Portable Alphabet Learning Device

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Abstract. The purpose of this research is to make a portable alphabet learning tool. The method used in this research was qualitative. This research discusses the making of learning devices using Raspberry Pi mini computers. The system input is the keyboard while the system output is sound on the speaker and displayed on the LCD. This system was built using the Python programming language. The system generates questions so users can learn and measure their ability to learn the alphabet. The results of this study indicated that the development of this device can facilitate learning the alphabet. This tool can be used to help reduce the problem of illiteracy in Indonesia.

1. Introduction
There are several factors that can affect success in the teaching-learning process both for children and adults. These factors include calmness, patience, and interest in learning. It is common to find cases in some students who experience a point of saturation in carrying out the learning process, this is because the instructors have not been able to create an atmosphere of learning that supports factors in achieving the success of teaching and learning [1]. The community has tried several methods for education so it can develop better. Covering from a young age to old age for example. There is no limit to learning the alphabet. Increasing complexity from time to time by utilizing a new technology. Like using board cords, microprocessors [2]. People need to know the alphabet before starting to learn to read. A study shows that the learning delivered in schools is more influential than at home. While instruction in a small group has more influence than individual learning [3].

Children can learn the alphabet using an alphabet board which is attractive for them because there are images inside it so they can easily memorize[4-5]. It is critical to choose effective learning methods for children because many methods used are still less effective [6].

A learning tool is needed to create successful teaching and learning activities. Making a tool based on a game can trigger children to learn and it can support the educational process [7]. Children can be easily attracted and active to learn. This learning method can be easily accepted and it becomes a learning solution for early childhood. Microcontrollers can be used as the main component in the tools to make study the letters and numbers for children, so they can learn about letters and numbers independently. In this tool, the output in the form of sound and the letters, as well as numbers, can be seen on LCD, and with the questions feature, children can measure the ability to remember letters and numbers [1].

The purpose of this study is to make a portable alphabet learning tool, which can help children and adults learn the alphabet, it leads to reduce the problem of illiteracy in Indonesia. This research used a qualitative method in the form of literature studies to collect data relating to the manufacture of portable alphabet systems.
2. Method
The research method used a qualitative descriptive based on the literature studies to obtain information related to the research. And, The system model is carried out by applying the information obtained. Then, the system is tested and evaluated, to determine system performance.

3. Results and Discussion
To find out the performance of the system, the system model that has been designed tested whether the results produced are appropriate as planned and are analyzed to determine the performance of the system. Raspberry Pi used as the main component of the learning tool. Raspberry Pi is a small computer with a Linux operating system. Motherboards on Raspberry Pi have various components that connect to many inputs, outputs, and others [8]. It is very supportive of modules and packages, which encourage the modularity of the program and can reuse code [9]. The language that used to program the tool is the Python programming language. Python is a simple but powerful programming language, easy to understand and flexible where this programming language is also related to C language. This programming language is also open source. Python is available on various operating systems, including Linux or UNIX, Apple, Windows, OS [10].

The design of hardware that will be built in this study was a mini-computer device that was connected to several sensors and other electronic components, then packaged in a simple form. The design of the tool is shown in Figure 1.

![Figure 1. Tool Shape Design](image-url)

The following is a display of the diagram block that can be seen in Figure 2.
Figure 2. Block Diagram

The working principle of the tool that builds based on the block diagram in Figure 2 is that the main input on the tool in the form of a push-button produces a voltage that will be input for 5 encoders used, then the encoder output will be input for the GPIO Raspberry. Figure 3 shows the GPIO found on raspberry pi.

Figure 3. GPIO Raspberry Pi

in the count mode, LDR will be active when the incoming light intensity is lacking, or the LDR is closed. LDR that is closed will produce several outputs, sound, and display on the LCD that corresponds to the number of LDR. In mode 1, it is for learning mode which will then display numbers and letters when the push button is pressed. Next in push button 2 for the count mode, it will only display numbers when LDR is closed, then for mode 3 as the question mode which will display in the form of questions. And to change the learning mode or question mode using the 4 push buttons that have been modified. Push buttons 5 and 6 are the language modes to be selected, 2 languages are available, namely English and Indonesian. Raspberry Pi 3 is used to manage data from an encoder. Sound output is generated from letters and numbers that have been programmed in the programming.
of python with the Text To Speech method that is provided by the Raspberry Pi 3. As for the output of the Indonesian language, it is generated from the recorded data stored in the Raspberry Pi memory, then to call the Raspi record provides a program MPG123. The microphone works when in question mode, this microphone will receive input from the sound generated from the user of the tool, then it will produce output on the speaker in the form of words, this method is called Speech to Text. Lastly LCD, used for outputs the Raspberry Pi, in the form of letters and numbers. The speaker is used to sound out from the output of the Raspberry Pi.

The encoder in this tool uses IC 74LS348 which functions to minimize input that will enter the main component, raspberry GPIO. This 74LS348 IC is a priority encoder so that it can be combined with other similar ICs, by connecting E0 to the first IC which will be E1 in the second IC. Figure 4 shows an image of the encoder configuration.

![Figure 4. Encoder Configuration](image)

The LDR will be used as a light sensor that functions for one of the modes in this letter and number learning tool. In Figure 5, the LDR configuration is shown (See Figure 5).
LCD is used to display letters and numbers on the device. The letters to be displayed will be one by one. The following will be illustrated the placement of a 16x2 LCD that will be connected to the Raspberry Pi. LCD uses an I2C module, due to insufficient GPIO that can accommodate input pins from a 16x2 LCD. In figure 6 it will show an LCD configuration image (See Figure 6).

There are several mode tests that will be carried out on this learning tool. The test mode to be performed is shown in Table 1.
4. Conclusion
The research concludes that with the design of this learning tool it can facilitate learning the alphabet, both children and adults who have not mastered it. This tool can be used to help reduce the problem of illiteracy in Indonesia.

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