The Influence Computer Based Training Utilization of Learning Outcomes of Solid State Electronics Viewed from Different Learning Style

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Abstract. Experimental learning method offers more experience and knowledge for learners. This research aims to determine the influence of computer based training utilization on learning outcomes of solid state electronics viewed from different learning style. Computer Based Training (CBT) is part of Computer Assisted Instruction (CAI), which is learning by using computer aids, such as for presentations as teaching aids and so on. CBT, which refers to Electronics WorkBench (EWB) is a category of software tools that can be used to simulate the workings of an electronic circuit both analog and digital. learning style is the way individuals begin to concentrate on, process, internalize, and remember new and difficult academic information or skill. Using CBT on experimental learning with different learning style could result on different learning outcomes. This research used quantitative approach in quasi-experimental frame. In this research, the compared conditions were the experimental learning method with CBT and analog experimenter and learning style, which were grouped into three, visual, auditory and kinesthetic learning style. The research instrument used were questionnaires and tests, while the data analysis used two ways of ANOVA. The statistical analysis showed that there was difference learning outcomes in Electonica Solid State Subject among experimental learning with CBT and analog experimenter. Furthermore, there was no interaction among the experimental learning with CBT and the learning style in terms of their effect towards learning outcomes.

Keywords: learning style; learning outcomes; experimental learning method

1. Introduction
Solid State Electronics Subject is a science subject which is one of the subjects of science an skills in the curriculum of Air Navigation and Telecommunication Engineering and Airport Electrical Engineering (TLB) in which the outcomes of students learning was that the students are expected to be able to understand and apply the principles and concepts of solid state electronics as well as able to apply the procedure of design and application of solid state electronics. [1] As a vocational education in general, the provision of education in the Surabaya Aviation Polytechnic prioritizes the practice with the proportion of 70% of the entire educational curriculum. [2] [3] With such a dominant proportion, the students are required to master all aspects of practicum, both in terms of understanding...
and applying the principles and concepts of digital and able to apply procedures design and application of digital techniques properly and correctly. [4] The experimental method is considered capable of increasing the construction of student knowledge in terms of understanding and applying the solid state electronics principles and concepts [5].

Learning style is a way for someone to do learning activities and process various types of information that come from the environment that can affect the learning process of that person. Learning styles influence individuals in receiving material in the learning process. Learning styles or human learning modalities generally consist of visual, auditory and kinesthetic learning styles. Learning outcomes in this case are indicators of the success of learning activities that can be identified based on clear measurements of the comparison between student achievement and the planned learning target [6].

CBT stands for “Computer Based Training (CBT), which also refers to Electronic WorkBench (EWB) is a category of software tools that can be used to simulate the workings of an electronic circuit both analog and digital [7]. Studying electronic circuits, a good understanding of electronic components, electrical circuit theory and analytical skills is needed. For this software, it is very useful for anyone who wants to deepen electronic material both analog and digital. We can make electronic circuit simulations in front of the computer without fear of a wrong connection, the risk of damage to the tool, and of course can conduct experiments related to the existing theory. Electronic circuit simulation is needed to test whether the circuit can run well and in accordance with the theoretical approach used in electronic books, without having to make the circuit in real terms. This research will be carried out to determine the differences in the influence of the use of computer based training and analog experimenter media in improving the learning outcomes of solid state electronics at the Surabaya Aviation Polytechnic.

Realizing that students are unique but they are in different environments and experiences, while content standards, graduate competency standards, and subject matter are determined equally for all students. To overcome this learning media with its ability to provide the same stimuli, equalize experiences, and give rise to the same perception. In testing these influences, testing will also be carried out on the influence of the learning styles of students, which can broadly consist of visual, auditory, and kinesthetic learning styles. This learning style test can be an explanatory factor of the effect of learning media on improving learning outcomes according to the real practice of learning conducted at the Surabaya Aviation Polytechnic.

2. Method
2.1. Research Design
This research used a quantitative approach with experimental design which refers to factorial design. The method chosen in this research is the quasi-Tuckman experiment method. [8] Research is in a design where two or more variables are manipulated at the same time to study the influence caused by interactions of several variable. [9] The Variables in this study are independent variables, moderator variables dan dependent variables. The dimensions of the independent variable are computer based training media and experimenter analog media, moderator variables namely visual, auditory and kinesthetic learning styles. Then the dependent variables are learning outcomes measured at the level of understand relationships and apply skills classified in the learning taxonomy of Reigeluth. So that the research design was in the form of a 2x3 factorial design. Therefore, [10] the data analysis used two ways, ANOVA and SPSS 20.

