputer.org, 2009). In this study, the authors took a sample of the first semester students of class 1A, amounting to 25 students.
The author made observations while doing face-to-face learning in the class, especially when the algorithm and programming material. Based on the results of direct observations it can be concluded that the level of student reasoning varies in the material of the algorithm and programming. Some are easy to accept the theory and practice of algorithm; some are hard to understand. The main topic of algorithm theory states that there are 2 methods to understanding algorithms, in a text and an image. This research was conducted with the aim to see how much influence the value of students understanding the algorithm in text or in images.

2. Theoretical Review

According to Gun Gun Maulana (2017), an algorithm is a collection of commands to solve a problem. Commands can be translated in stages starting from beginning to end, while the problem can be anything, provided that it has the initial conditions that must be met before running an algorithm.

Whereas in wordpress.com written by (andikafisma, 2015), said that the algorithm is a sequence of steps in solving problems that are arranged systematically and logically. The keyword in the algorithm is the word "logical" and must be determined the value of true or false. There is a difference between algorithm and program. An algorithm is a step sequence specification for solving a problem, whereas a program is a collection of computer statements. Some experts give the formula that: Program = algorithm + language (data structure). The relationship between data structures and algorithms is closely related to the program. Making a good algorithm without choosing the right data structure (language) will make the program less good, and vice versa. The algorithm created has many advantages, namely: (1) Writing the algorithm does not depend on any programming language, (2) Algorithm notation can be translated into various programming languages, (3) Whatever programming language is used, the output will be the same because the algorithm is the same, (andikafisma, 2015).

In general algorithm notation is grouped into 3 forms, namely: (a) Descriptive / natural / verbal, (b) pseudocode, and (c). flow chart. The verbal way and pseudocode are more on forms of writing / code, while the flowchart is more on graphic forms (Proceeding, Bambang S., 2013).

Following is the description of the three algorithm notations:

a. Descriptive (Natural), means that the algorithm is written in the form of sentences of human language such as Indonesian or English. This descriptive notation is suitable for short algorithms, for long notations are less effective to use.

Example:
The algorithm for buying clothes
1. Enter the clothing store
2. Look at the size, repeat if the size does not fit , find another size
3. Look at the other clothes
4. Check the price, is the price suitable?
   a. if yes, buy
   b. f not, go to step 3
5. Finished, go home.

b. Pseudocode, derived from the words pseudo and code. Pseudo means imitation and code means code in the form of instructions written in computer language or programming language code. Pseudocode is usually used to describe the logical sequence of a program regardless of how the programming language.

Example:
Calculate the Area of a Rectangle
Formula : \( lw = \text{long} \times \text{wide} \)

Calculate the Area of a Rectangle
1) input \( l \) OR 1) input \( \leftrightarrow l \)
2) input \( w \) 2) input \( \leftrightarrow w \)
3) \( lw = l \times w \) 3) \( lw \leftrightarrow l \times w \)
4) output \( lw \) 4) output \( \leftrightarrow lw \)
c. Flow Chart (Flowchart), is a chart that illustrates the sequence of activities or program steps from beginning to end by using symbols or pictures that represent the functions of program steps and flow lines that show the sequence of symbols to be worked on.

Example:

![Flowchart Program](image)

**Figure 1. Flowchart Program**

Taken from pradigtaagus writing on blogspot.com which was uploaded on August 16, 2019. Following in the table below contains the symbols commonly used for Flowcharts (Programs).

**Table 1. Program Flowchart Symbols.**

| Symbol | Description |
|--------|-------------|
| ![Symbol](image) | Flow Direction symbol |
| ![Symbol](image) | Terminator Symbol |
| ![Symbol](image) | Connector Symbol |
| ![Symbol](image) | Connector Symbol |
| ![Symbol](image) | Processing Symbol |
| ![Symbol](image) | Symbol Manual Operation |
| ![Symbol](image) | Symbol Decision |
| ![Symbol](image) | Symbol Input-Output |
| ![Symbol](image) | Symbol Manual Input |
| ![Symbol](image) | Symbol Preparation |
| ![Symbol](image) | Symbol Predefine Proses |
| ![Symbol](image) | Symbol Display |
| ![Symbol](image) | Symbol disk and On-line Storage |
| ![Symbol](image) | Symbol magnetik tape Unit |
| ![Symbol](image) | Symbol Punch Card |
| ![Symbol](image) | Symbol Dokumen |
3. Methodology
The testing method used by the author to be able to declare valid results using the T-Paired Sample T-test. This test is used to determine the presence or absence of differences in the average effect between two groups of samples that are paired (related) with the same object, (duwiconsultan, 2011).

Paired T Test is a comparative test conducted on a paired sample. This test is similar to the independent t test, but is more specific for paired or related samples. Therefore it is also called the pairing t test. The author conducted a paired t test with the help of Ms. application. Excel, (statistika.com, 2013).

Indications for use of this test include:
a. Used to compare the mean of a paired sample
b. Paired samples are a group of samples with the same subjects but undergo two different treatments or measurements.

