

A COMPARISON BETWEEN THE USE OF CISCO PACKET TRACER AND GRAPHICAL NETWORK SIMULATOR 3 AS LEARNING MEDIA ON STUDENTS' ACHIEVEMENT

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ABSTRACT

Usually in studying the practice of computer networks, it is encountered several obstacles such as (1) limited computer networks design tools, (2) limited learning time to design computer networks and (3) technical difficulties for finding the solutions of errors. To overcome those barriers as proposed in this study, computer network simulators were used. Computer network simulators were expected to help students designing and simulating networks planned to be applied to computer network practices. This study used two simulators to compare its effectiveness in assisting the students to learn computer networks, which were Cisco Packet Tracer and Graphical Network Simulator 3 (GNS3). This study was aimed to determine the difference of the influence of network simulators to (1) learning achievement, and (2) learning achievement improvement. The quasi-experiment method was used and data were collected through conducting testing before and after the utilization of the simulators. Based on the testing results it was concluded that (1) different effect of using Cisco Packet Tracer and GNS3, the average grade achievement in the class using GNS3 and using Cisco packet tracer were 76.67 and 70 respectively, and (2) improved learning achievement using GNS3 for around 35%, higher than using Cisco Packet Tracer.

Keywords: cisco packet tracer, gns3, learning achievement, networking simulator

INTRODUCTION

The success of a learning process at school is influenced by internal factors and external factors. Internal factor involves student's skills such as motoric skills and thinking schemes. External factors include teachers, school environment, school curriculum, instructional media, and school infrastructure (Aunurrahman, 2014). Learning media can be defined as a medium that carries messages or information aimed at instructional or contains learning purposes, which are used to convey the content of teaching materials (Arsyad, 2011). The instructional media include books, audio, video, slides, photos, pictures, graphics, simulators, and others (Anitah, 2008). Learning Media is an essential aspect of a learning process that significantly influences the learning outcomes (Tiwan, 2012; Suyitno, 2016; Marsudi, 2016).

Many Vocational High Schools, also known as Sekolah Menengah Kejuruan (SMK),

open Computer Networking Engineering Programs or Teknik Komputer dan Jaringan (TKJ). In this program, the students would learn design of computer networks, create a computer network and network server administration. During the program, it is found many problems such as (1) the lack of network devices (2) takes a long time in the networking process (3) difficulties to find solutions when facing constraints or errors (Hariyanto & Nugraha, 2012).

A possible way to reduce the failure rate of network practices is using a simulator to help learning computer networks. Network simulators are expected to help students designing and simulating networks that will be applied to the actual networks afterwards. The network simulator that has been widely used in the learning process is Cisco Packet Tracer. Javid (2014) found that the benefit of Cisco Packet Tracer is the students can learn basic concepts of computer networks and they also can simulate a computer network without

buying expensive tools. Comparing to the previous simulator, this study proposes GNS3 as a new simulator to be tested (Maizura et al., 2018). Cisco Packet Tracer and GNS3 have some similarities such as free software and they can be run on operating systems such as windows and Linux. However by using GNS3, it is possible to run Cisco IOS (Internet Operating System) and make it a more real topology with interaction to other systems like OS that exist in VirtualBox.

The study is supported by Vesel et al. (2016) who discussed the media that can be used for modeling network structure. They claimed that GNS3 was a good network software used for simulation of computer networks that approached the creation of a real network, so GNS3 become the right software for computer network modeling.

In addition, Handayani et al. (2012) discussed the making network design using Multiprotocol Label Switching (MPLS) technology and simulation using Graphical Network Simulator (GNS3) which connect several campus locations to improve network performance. GNS3 is a network simulator that can be used to simulate a complex MPLS network well. This simulator is useful for network technicians to check the configuration that needs to be used before being implemented to the real router.

