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Improving Self-Efficacy Of Cadets Through Asterix Data Conversion Tool Media

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ABSTRACT

The purpose of this research is to assess whether there is an improvement in self-efficacy in learning outcomes by using learning media with an Asterix data converter tool. This study was conducted with cadets in the Air Navigation Engineering program at the Surabaya Aviation Polytechnic, taking into account their initial abilities, using an experimental method of learning. This research falls under the category of quasi-experiment. Data analysis was performed using the N-Gain score test. The research results show a significant improvement in learning outcomes through the Asterix data learning media. Almost all cadets who were provided with the Asterix data converter application learning media obtained better self-efficacy compared to cadets whose learning did not include the additional learning media of the Asterix data converter tool. The N-Gain score for the experimental class was 0.56, and for the control class, it was 0.53. Therefore, it can be concluded that the increase in self-efficacy in the experimental class is greater than in the control class.

INTRODUCTION

Automatic Dependent Surveillance Broadcast (ADS-B) is a surveillance method that continuously broadcasts the position of an aircraft via satellite, unlike radar technology which relies on scanning aircraft targets(Koh, 2019; Stroman, 2021). Aircraft equipped with ADS-B transponders continuously transmit information from the Flight Management System. The data broadcasted includes altitude, speed, and identity, similar to secondary radar information. However, the advantage of ADS-B lies in its ability to include various additional data such as weather information, avionics systems, and more(Alip et al., 2018).

Data about the aircraft's position and speed are obtained from the Global Navigation Satellite System (GNSS), with a minimum of three satellites needed for comparison purposes(Clarizia & Ruf, 2016; Sabatini et al., n.d.). Information about the flight, which is openly broadcast, is received and processed by ground receiver stations. The term "dependent" indicates that flight data is not initiated by ground stations (as in radar systems) but by the aircraft itself. This ADS-B system also facilitates data exchange between aircraft (Lalu et al., n.d.).

Data from ADS-B comes in the asterix CAT21 format. Before it can be used, this data needs to be decoded to fit the User Application Profile (UAP) for Asterix CAT21 data(Khan et al., 2023; Ruseno et al., 2022). In the scope of work, especially in equipment maintenance, it's important to have adequate understanding to analyze potential issues with each device. Therefore, comprehensive knowledge and understanding from the

outset of each equipment, including the ability to read Asterix Data, perform conversion from hexadecimal to binary and decimal systems, and understand its digital signal format, are required(Rizka Rahmayani et al., n.d.).

ASTERIX (All Purpose Structure Eurocontrol Surveillance Information Exchange) is a standardized data exchange format for Air Traffic Service (ATS) information that has been endorsed by Eurocontrol, the ATS organization in Europe. This format is used to transmit information from surveillance devices such as radar, ADS-B, and MLAT. The information sent includes equipment status as well as detected or processed data, such as aircraft targets(Halizah et al., n.d.). The asterix format is written in hexadecimal numbers (0-F) and is converted to binary or decimal numbers when applied in the encoding and decoding processes(Gulo, 2016).

Learning media is a tool that facilitates the teaching and learning process, making the conveyed message clearer and allowing educational or instructional objectives to be achieved effectively and efficiently(Nurrita, 2018).

According to Bandura (1997), self-efficacy can be defined as an individual's belief in their ability to master a situation and achieve positive outcomes. Bandura also stated that self-belief is one of the most powerful factors in changing a person's behavior. Self-efficacy encourages individuals to take the first steps towards their goals, provides motivation to make planned and agreed-upon efforts, and personal success empowers them to persevere in the face of challenges(Sunaryo, 2017).

Kisti and Fardana concluded that students with high levels of self-confidence exhibit the following characteristics: (a) The ability to effectively handle challenging situations, (b) Confidence in overcoming obstacles, (c) Viewing threats as challenges to be overcome, (d) Having determination in their efforts, (e) Believing in their own abilities, (f) Rarely showing doubt, and (g) Actively seeking new situations. According to Lunenburg's report (2011), self-confidence influences motivation to learn and determines the goals an individual aims to achieve(Sovia et al., 2020).

Therefore, the author has created a design for an Asterix data conversion tool instructional media to determine the impact of the improvement in self-efficacy of cadets after studying the instructional media, based on observations.