To know the influence of CBT which refers to EWB software utilization towards the learning outcomes in Solid State Electronics subject, sampling was conducted on experimental group and control group. Tests were conducted simultaneously in each group after the lecture with EWB software and the lecture using analog experimenter. In accordance with the relationship between variables mentioned in the previous chapter, then the research can be described in the table 1.
Table 1. Relationship between Variables

| Learning Style   | Teaching Media         | Computer-based Training | Analog experimenter |
|------------------|------------------------|-------------------------|---------------------|
| Visual (A₁)      | X₁,A₁                  |                         | X₂,A₁              |
| Auditory (A₂)    | X₁,A₂                  |                         | X₂,A₂              |
| Kinesthetic (A₃) | X₁,A₃                  |                         | X₂,A₃              |

Table 1. Relationship between variables

Information:
X₁,A₁ : The interaction between teaching computer-based training to the visual learning style.
X₂,A₁ : The interaction between teaching media analog experimenter to the visual learning style.
X₁,A₂ : The interaction between teaching media computer-based training to the auditory learning style.
X₂,A₂ : The interaction between teaching media analog experimenter to the auditory learning style.
X₁,A₃ : The interaction between teaching media computer-based training to the kinesthetic learning style.
X₂,A₃ : The interaction between teaching media analog experimenter to the kinesthetic learning style.

2.2. Population and Sample

The population of this research involved all students of the Air Navigation and Telecommunication Engineering (TNU) and Airport Electrical Engineering (TLB) at the Surabaya Aviation Polytechnic. In the Air Navigation and Telecommunication Engineering (TNU), there was two class of students of first semester with 49 students. Meanwhile, in the Airport Electrical Engineering (TLB), there was two class of students first semester consisting of 46 students.

2.3. Data Collection

1) Type of Data
   a) Learning outcomes data is the interval data
   b) Learning style data is ordinal data

2) Data collection technique

To process the data required in this study, the following techniques were used:
   a) Questionnaire
      To collect data on student learning styles used learning style instrument made by DePorter (2002). Instrument learning styles are used to assess whether students have a tendency for visual, auditory or kinesthetic learning styles. The instrument consisted of 12 questions for visual learning style, 12 questions for auditory learning styles and 12 questions for kinesthetic learning styles. Each question is given three answer choices to choose one, namely: often, sometimes and rarely.
   b) Test
      The Learning outcomes were test based on the practice handout with 8 test items
2.4. Technical Data Analysis

In this research technical analysis used was two-way ANOVA. For that, previously performed hypothesis test was firstly tested following the requirements below:

1) Normality test.

Normality testing to evaluate the null hypothesis ($H_0$) on media which states that data is normally distributed.

| Table 2. Normality test of media data in learning (one-sample kolmogorov-smirnov test) |
|---------------------------------------------|---|---|
| CBT  | AE |
| N    | 49 | 46 |
| Normal Parameters $^{a,b}$ | Mean | 50.4 | 74.4 |
|      | 1  | 0  |
|      | 11.5 | 13.4 |
| Deviation | 06 | 91 |
| Most Extreme Differences | Absolute | .145 | .110 |
|      | Positive | .082 | .059 |
|      | Negative | -.145 | - |
| Kolmogorov-Smirnov Z | 1.01 | .746 |
| Asymp. Sig. (2-tailed) | .256 | .633 |

a. Test distribution is Normal.
b. Calculated from data.

From table 2, for all groups, it can be seen the normality for learning outcomes for learning strategies with the use of computer based training media, the significance of which is 0.256>0.05, meaning that the data is normally distributed.