Twelefty & Zani (2015) developed an application of clustering computing system which would be applied in computer network laboratories by using a GNS3 simulator. The simulator was used as a laboratory testing tool to implement the GNS3 cluster system on network simulations and simulate the core network of a building. The results indicated that the cluster system can be implemented using GNS3.

This study is an effort to improve the students' learning achievement by using simulator-based learning media. The network learning theoretical materials to be delivered can be simulated before the real equipment practices. The purpose of this study is to

examine the impact of network simulator usage (1) learning performance and (2) learning achievement.

METHOD

This section discusses the research methods which is consists of the research the research design, the research sample and data collection techniques. Using quasi-experiment design, there are two groupes compared, the control group treated with Cisco Packet Tracer, and the experimental group treated with GNS3. Both groups will get pre-test and post-test before and after the treatment. For the detailed design of this study adapted from Sugiyono (2010), it is presented in Table 1.

Table 1. Research Design

Group	Pretest	Treatment	Posttest
Experiment	O ₁	X ₁	O ₂
Control	O ₃	X ₂	O ₄

Where

O₁: Pretest Experimental Group

O₂: Posttest Experimental Group

O₃: Pretest Control Group

O₄: Posttest Control Group

X₁: Use of GNS3 Simulator Learning Media

X₂: Use of Cisco Packet Tracer Simulator Learning Media

Based on Table 1, there were two groups to apply the design and then they were assessed using a pretest to know the students' prior abilities. The results will consider as proper or valid if the two groups' prior abilities do not differ significantly. Then both groups were treated, X₁ was treated using a GNS3 simulator and X₂ treated with a Cisco Packet Tracer. After being treated, both groups performed a post-test. This study used total sampling technique which means the number of samples is equal to the number of population (Arikunto, 2006). 72 students of SMK N 1 Sukoharjo had participated in the study divided into 2 for the experimental group and the control group. For collecting the data, it was conducted a test. A

test is a collection of questions or exercises used to measure the students' skills, knowledge of intelligence, and abilities or talents possessed by individuals or groups (Arikunto, 2006). The test was aimed to assess the difference in learning achievement of each group.

The data analysis was done by conducting a balance test, a normality test, a homogeneity test and a hypothesis test. All tests were performed before hypothesis testing. The equilibrium test result was measured by the pretest value through a t-test. The result of the balance is 0.278, a lot greater than 0.05, which meant that the sample has the same initial ability.

The results of the normality test obtained the pre-test results of the control group and experiment group were 0.123 and 0.285 respectively. While the post-test results of the control group and experiment group were 0.131 and 0.606 respectively. Thus, the result of the normality test as a whole was more than 0.05. It is shown that the results of the normality test from the pretest and posttest of the experimental group and the control group were normally distributed. From the homogen test results of the control and experiment group, it was obtained sig value at the pretest and posttest which were 0.565 and 0.172 respectively. Because both of the sig values were more than 0.05 then it was concluded that the data were homogenous. Based on the results of data analysis, the data in this study was normally distributed and homogeneous, and so it could be continued with a hypothesis and a parametric statistic test.

RESULTS AND DISCUSSION

The hypothesis testing was conducted after the Cisco Packet Tracer and GNS 3 were implanted on the subject of the study, then data

collection and analysis were conducted. The results of data collection and analysis showed that the result has been fulfilled, equal to the pretest, homogenous and normal, then it was tested using the independent test sample hypothesis test. The Result of Hypothesis testing was presented in Table 2.

Tabel 2. The Result of Hypothesis Testing

Group	N	Sig	$\alpha=$ 5%	Criteria	Information
Experiment & control	36	0.000	0.05	0.000< 0.05	H0 rejected H1 accepted

Table 2 shows the result of Hypothesis Testing with sigificance less than 0.05 and t_{count} more than t_{table} . It means H_0 is rejected and H_a is accepted. Therefore there is a significant difference before and after the implementation of the media in each group. There was increasing average in the experiment group values which was higher than the control group. In the control group the increase was around 4.03 while the experimental group was 12.64. In summary, the results of this test accepted the hypothesis of different impact of the use of Cisco Packet Tracer and GNS3 simulator as a medium of learning on student achievement in the subject of LAN network installation. There is different impact on students' achievement improvement between the learning process by using Cisco Packet Tracer and by using GNS3 simulators on the LAN Network Installation subject indicated by the post-test results. The post-test results of the experimental and control groups are presented in Table 3 and Figure 1.

