The Development of Geoelectric Exploration Material on Advanced Earth Physics Course

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Abstract- This paper is focused on designing development of geoelectrical tools as a learning media for advanced earth science course. The geoelectrical tools have been designed by utilizing inverter technology, power supply which has integrated by the battery charging system. One consists of three main components that are inverter for increasing the initial voltage of 12 to 220 volts, charging module as the energy sources for the batteries before used and the power supply unit. The geoelectrical tools have been successfully designed and have released the output power of 0 – 400 volts with a typical current of maximum five Ampere which is ready to be injected to the earth. Validation results by media expert to the achievement indicator of the learning media have shown that the designed media has been categorized "very valid" so that it is appropriate in the learning process for the advanced earth science course.

Keywords: Media Education, Geoelectric, Inverter

1. Introduction

Education is a conscious and deliberate effort to develop the potential of every human being who formally carried out through a learning process. UUSPN No. 20 of 2003 clause 1, verse 1 suggests that "Education is a conscious and deliberate effort to create an atmosphere of learning and the learning process so that learners are actively developing the potential for him to have the spiritual power of religion, self-control, personality, intelligence, noble character, and skills needed, society, nation and country. The 21st century is a century of knowledge characterized by the rapid development of technology, information and communication. The characteristics of the 21st century include the availability of information anywhere and anytime and implementation of machine usage that is able to reach all routine work that can be done anywhere and anytime (Miftahul et al, 2019).

Improved quality and investment, as well as the transformation of the national education sector within the meaning and scope of the broadest, is the emphasis of development in the field of education desired by education today. For that, in efforts to achieve the highest possible quality, governments and communities within the ranks of the utilization of educational resources unremitting hold improvements to the dimensions of the determinants of educational progress (Nasir et al, 2018). Critical dimensions advancement of education, according to Nana (2011) is: a) the dimensions of educational inputs, b) the dimensions of the educational process, and c) the dimensions of educational outcomes.

This shows that to obtain the above expectations, the three-dimensional absolute receive treatment and serious revamping, simultaneous and proportional. Inside dimensions of the educational process, the main focal point is the learning process undertaken by students, lecturers not done alone. This means that each student is the subject of the educational process (Suarman et al, 2018). While lecturers act as mentors and facilitators as well as the education process. Relevant learning among faculty as teachers and students as learners lead students actively involved in carrying out learning activities that support

learning. According to Mel Silberman (2011), at the time of active learning activities, students do most of the work to be done. They use their brains to study the ideas, solve problems and apply what they learn. This principle needs to be applied in each of the learning processes on subjects including terrestrial and space physics (Daviq & Rita, 2018).

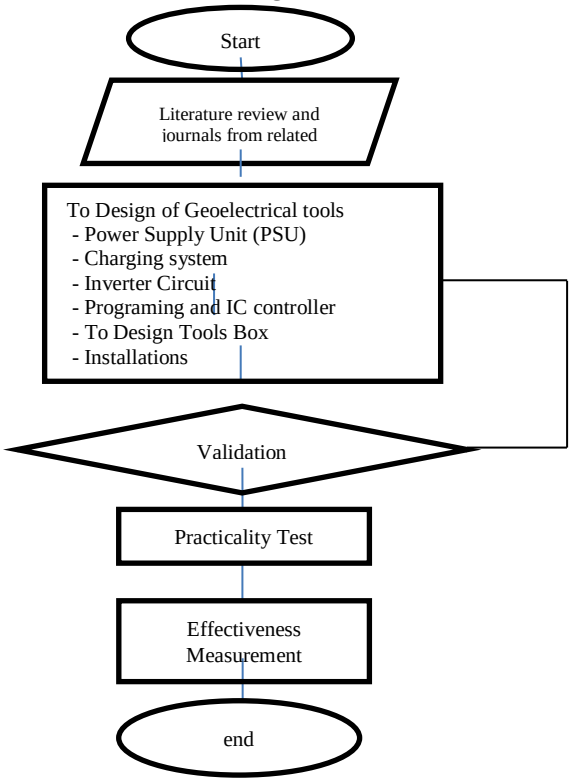
Physics is one branch of science that underlie the development of advanced technology and the concept of living in harmony with nature (Prayekti, 2010). Physics according to Serway et al (2009) is based on experimental observations and quantitative measurements. The main goal of physics is to find a number of basic laws that govern the various natural phenomena and use them to develop a theory that can predict the results of future experiments (Suryani, 2019).