RESEARCH METHOD

The research in this study employs a quasi-experimental method(Alakrash et al., n.d.; Hastjarjo, 2019; Rogers & Révész, 2019). There are two classes in this research: the control class and the experimental class. The control class is the class that is not subjected to any specific treatment, and the delivery of the instruction still employs conventional instructional media, similar to what was done in previous instructional activities. The experimental class, on the other hand, is the class subjected to guided methods through an experiment, involving instruction through the Asterix data conversion tool. To assess the cadets' ability to learn Asterix data, pretests and posttests are conducted.

The data collected in this study pertains to the achievement of cognitive learning outcomes. The cognitive aspect involves thinking processes that encompass the ability to relate, assess, and consider things. It includes abilities such as memory, problem-solving, decision-making, analysis, synthesis, and various other aspects of the thinking and information processing process within the context of learning and understanding. In other words, the cognitive aspect addresses how information is processed and comprehended by individuals through learning activities.

This research was conducted at the Surabaya Aviation Polytechnic, specifically in

the D3 Air Navigation Engineering program. The sample selection was based on uniformity or homogeneity, which can be interpreted as cadets having similar prior knowledge regarding Asterix data. The research sample consisted of cadets from course TNU 13 Alpha and TNU 13 Bravo. To determine the experimental and control groups, a random allocation system was used. Based on the results, course TNU 13 Bravo was assigned as the experimental group, and TNU 13 Alpha was designated as the control group. The instrument used in this research was a pre-test and post-test to measure students' learning outcomes in the cognitive aspect. The assessment for the learning outcomes test consisted of multiple-choice questions. The N-Gain score was used in this study to evaluate the effectiveness of the instructional media in enhancing the self-efficacy of cadets in learning Asterix data.

RESULTS AND DISCUSSION

1. Operation of the Design

It begins with the installation of the Arduino board hardware on the laptop using a USB B to USB A cable, as shown in the figure below.

Figure 1. The Arduino Board Connection to the User's Laptop

In Figure 2 below, you can see the display of the port number assigned to the Arduino Board. The next step after connecting and powering up is to check the Arduino port number through the Arduino IDE application. You can do this by opening the "Tools" menu and selecting "Port." In this case, COM6 is the port identification for the Arduino Uno, which is necessary for the Arduino to establish a connection with the Asterix data conversion application. Therefore, before proceeding with Asterix data conversion, it's important to verify the port number used by the Arduino to ensure a successful connection.