Formula T Paired:
\[ t = \frac{x_d - \mu_0}{s_d / \sqrt{n}} \]

OR:
\[ t = \frac{d}{s_d / \sqrt{n}} \]

\( d = \) difference \( 2 / \) average, or \( x_d - \mu_0 \)
\( s_d = \) standard deviasi of difference
\( n = \) Total Sample.

Decision of Paired Hypothesis:
a. \(-t\) table > t count or t count > \( t \) table or Absolut t count > Absolut t table:
   There Are Significant Differences or Ho Rejected.
b. \(-t\) table < t count or t count < \( t \) table or Absolut t count < Absolut t table:
   There Are Significant Differences or Ho Rejected.

4. Results and Discussion
Sample data for algorithm values using descriptive (text) and image (image) methods as in the table below

| no | pre | post | selisih |
|----|-----|------|--------|
| 1  | 75  | 80   | -5     |
| 2  | 77  | 70   | 7      |
| 3  | 66  | 68   | -2     |
| 4  | 70  | 80   | -10    |
| 5  | 66  | 79   | -13    |
| 6  | 77  | 75   | 2      |
| 7  | 80  | 70   | 10     |
| 8  | 77  | 80   | -3     |
| 9  | 79  | 70   | 9      |
| 10 | 69  | 68   | 1      |
| 11 | 68  | 80   | -12    |
| 12 | 77  | 79   | -2     |
| 13 | 68  | 79   | -11    |
| 14 | 68  | 80   | -12    |
| 15 | 68  | 80   | -12    |
| 16 | 70  | 80   | -10    |
The manual testing process obtained the following results:

**Table 3. Test Results with: Paired T-test**

| no | pre | post | selisih |
|----|-----|------|--------|
| 17 | 75  | 79   | -4     |
| 18 | 70  | 80   | -10    |
| 19 | 68  | 79   | -11    |
| 20 | 76  | 60   | 16     |
| 21 | 76  | 70   | 6      |
| 22 | 75  | 77   | -2     |
| 23 | 75  | 80   | -5     |
| 24 | 68  | 68   | 0      |
| 25 | 77  | 80   | -3     |

The process of testing with Paired t-test using the help of Ms. Excel as follows:

**Table 4. The Testing Process with Ms. Excel**

The final results of the Paired Sample T-test calculation are shown in the table below:
Table 5. Test Results with Ms. Excel

|                      | Variable 1 | Variable 2 |
|----------------------|------------|------------|
| Mean                 | 72.600000  | 75.720000  |
| Variance             | 20.250000  | 32.04333   |
| Observations         | 25.000000  | 25.000000  |
| Pearson Correlation  | (0.22213)  | -          |
| Hypothesized Mean Difference |         | -          |
| df                   | 24.000000  | -          |
| t Stat               | (1.95597)  | -          |
| P(T<=t) one-tail     | 0.03116    | -          |
| t Critical one-tail  | 1.71088    | -          |
| H0                   | -          | -          |
| P(T<=t) two-tail     | 0.06221    | -          |
| t Critical two-tail  | 2.06390    | -          |

The testing steps are as follows:

1) Determine the Hypothesis. Ho: there is no difference between the average algol value with descriptive methods and images / symbols. Ha: there is a difference between the average algol value with descriptive methods and images / symbols.

2) Determine the level of significance. The test uses a two-tailed test with a significance level of $a = 5\%$. Means we take the risk of making a wrong decision to reject the correct hypothesis as much as 5% (significance 5% or 0.05)

3) Determine t-count. From the table we get the value of t-count (-1.95597)

4) Define t-table. T-table is sought at $a = 5\%$: 2 = 2.5% (2-tailed test) with degrees of freedom (df) n-1 or (25-1 = 24). With 2-sided testing (significant = 0.025) results obtained for t table of (2.06390)

5) Testing Criteria Ho is accepted if $t$ arithmetic, Ho is rejected if $t$ arithmetic $> T$ table

6) Based on probability: Ho is accepted if P value $> 0.05$ and Ho is rejected if P value $< 0.05$, then by comparing t-count with t-table and the probability is obtained $t$ count $> t$ table (-1.95597 $> 2.06390$) and P value (0.06221 $> 0.05$) then Ho is accepted.

7) Conclusion, because the value of $t$ count $> t$ table (-1.95577 $> 2.06390$) and P value (0.06221 $> 0.05$), Ho is accepted, meaning that there are differences in students' understanding of the algorithmic method in the picture with the method algorithm in text. By looking at the Mean value in the Paired Sample test of (72.600 and 75.720) obtained a positive p value of (0.06221) means that the average student is easier to understand the algorithm using the drawing method than the black algorithm in text.

5. Conclusion

Based on the results of calculations of an average of 25 students of class 1A, it can be seen that the T-stat is smaller than the T-critical two tile which means that H1 can be accepted. The algol method in the picture can facilitate student understanding, or T-count $< T$ table (-1.955597 $< 2.06390$), then H0 can be accepted. So it can be concluded that the algorithmic method with images gives more value than the value for the descriptive algorithm method (text)

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