One of the facilities and infrastructure, which are crucial to create is conducive atmosphere and effective learning, especially during the learning process in the course of Geoscience availability of experimental tools and worksheets for students (MFI) that lectures be conducive and effective to convey the message of learning (Islami, 2018).

Given that in the lecture material on geoelectric exploration importantly to improve the quality of the earth physics lectures particularly on material exploration geoelectric. So researchers are interested in conducting research entitled: "Development of Media Education and Student Worksheet Exploration to Content Geolistrik On Earth and Space Physics Class.

2. Methodology

This section describes the flow chart of the research, design validation tool geoelectric and techniques used in the assessment tool as a media learning of geoelectric on the earth advanced physics course. Flowchart of the conducted research is discribed in Figure 1.



Picture 1. Flowchart of Research

The stages of research to be carried out is as described in Figure 1. The study began by collecting information from literature related or from journals are still in touch with research. after done collage information gathering process, the next step is to design tools that will be used geoelectric as a learning medium for students. The main component of the geoelectric tool that will be in the design is the power supply unit as a voltage source. Charging systems as battery chargers. Change and an inverter circuit as a voltage amplifier. IC programming and control as a safety circuit that tools work according to the expected voltage value. The toolbox as a geoelectric component as well as the installation of the tool to connect all the components into a unity. After the stage of manufacture, the next is to perform validation to access whether a tool that has been designed eligible as a media of learning according to the review experts. Flowchart of research conducted in this study by the validation phase.

2.2. Design Tool Geolistrik

Geolistrik tool design basically consists of several parts. The first part is a 220 volt AC source is used as an input to the circuit the battery charging system. Battery charging system itself will change the AC voltage of 220 volts to 12 volts DC to be stored into the battery. Circuit or the charging system is equipped with a power supply circuit that will automatical Controller by IC charging process when the voltage of each battery is less than 12 volts and stop the charging process when the battery voltage has reached the 12-volt battery. The following geoelectric tool design scheme.

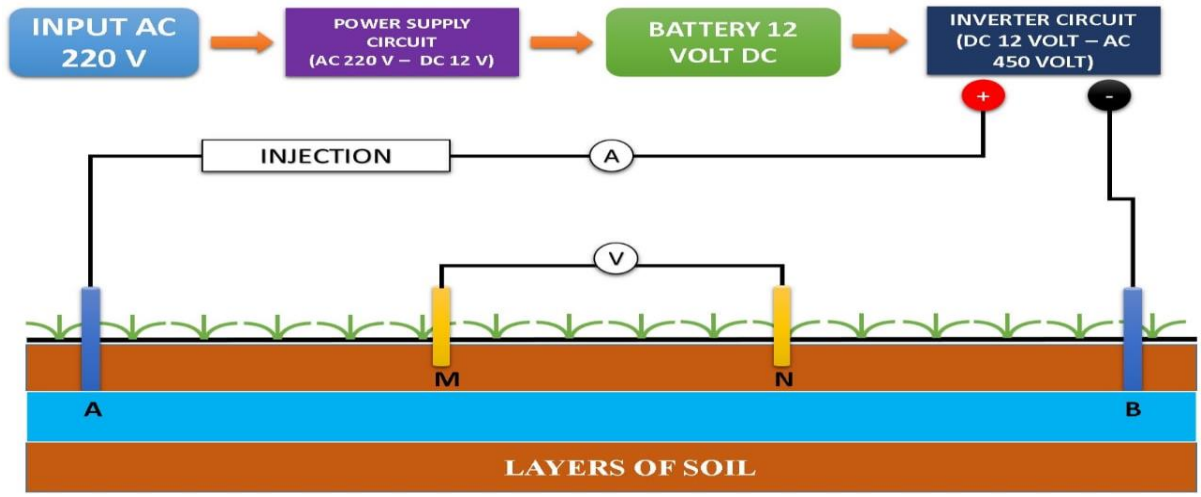


Figure 2. Design tool geoelectric

On picture. 2 DC voltage of Li-Ion battery of 12 volts will be entered into the inverter to be converted into AC voltage and raised its voltage value using a transformer to 450 volts. Inverter voltage results in further injected into the earth using a wired electrode. The reading of the results of current and voltage measurements done using voltmeters and ammeters which has been in connecting with current and voltage electrode.

