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Public Interest Centre of Excellence

International Teaching Aid Competition 2023

Reconnoitering Innovative Ideas in Postnormal Times

iTAC 2023

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INTERNATIONAL TEACHING AID COMPETITION
E-PROCEEDINGS

Copy Editors*: Syazliyati Ibrahim, Azni Syafena Andin Salamat, Berlian Nur Morat (Dr.), Najah Mokhtar, Noor 'Izzati Ahmad Shafiai, Muhamad Khairul Anuar Bin Zulkepli (Dr.)*
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PREFACE

iTAC or International Teaching Aid Competition 2023 was a venue for academicians, researchers, industries, junior and young inventors to showcase their innovative ideas not only in the teaching and learning sphere but also in other numerous disciplines of study. This competition was organised by the Special Interest Group, Public Interest Centre of Excellence (SIG PICE) UiTM Kedah Branch, Malaysia. Its main aim was to promote the production of innovative ideas among academicians, students and also the public at large.

In accordance with the theme "Reconnoitering Innovative Ideas in Post-normal Times", the development of novel ideas from the perspectives of interdisciplinary innovations is more compelling today, especially in the post-covid 19 times. Post-pandemic initiatives are the most relevant in the current world to adapt to new ways of doing things and all these surely require networking and collaboration. Rising to the occasion, iTAC 2023 has managed to attract more than 267 participations for all categories. The staggering number of submissions has proven the relevance of this competition to the academic world and beyond in urging the culture of innovating ideas.

iTAC 2023 committee would like to thank all creative participants for showcasing their innovative ideas with us. As expected in any competition, there will be those who win and those who lose. Congratulations to all the award recipients (Diamond, Gold, Silver and Bronze) for their winning entries. Those who did not make the cut this year can always improve and join us again later.

It is hoped that iTAC 2023 has been a worthy platform for all participating innovators who have shown ingenious efforts in their products and ideas. This compilation of extended abstracts published as iTAC 2023 E-Proceedings contains insights into what current researchers, both experienced and novice, find important and relevant in the post-normal times.

Best regards,

iTAC 2023 Committee
Special Interest Group, Public Interest Centre of Excellence (SIG PICE)
UiTM Kedah Branch
Malaysia

EFFICACY OF MODELS AS TEACHING TOOLS FOR THE MEASURING AND ESTIMATING OF PAD FOUNDATION EXCAVATION

An Nisha Nur Welliana Abd Rased
Program of Building Surveying, Department of Built Environment Studies & Technology, College of Built Environment, University Teknologi MARA, Perak Branch, Seri Iskandar Campus, Seri Iskandar, 32610 Perak, Malaysia
annisha@uitm.edu.my

Nurhidayah Samsul Rijal
Program of Building Surveying, Department of Built Environment Studies & Technology, College of Built Environment, University Teknologi MARA, Perak Branch, Seri Iskandar Campus, Seri Iskandar, 32610 Perak, Malaysia
hidayahrijal@uitm.edu.my

Muhammad Zahir Zulkernain
Program of Building Surveying, Department of Built Environment Studies & Technology, College of Built Environment, University Teknologi MARA, Perak Branch, Seri Iskandar Campus, Seri Iskandar, 32610 Perak, Malaysia
zahirzulkernain@uitm.edu.my

Mohamad Haszirul Mohd Hashim
Program of Building Surveying, Department of Built Environment Studies & Technology, College of Built Environment, University Teknologi MARA, Perak Branch, Seri Iskandar Campus, Seri Iskandar, 32610 Perak, Malaysia
Haszirul@uitm.edu.my