2) Homogeneity Test

The homogeneity test of the population variant was done through Levene Test. Through the homogeneity test, it can be found that the similarity of variant of bound variable (learning outcome) was based on each variance score of the independent variable (CBT and analog experimenter and Learning Style) [11] [12]. The homogeneity test summary was presented in the following table 3.

| Table 3. Homogeneity test result through levene test |
|---------------------------------------------|---|
| Levene's Test of Equality of Error Variances$^a$ |
| Dependent Variable: Learning Outcomes |
| F  | df1 | df2 | Sig. |
| .570 | 5  | 89  | .723 |

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

a. Design: Strategy + Learning style + Learning Style Strategy
3. Result and discussion

3.1. First Hypothesis

Table 4. Tests of between-subject effect

| Source                          | Type I Sum of Squares | df  | Mean Square | F    | Sig.   |
|--------------------------------|-----------------------|-----|-------------|------|--------|
| Model                          | 386187.552            | 6   | 64364.592   | 450.130 | .000   |
| Strategy (Media CBT dan AE)    | 385739.082            | 2   | 192869.541  | 1348.823 | .000   |
| Learning Style                 | 40.033                | 2   | 20.016      | .140  | .870   |
| Learning Style Strategy        | 408.438               | 2   | 204.219     | 1.428  | .245   |
| Error                          | 12726.198             | 89  | 142.991     |       |        |
| Total                          | 398913.750            | 95  |             |       |        |

a. R Squared = .968 (Adjusted R Squared = .966)
b. Computed using alpha = .05

Table 5. The estimation between marginal mean in using media strategy to the learning outcomes

| Strategy          | Mean | Std. Error | 95% Confidence Interval | Lower Bound | Upper Bound |
|-------------------|------|------------|-------------------------|-------------|-------------|
| CBT               | 49.815 | 1.860 | 46.119 | 53.511 |
| Analog experimenter | 74.647 | 1.980 | 70.713 | 78.582 |

Judging from the calculation of estimates marginal mean between the Media utilization strategy and the Learning Outcomes in table V, it shows that the average value of using analog experimenter is better than using CBT. [13] The average value of using analog experimenter is 74.647 while the average value of using CBT is 49.815.

Table 6. Significant level of the calculation result and coefficient f

| No | Hypothesis                  | F hitung | F table | Sig. | Alpha |
|----|-----------------------------|----------|---------|------|-------|
| 1  | Model (combined)            | 450.130  | 2.19    | .000 | 0.05  |
| 2  | Strategy (Media CBT dan AE) | 1348.823 | 2.70    | .000 | 0.05  |
| 3  | Learning Style              | .140     | 2.70    | .870 | 0.05  |
| 4  | Learning Style Strategy     | 1.428    | 2.70    | .245 | 0.05  |

The hypothesis of this research are:

H₀: There is no influence on the use of computer-based training media, experimenter analog on learning outcomes

H₁: There is influence of using computer based training media, experimenter analog on learning outcomes

From table IV shows that coefficient value. Sig for learning uses learning strategies with CBT and AE on learning outcomes of 0.00 at a significant level of 0.05, this means :

Koef. Sig 0.00 ≤ 0.05 stated H₀ rejected

F Count 1348.823 > 2.70 stated H₀ rejected
So, based on the calculation it can be concluded that the null hypothesis is rejected, which means “there is the influence of computer based training media utilization with experimental researchers on learning outcomes” solid state electronics courses at Aviation Polytechnic of Surabaya.

3.2. Second Hypothesis

The hypothesis in this research are:

H0 : There is no influence between students who have visual, auditory and kinesthetic learning styles on learning outcomes

H1 : There is the influence between students who have visual, auditory and kinesthetic learning styles on learning outcomes

From table IV shows that coefficient value. Sig for learning style on learning outcomes is 0.870, this means:

Koef. Sig 0.870 ≤ 0.05 stated H0 accepted

F Count 0.140 > 2.70 stated H0 accepted

So, based on the calculation it can be concluded that the null hypothesis is accepted, which means “there is no influence between students who have visual, auditory and kinesthetic learning styles on learning outcomes” solid state electronics at Aviation Polytechnic of Surabaya.