Tabel 3. Posttest Result of the Control Group and the Experimental Group

Group	Min Value	Max value	Average Value
Control	55	80	70
Experimental	60	95	76.67

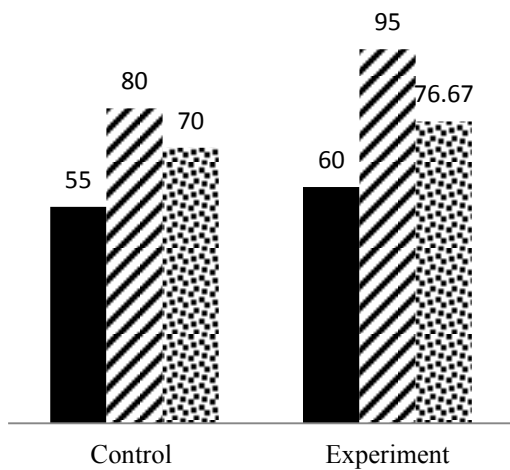


Figure 1 Posttest Results of the Control Group and the Experimental Group

Table 4. Gain Index

Group	Pretest	Posttest	Gain	Standart Gain	Classification
Experiment	64.02	76.66	12.64	0.35	Medium
Control	65.67	70	4.33	0.11	Low

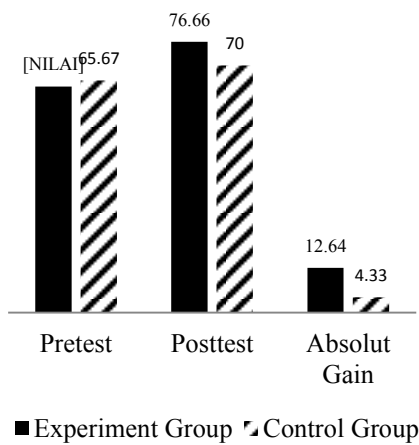


Figure 2. The Score of Control Group Experiment

Table 4 and Figure 2 show the results of the experimental group gain. The calculation of the experiments increased by 0.35 categorized as moderate and in the control group it was increased by 0.11 categorized as low. From the results of the gain index, it can be concluded that students learning achievement in the experimental group is higher than the control group.

Table 3 and Figure 1 present the minimum values of the control group and the experimental group are 55 and 60 respectively. While the maximum value of the control group and the experimental group are 80 and 95 respectively. The mean scores of the two groups are also different. The mean scores for the control group and the experimental group are 70 and 76.67 respectively. The experimental group got the higher result than the control group. The result is supported by the improvement of student achievement using a gain index test presented in Table 4.

CONCLUSION

Based on the results of the study that has been done, the implementation of appropriate learning media can influence students' achievement. Network learning media used in this study is the network simulator. At the time of its implementation, the network simulator can make students more eager in learning to design computer networks. The network simulator used in this study were Cisco Packet Tracer and GNS3. Both simulators have some similarities such as free software and can be run on operating systems such as windows and Linux. However, GNS3 allows students to run Cisco IOS, and create a more real topology with interaction to other systems such as the existing OS in VirtualBox that makes students like configure the real router. GNS3 is also a new learning media network for students of class XI SMK N 1 Sukoharjo, new learning media makes students feel interested and motivated to try and learn. This study can conclude that there

is different impact on learning achievement between students treated with Cisco Packet Tracer and GNS3. The students' learning achievement treated with GNS3 is 35% which is higher than the students treated with Cisco Packet Tracer students with the percentage of 11%.

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