ABSTRACT

Excavation pad foundation in subject measuring and estimating is an important part of any civil engineering course that is necessary to calculate the dimensions and volume. However, conventional approaches of teaching this topic that rely solely on theoretical frameworks and classroom lectures may not effectively translate to real-world applications. Lack of practical knowledge and visual depiction of the excavation pad foundation may result in misconceptions, inaccurate measurement, and unsafe estimating practices in actual projects. The employment of models as teaching tools for this topic in measuring and estimating may provide a solution to these problems. Therefore, this study's objective is to investigate the effectiveness of using models as aids in teaching subject measurement and estimating for the excavation of pad foundation topic. To clearly represent the model parts, the pad foundation is likewise made of colored polystyrene, and the reinforcing frame is built of wire. The data from the questionnaire regarding the students' perceptions of learning outcomes before and after the model's application were analyzed. From this model, students can gain a deeper comprehension of the concepts involved in excavation pad foundation by using models, which can lead to more accurate and

efficient construction practices. Moreover, this approach has significant commercialization potential. The models may be used in civil engineering and construction worker/contractor training programs to teach excavation pad foundations in measuring and estimating. This requires innovative educational resources, including model kits, computer programs, and instructional videos.

Keywords: models, excavation, foundation, measurement, teaching

INTRODUCTION

Teaching and learning about measuring construction materials can present certain challenges and difficulties. Materials complexity, measuring procedures, accuracy and precision, measurement units, estimate and waste calculations, and practical application are all potential points of contention in this field. A study by Patience et al. (2016) states that students will learn more via examples and field trips.

Estimation is critical in building projects since it entails forecasting the required materials. Factors like material efficiency, waste calculations, and accounting for anticipated differences in design or building practices make teaching students how to make correct estimates difficult. It is possible that instruction in estimation methods, including the use of material takeoff sheets and computational tools, will also be required.

Building materials are measured using specialized equipment. Lecturers must successfully model and explain these methods to their students. Rulers, calipers, and laser measuring machines are only some of the tools that may be needed to determine the exact measurements of structural parts. Accurate measurements are crucial, lecturers should instruct their students on how to take them. Measurement inaccuracies might endanger structural safety and cost.

MODEL USED AS TEACHING AIDS IN SUBJECT MEASUREMENT AND ESTIMATING

The best way to overcome all obstacles is through classroom theory, hands-on exercises, live demonstrations, and real-world applications. This study exposes students to calculations using models as learning material. The use of this model can allow students to experience real-world learning environments, even if it is not on a construction site. Lecturers should provide a safe space where students feel comfortable exploring measuring methods, asking questions, and gaining experience while receiving guidance from a lecturer. Students may get a firm grasp of measuring related to construction materials if exposed to a thorough and organized curriculum.

Visualization is one of the greatest challenges faced by engineering students. In fact, it has been observed that success in Engineering and Mathematics generally has a strong correlation with visualization abilities. Una Beagon and Holmes (2014) found that students' exposure to real-

world learning environments aided in developing their skill sets. Students have the ability to construct and evaluate their own perceptions of a given phenomenon when performing modeling activities that promote interpretation and understanding of systems (Brigas, 2019). Bekkering et al. (2020) stated that the models are thought-provoking tools that can be used to understand, analyze, and imagine the substance of building in a wider sense.

Innovative tools and techniques are used as a key factor to attain cognition at a higher level (Kolhe, 2017). Besides that, students like to participate in class and learn better when lecturers utilize visual aids like 3D models and real objects (Patience, 2016). To improve learning, measuring principles must be used practically. Students may have a better understanding of how measurements are obtained in actual building situations via the use of laboratory activities and field excursions. However, there may be challenges with implementing this topic due to a lack of resources.

MAKING PROCESS OF MODEL

Artificial grass, 6 polystyrene plates, a glue gun, watercolor, and wire are used to make a pad foundation excavation model. First, five of the polystyrene plates are painted with watercolors in various colors to differentiate between the layers of the structure, and one of the plates is covered with an artificial grass surface (Figure 1). The following step involves stacking multiple layers of polystyrene to create the soil layer for the excavation, such as in Figure 2(a). The lowest layer is the ground base, the next layer is the lean concrete, the pad footing layer, the stump layer, then the decreased level layer and the top layer is the topsoil layer.