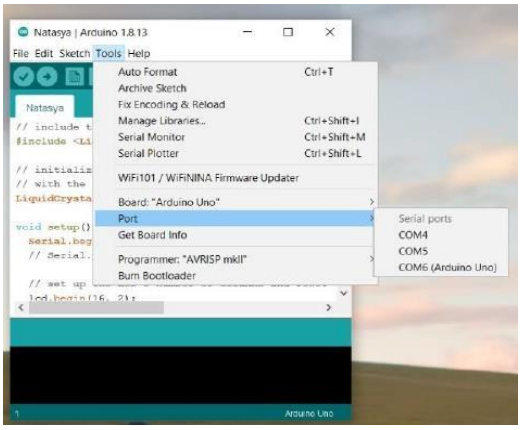

Figure 2. Arduino IDE Script

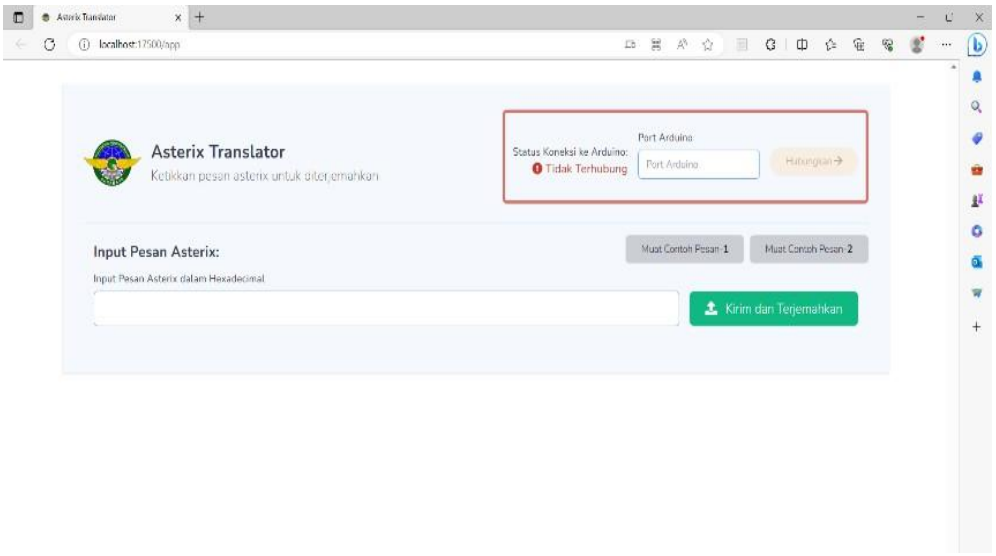

Figure 3. Asterix Data Translator Application Interface

After identifying the port used by the Arduino, open the Asterix data conversion application. You can do this through a shortcut on your laptop or by using the Asterix Translator link. Inside the Asterix data conversion application interface, you will see a display as shown in Figure 3. When the application is first opened, the port column will indicate that there is no connection yet, and the input data asterix column will still be empty.

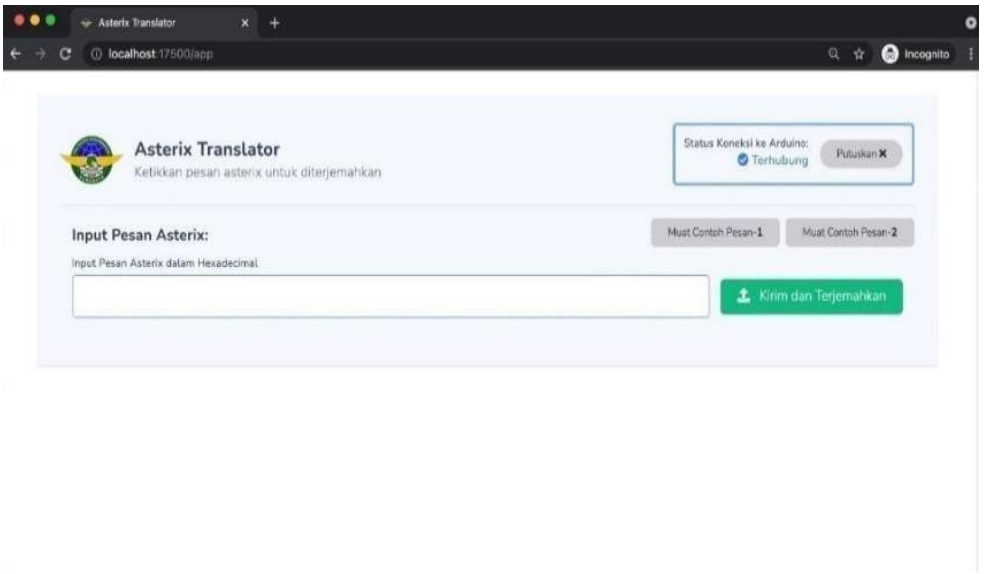

Figure 4. Application Interface with Arduino Connected Status

In Figure 4, it is evident that the Arduino is connected to the port. Therefore, the Asterix data conversion application is ready to be used. Users can input sample Asterix data or use the default Asterix data provided in the application to observe the conversion results, as seen in Figure 5 below.