**Table 7** Estimates Marginal Mean between the effect of learning style to the learning outcomes

| Learning Style | Mean  | Std. Error | 95% Confidence Interval |
|----------------|-------|------------|-------------------------|
| Visual         | 63.346| 1.675      | 60.018                  | 66.674                  |
| Audio          | 60.813| 2.618      | 55.611                  | 66.014                  |
| Kinesthetic    | 62.535| 2.636      | 57.296                  | 67.773                  |

Based on table VII, shows the overall average learning outcomes of students between learning styles which are more or less the same or do not have a significant difference. Where, the average value of learning outcomes of students who have a visual learning style is 63.35, while the average value of learning outcomes of students who have an auditory learning style is 60.81 and the average value of learning outcomes of students who have learning style kinesthetic is 62.53.

3.3. Third Hypothesis

The hypothesis in this research are:

H0 : There is no interaction between the use of computer based training and analog experimenter with learning style of students towards learning outcomes

H1 : There is interaction between the use of computer based training and analog experimenter with learning style of students towards learning outcomes

From table IV shows that coefficient value. Sig for interaction between the strategies used in learning (computer based training and analog experimenter) with the learning styles possessed by students (visual, auditory and kinesthetic) in influencing learning outcomes which is 0.245, this means:

Koef. Sig 0.245 ≤ 0.05 stated H0 accepted

F Count 1.428 > 2.70 stated H0 accepted

So, based on the calculation it can be concluded that the null hypothesis is accepted, which means “there is no significant interaction between the use of computer based training and analog experimenter and the learning styles of students towards learning outcome”, in solid state electronics courses at Aviation Polytechnic of Surabaya.
Table 8. Interaction between variable variants

| Strategy          | Learning Style | Mean  | Std. Deviation | N  |
|-------------------|----------------|-------|----------------|----|
| CBT               | Visual         | 51.00 | 11.388         | 25 |
|                   | Auditory       | 51.50 | 11.252         | 15 |
|                   | Kinesthetic    | 46.94 | 12.917         | 9  |
|                   | Total          | 50.41 | 11.506         | 49 |
| Analog experimenter | Visual        | 75.69 | 13.445         | 26 |
|                   | Auditory       | 70.13 | 12.165         | 8  |
|                   | Kinesthetic    | 78.13 | 9.301          | 12 |
|                   | Total          | 75.36 | 12.311         | 46 |
| Total             | Visual         | 63.59 | 17.551         | 51 |
|                   | Auditory       | 57.98 | 14.489         | 23 |
|                   | Kinesthetic    | 64.76 | 19.087         | 21 |
|                   | Total          | 62.49 | 17.242         | 95 |

4. Conclusion

There is the influence of using computer-based training and analog experimenter on the learning outcomes of students in solid state electronics courses, where from the results of the study there are differences in learning outcomes using computer-based training and analog experimenter. The group of students using analog experimenter is superior to their learning outcomes than the group of students who use computer-based training media. The average value of the use of computer-based training media in learning in the Airport Electrical Engineering’s class is 49,815 while the use of analog experimenter media in the Telecommunication and Air Navigation Engineering’s class is 74,647.

There is no influence of learning styles on student learning outcomes, known in the sig value, count 0.870> 0.05 and the calculated F coefficient 0.140 <2.70 so that Ho is accepted and it is concluded that there is no difference in learning outcomes between students who have a visual, auditory, and kinesthetic learning style towards learning outcomes. In general, the average student has a visual learning style. Where, out of 95 students who have a visual learning style of 51 students with an average learning outcome that is equal to 63.35. Students who have auditory learning styles 23 students with an average score of 60.81. Students who have kinesthetic learning styles with a total of 21 students and the average learning outcomes are 62.53.

There is no significant interaction between the use of computer-based training media, analog experimenter and learning styles towards learning outcomes in solid state electronics courses at the Aviation Polytechnic of Surabaya. The computer-based training media as a media program is a type of audio and visual media, so the use of computer-based training media used in the class with dominant audio and visual learning styles in the course certainly can provide higher learning outcomes, proven that the average learning outcomes are superior to the group of students who have kinesthetic learning styles. Relationships or interactions between media and learning styles are not significant, because the average learning outcomes of students are below the minimum completeness criteria. By using experimental analogue media students should have visual and kinesthetic learning styles that can easily capture the information provided. However, for students who have an audio learning style the learning outcomes are also high, although it is not commensurate with students who have a visual and kinesthetic learning style. This can be based on the experimenter's analog media which are original media so that in addition to their manifestations they can be observed, they are also practiced directly so that all senses are to move or operate.
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