Figure 1: Polystyrene paint with watercolor

Reinforcement of pad foundation is produced by using a wire that is cut according to the actual size and shape of the pad foundation. Then it is joined by using a finer wire to tie each wire connection earlier and is formed as in Figure 2(b). Figure 2(c) shows that the pad foundation model is produced from polystyrene that paints with watercolor.

(a) (b) (c)

Figure 2: (a) Models of excavation pad foundation area, (b) reinforcement of pad foundation and (c) pad foundation

Once the model is completed, it is used during the learning process with students in class. The lecturer explained the process of calculating the excavation work of the pad foundation by moving one level of polystyrene one by one to show the layer of soil that needs to be excavated. At the same time, the reinforcement model of pad foundation is taught to show the shape and position of each reinforcement to help students calculate the number and length of reinforcement. The foundation pad model is shown to the students on how it will be placed in the ground by inserting it into the hole of the excavation pad foundation area model after the soil has been excavated.

Figure 3: Learning process in the classroom using models

After the learning process is completed, students are asked to fill in a Google form that contains evaluations related to students' feedback on the effectiveness of learning through the use of models for the topic of Excavation for Pad Foundation for the Subject of Measurement and Estimating (BSR214).

FINDING

The data acquired from the result of the students' questionnaire suggest that they have improved knowledge after having hands-on experience with the model. According to Figures 4 and 5, the number of students who understand very well has climbed to 15%, students who understand have increased by 19%, students who have equivalent understanding have increased by 18%, and there are no students who do not comprehend and are extremely misunderstood.

As a consequence of observations made throughout the learning process, which allows students to utilize their imaginations, the usage of models can assist students in comprehending the true scenario before they are taught to do calculations. Furthermore, pupils are observed to focus more and ask direct questions if there are issues with the model and the calculations produced. It is because by touching real objects, they find them more engaging.

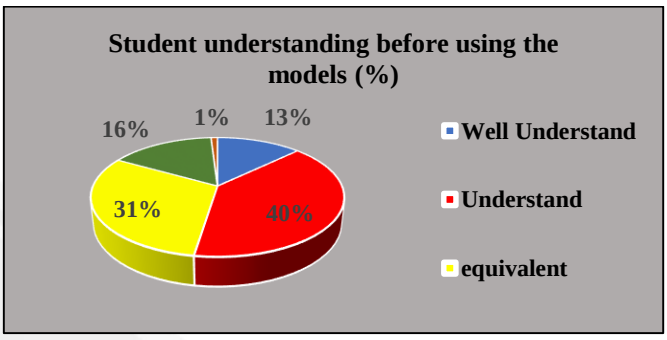

Figure 4: Student understanding before using the models (%)

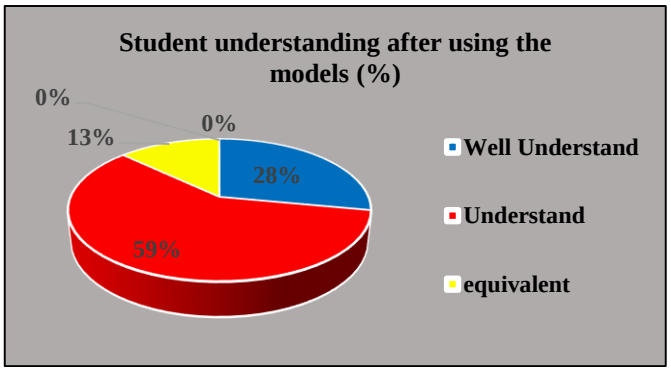

Figure 5: Student understanding after using the models (%)

CONCLUSION

In conclusion, there is no disputing the effectiveness of models as instructional aids for estimating and measuring pad foundation excavation. Models allow instructors and students to practice hypothetical situations, expanding their knowledge of excavation and its difficulties. These models give a hands-on exercise that encourages participation and deepens understanding. Models help students see complicated ideas and physical connections that are hard to understand just by reading about them or looking at two-dimensional pictures.