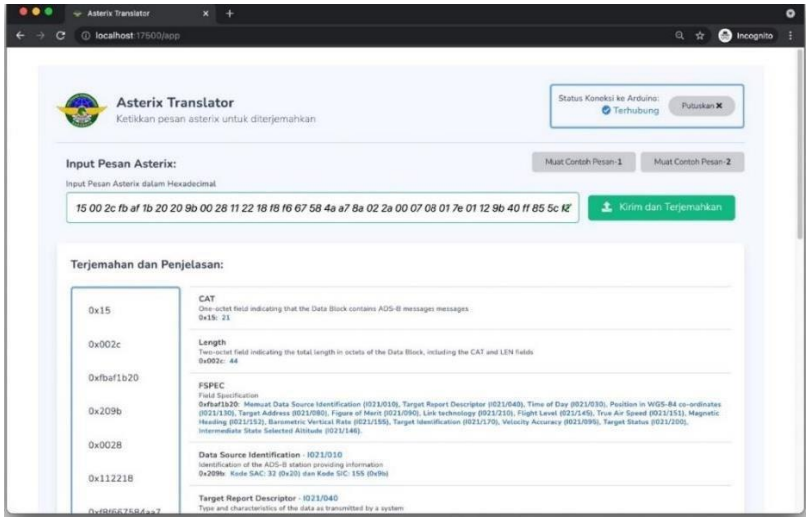

Figure 5. Application Interface with Successful Conversion Results

Figure 6. Arduino Display When Translation Is Successful

Figure 6 represents the final display on the LCD screen when the Asterix data has been successfully converte.

2. Student Mastery Results

Table 1. N-Gain Values and Average Pretest-Posttest Scores in the Experimental and Control Classes

No	Class	Average pre-test score	Average post-test score	N-gain score
1	Eksperiment	52	78	0,56
2	Controll	50	76	0,53

In Table 1 above, it provides an overview of the extent to which cadets can comprehend or understand. The extent to which cadets can comprehend Asterix data learning can be observed from the increase in the average pretest and posttest scores.

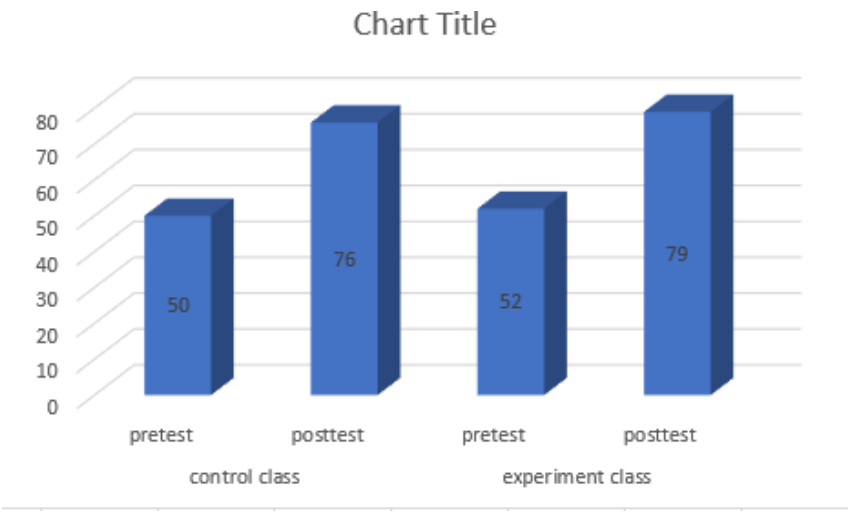

Figure 7. Comparison Chart of Average Scores for the Experimental and Control Classes on Pretests and Posttests.

Based on the figures and the table above, it can be seen that the pretest scores for both the experimental and control classes are similar, with scores above 50. The posttest scores for both classes also have a similar range, above 70. However, the average posttest scores for the experimental class are higher than those for the control class.

In general, it is evident that the cadets have experienced an improvement in learning Asterix data. This can be observed from the N-Gain values obtained as per the data in Table 1. N-Gain is a method for measuring student learning improvement. It is calculated by subtracting the pretest score from the post-test score and then dividing the result by the difference between the maximum score and the pretest score. The N-Gain value for the experimental class is 0.56, and for the control class, it is 0.53. Therefore, it can be concluded that the increase in self-efficacy in the experimental class is greater compared to the control class

CONCLUSION

Based on the research results and data analysis, the N-Gain scores in both classes are found to be 0.53 and 0.54, which fall into the moderate category. This indicates that the Asterix data conversion instructional media application is suitable for use as a learning tool. It is also evident that the instructional approach through the Asterix data conversion instructional media has an impact on the ability and self-efficacy of cadets in the Air Navigation Engineering program at the Surabaya Aviation Polytechnic. Although, in general, the self-efficacy of cadets in the experimental group is better than in the control group.

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