2.3. Validation

After the geoelectric tool design has been created and has had an output value of the validation process is then performed. The validation process conducted in this study is a validation tool geoelectric by learning media experts to access the extent of the tools that have generated meets the indicators of achievement for a media of learning. Indicators of achievement that became the standard assessment

consists of 7 items are functioning, convenience, safety, aesthetic, economic value, size, and using media. The proficient accuracy rate is 3 lecturers who have the capacity to conduct assessments on geoelectric of learning media. Instruments used using a questionnaire with a distribution point Likert scale 1-4 assessment form for measuring the validity of the media that has been generated.

3. Result and Discussion (Results and Discussion)

In this section will describe the results of the discussion in the form of analysis tools as well as the validation results generated performed by the media.

3.1. Tools OF Geoelectric

He inverter which serves as a DC voltage to AC converter has a major role in component geoelectric tool. 2 pieces of Li-Ion 12 Volt DC serves as a supply voltage to the inverter. The inverter will change the DC voltage into AC then be raised using a transformer, Trasformator output of DC voltage is converted. Then injected into the soil.

Component Inverter main circuit is Transistor IRF 540N. Transistor IRF 540 N serves as a switch or switches on the AC waveform process. In the inverter used 10 pieces Transistor IRF 540 N to produce an output AC signal. The results generated voltage is 24 volts AC which is then amplified using a transformer to 220 Volt AC. The use of capacitors used to raise the voltage to 450 volts AC.

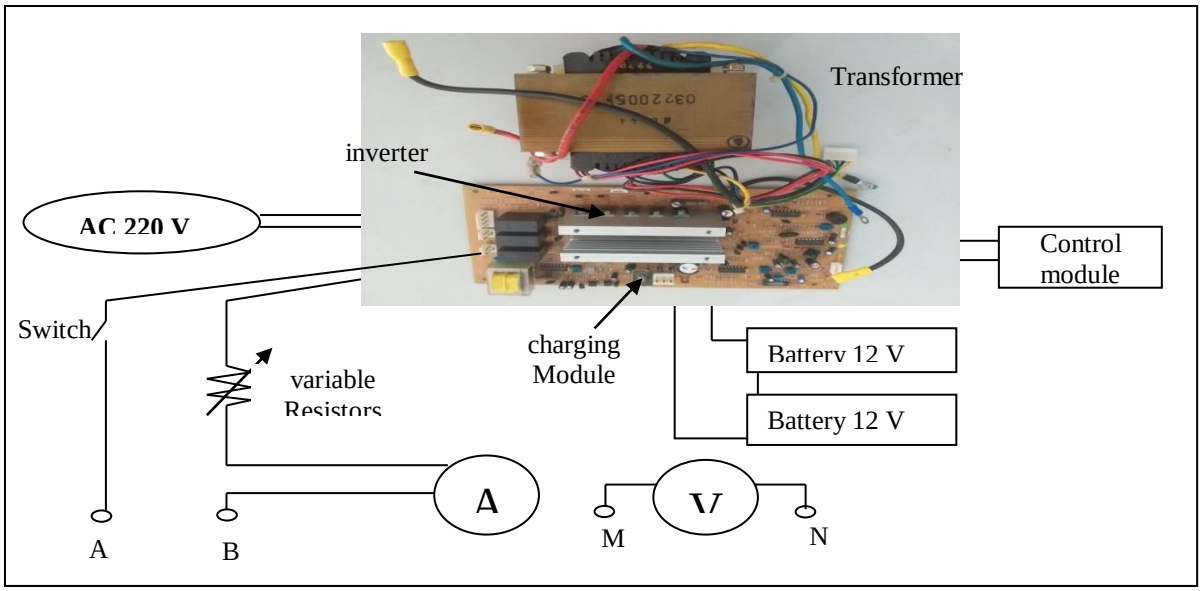


Figure 2, Inverter Circuit

As a control and security system at the circuit then added IC Control LM339N the charging module to control the charging time. In this case, the charging mode is active when a voltage of each battery is under 12 volts and vice versa charging mode will stop when the voltage of each battery reaches 13.9 volts. Control IC LM339 N is also used for calibrating the voltage to be used. Subsequently issued voltage inverter will be connected to a variable resistor in it is intended that the output voltage to be injected can be varied from 0 Volt - 450 Volt

