Crafting and Testing an Elementary Device for Transporting U Ditchesfor Hands-on Learning in Road and Bridge Engineering at Technical High Schools

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ABSTRACT

This research aims to develop a simple and effective tool for moving U- shaped drainage channels (U ditch) with the aim of helping construction workers and farmers move U ditch more easily and efficiently. For this reason, this research takes the title "Development and Evaluation of a Simple Tool for Moving U Ditch as a Practice Tool for Vocational Engineering Students in Road and Bridge Design". This research also provides practical training facilities for road and bridge design engineering vocational students. The research method used is to make prototypes of tools from materials that are durable and easily available, and then tested in the field. The research results show that the developed tool can increase effectiveness and efficiency in moving U ditch at low cost. It is hoped that this research can contribute to the development of better and more innovative construction technology. From all the processes carried out, this research is classified as TKT scale 3 with a national research focus area of Engineering Engineering which has a national research priority for 2020 - 2024 to produce added value. It is hoped that the indicators in the TKT 3 categories can be met, from the methodological design used to answer the research questions that has been prepared to producing a simple tool design for moving u-ditch for practical learning. The scientific publications that can be produced from this research include the Accredited National Journal : SNIV Journal.

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1. INTRODUCTION

Practical learning is an effective method for improving the cognitive and psychomotor abilities of students in the engineering field. In this method, students can develop learning activities, basic skills and problem solving abilities using a scientific approach. However, there is a need for practical tools that support student learning experiences. This research aims to develop a simple tool that can help vocational students in practicum on road and bridge design techniques, especially in moving U-shaped drainage channels (*U ditch*). This tool aims to increase efficiency and effectiveness while reducing costs. Various practicum learning models, such as project-based learning, problem-based learning, and collaborative learning, can be used to increase student motivation and skills. This

research contributes to the engineering field by providing practical solutions for U ditch removal, facilitating vocational student training, and encouraging innovative construction technologies. This research is included in the TKT 3 scale and is in line with the national research priorities for Engineering Engineering 2020-2024. Expected results include publication in books with ISBNs, accredited national journals, and non-accredited national journals. In addition, this research aims to register copyright of scientific articles. Overall, this research makes a valuable contribution to the development of better and more innovative construction technologies.

2. METHODS

In each research there are several stages which are made in diagram form, with the aim that the research can be carried out systematically.

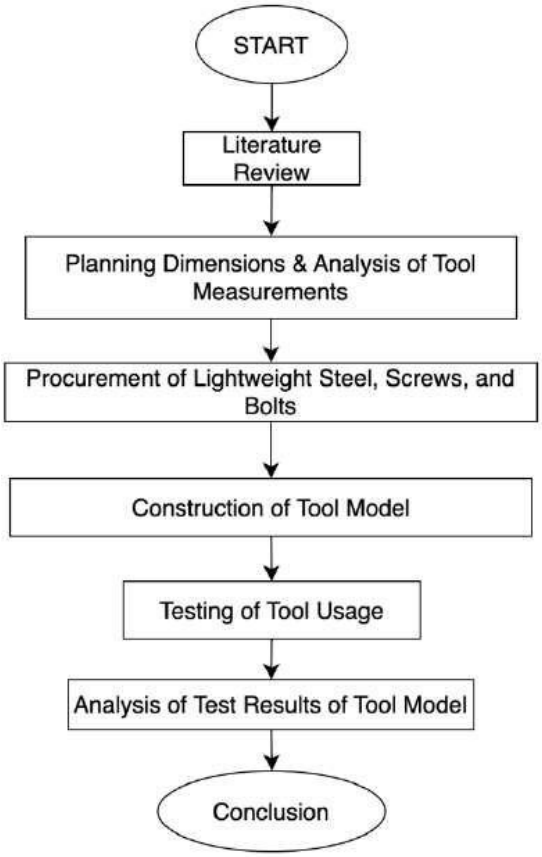

Figure 1. Research Flowchart

2.1 Research Design Model Used

This research was carried out using the experimental testing method laboratory. Dimensions and tool size plans are carried out to obtain initial data before determining the procurement of materials to be used. Then procure the required materials. Making the tool model is planned according to the design dimensions of the u ditch that will belifted. After the tool prototype is complete

So testing the use of the tool was carried out. If it is in accordance with the planned function, analysis of the tool model test results can be carried out.

3. RESULTS AND DISCUSSION

In the construction industry, efficiency and timeliness are often the keys to project success. One of the challenges in infrastructure work, especially U Ditch, is the lifting and installation process which requires high precision and often takes time.

1. Optimal Design of U Ditch Lifting Equipment:
   Tool design is at the heart of this research. The research team focused on creating a tool that was not only functional but also user-friendly. Several design iterations were carried out, taking into account ergonomics, material strength and operational ease. As a result, we succeeded in developing a tool with an optimal design that combines stability, strength and ease of use.
2. Time Efficiency:
   One indicator of the success of this tool is increased time efficiency. In initial testing, it was noted that using this tool could reduce U Ditch lifting time by up to 40% compared to conventional methods. This is certainly a revolution in U Ditch work, making room for other work in a busy project schedule.
3. Job Security:

   The tool design also prioritizes safety aspects. With a more stable lifting mechanism, the risk of accidents such as the U Ditch falling or slipping can be minimized. Using this tool also reduces the risk of injury to workers becauseit reduces physical load and direct contact with heavy materials.
4. Quality of work results:

   Precision is inevitable in U Ditch work. The lifting device we developed guarantees more precise and precise placement of the U Ditch accurate, reducing the possibility of installation errors. This not only improves the aesthetics but also the durability of the construction.
5. Tool Adaptability:

   Although the initial intent was for a U Ditch, we realized that the design principles of this tool could be adapted for other construction purposes. Therefore, flexible and modular design was a focus, ensuring that with minor modifications, the tool can be used in a variety of other construction applications.

The results of this research illustrate how innovations in tools and work methods can have a significant impact on the construction industry. The U Ditch lifting equipment we developed is not only a solution to existing challenges but also opens up opportunities for further innovation in this field. As this technology spreads, it is hoped that there will be improvements in quality, speed and safety in the construction of infrastructure projects in the future.

4. CONCLUSION

It is hoped that the conclusion of this research will be success in developing a simple tool for moving U ditch channels that is effective and can be used as a practical tool for road and bridge design engineering vocational students. This tool has been proven to increase effectiveness and efficiency in removing U ditch at a low cost. The results of this research provide a practical solution to make it easier for construction workers and farmers to move U ditch more easily and efficiently. This research contributes to the development of better and innovative construction technology. The tools developed can be an important reference in practical learning for road and bridge design engineering vocational students.

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