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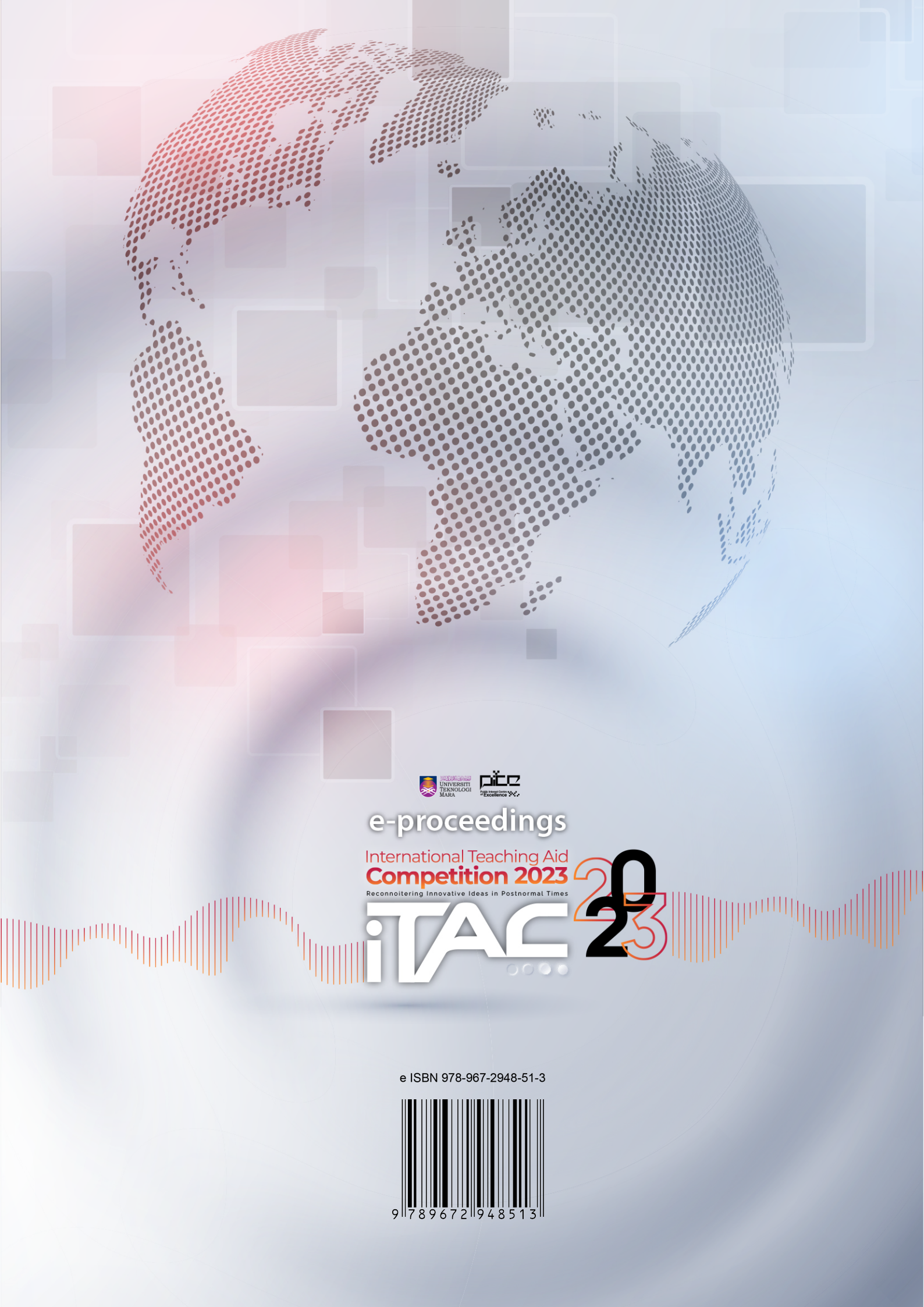

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