3.2. Validation Tool Geolistrik

Table 1, Table Summary of the results of the validation tool geoelectric

No. Indicator	Average	Category
1. functioning	3:33	ST
2. Ease	3.66	ST
3. Safety	3:40	ST
4. Aesthetics	3:10	T
5. The economic value	3:33	ST
6. Size	3:40	ST
7. Accuracy of Use	3:33	ST
On average Indicators	3:36	ST

Based on Tabel.1 can be seen by some validator vote against the elements - elements of evaluation, where these elements are a few indicators. Knowable tools included in the category of T (High) is equipment as valid by the average value of the indicator is 3.36. Of course, in the assessment of validation of experimental tools are some of the indicators of achievement of the validity of the learning media:

a. Functioning
Refers to the overall functioning of the functions of existing components in the device. In this aspect, obtained an average score of 3.33 of the entire media expert assessment given to indicate that the learning media in geoelectric produced has the functioning of the components of the tool is high.

b. Easiness
Ease refers to the perceived ease of learners in the use of instructional media sat easily in the learning process and repack structure of learning media of geoelectric. The average score earned media expert to ease this indicator is 3.66 which indicates that the media has an indicator of learning geoelectric ease in very high operational

c. Safety
Safety settings for the indicator, the average score obtained media expert is 3.40 categorized as very high. Thus instructional media tools generated geoelectric safe and sturdy when used for students as a learning medium

d. Aesthetics
Aesthetics indicators are points of the achievement indicators of learning media surrounding the physical neatness of learning media. For this achievement indicators, the average score validator is 3.10 with the high category.

e. Economic Value.
Indicators of economic value in a medium of learning refers to the affordability needed to produce instructional media and easily find the tools and materials to produce instructional media. For this achievement indicators, media experts give an average score of 3:33 with a very high category.

f. Size
For the size indicator, the average score obtained validation is 3.40 categorized as very high. Thus the geoelectric learning media are perfectly proportioned size to be moved and have components of tools that can be seen and observed.

g. Accuracy of Use.
The accuracy refers to the use of instructional media against the competencies required by the user. In this case, the learning media geoelectric get average scores of media experts for 3:33 with a very high category.

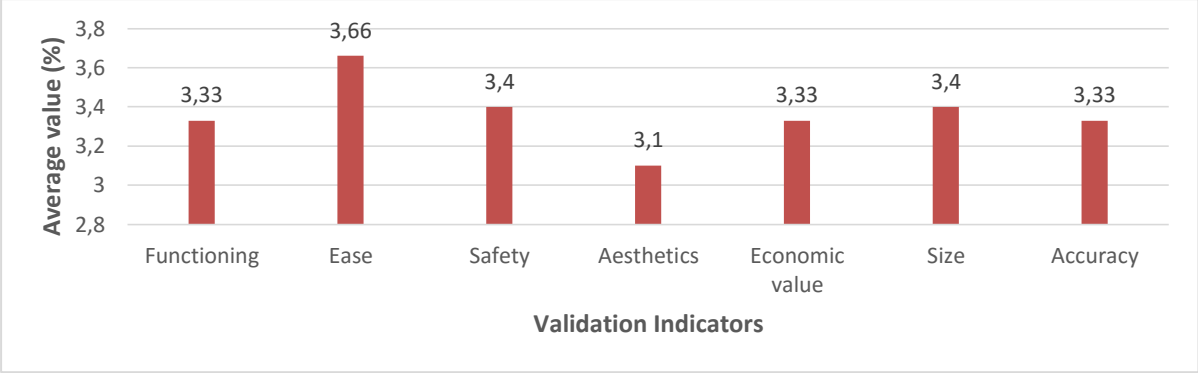


Figure 2. Validation Tool Geolistrik

4. Conclusion

Geoelectric tool manufacture can be performed using the inverter circuit. The resulting excess geoelectric tool above is to have the ease of recharging 12-volt batteries because it is equipped with a charging circuit in the inverter. Excess next is to do the selection of the output current to be injected into the soil using the existing selector on the geoelectric tool. Practicality is the use of tools are also the advantages of the geoelectric this tool because all research instruments have been integrated into one place without the need for additional measuring instruments from outside.

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