UNIVERSITI TEKNOLOGI MARA

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

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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
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FS: FRACTION SOLUTION

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ABSTRACT
Fraction is one of the most important topics for learners to build a solid foundation to be successful in related concepts such as ratio, proportion, rate, probability and beyond. However, it is a topic that worldwide students struggle, especially on fraction arithmetic. The lack of understanding is then translated into difficulties with advanced mathematics, and other related subjects and applications. The main drawback of the existing teaching aids for fraction is that they are emphasizing the understanding of individual fractions, but not fraction arithmetic. An innovative teaching aid termed Fraction Scale (FS) is proposed to address the problem. The FS aims to provide visual representation of various concepts of fraction including fraction arithmetic. An experiment was conducted in two sub-urban primary schools to test the effectiveness of FS. During the sessions, the concepts of fraction were introduced using the FS according to the lesson plan designed specifically for FS. The results show that the scores of fraction arithmetic in post-test are higher than the pre-test for all the three types of fraction problems given. The feedback from the students reveals that the design of FS is user-friendly and helps them to understand fraction arithmetic. Hopefully, FS contributes to the efforts of achieving the nation's target of 60:40 Ratio Policy in which the enrolment of students in science and technical stream is sixty percent. The commercialization potential of FS is great as the topic of the fraction is in the syllabi of elementary education worldwide.

Keywords: fraction arithmetic, visualization, STEM education, 60:40 Ratio Policy

INTRODUCTION

Fraction is one of the most important topics for learners to build a solid foundation to be successful in related concepts such as ratio, proportion, rate, probability and beyond. However, it is a topic that worldwide students struggle, especially on fraction arithmetic. The reasons for

having difficulty to understand topic of fractions include multi meaning of fractions, unique way or writing fraction, and overgeneralize knowledge from whole numbers (McNamara & Shaughnessy, 2010). The review by (Lortie-Forgues, Tian, Siegler, 2015) reveals two main types of difficulties in learning fraction arithmetic which are the inherent difficulties of fraction and the culturally contingent difficulties.

The understanding of fraction concepts is always working with representation of fraction meaning (Lee & Lee, 2019). The most preferred representation used are area, length, and cluster models (Dogan & Tertemiz, 2020). However, these representations and most of the existing teaching aids for fraction concepts are emphasizing the understanding of individual fractions, but not fraction arithmetic. As a result, students face difficulties in fraction addition when applying concepts, applying principles, and solving verbal problems (Wulandari & Amir, 2022).

The lack of understanding of fraction concepts and fraction arithmetic is then translated into difficulties with advanced mathematics, and other related subjects and applications. An innovative teaching aid termed Fraction Scale (FS) is proposed to address the problem. The FS aims to provide visual representation of various concepts of fraction including fraction arithmetic. An experiment has been conducted to evaluate the effectiveness of FS.

METHODOLOGY

Fraction Scale

Fraction Scale (FS) is an intellectual property protected invention. The meaning of FS is two folds. It was invented to provide representation that depicts information about the content. The architecture of FS is based on the measure concept of fraction by Kieren (1988). The notion is important for fraction arithmetic as it measures how much. Furthermore, with its unique design, FS has the advantage of allowing users to perform arithmetic that involves proper fraction, improper fraction, and mixed fraction, not confined to only the part of a whole.

Experiment

The effectiveness of the FS was tested in two sub-urban schools. A pre-test was administered prior to the workshop conducted using the teaching aid. During the workshop, the concepts of fraction were introduced using the FS according to the lesson plan design specifically for the teaching aid. The students were also given chance to use the FS for solving fraction arithmetic during the hands-on sessions. At the end of the session, 22 students sat for the post-test. Both pre-test and post-test were using the same instrument which includes arithmetic of proper fraction, improper fraction, and mixed number. A questionnaire was also disseminated to the students to gather their experience and perception on the FS.

FINDING

It was found that the scores of fraction arithmetic in the post-test were higher than the pre-test scores for all the three types of fraction problems given as shown in Figure 1. The difference in means between the post-test and pre-test is the biggest for arithmetic problems that involve proper fractions, followed by improper fractions and mixed numbers.

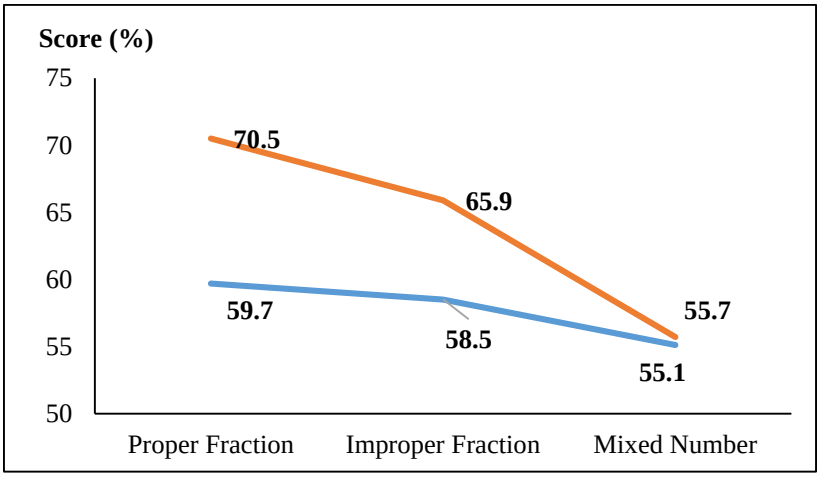

Figure 1. Comparison of scores from pre-test and post-test.

The feedback from the students reveals that the design of FS is user-friendly as they can read the scales easily. They perceived that the FS helps them to understand fraction arithmetic easily.

CONCLUSION

The FS is effective to improve the performance of students in the experiment conducted. The students also perceive that FS helps them to understand fraction arithmetic. Hopefully, FS contributes to the efforts of achieving the nation's target of 60:40 Ratio Policy in which the enrolment of students in science and technical stream is sixty percent. The commercialization potential of FS is great as the topic of the fraction is in the syllabi of elementary education worldwide.

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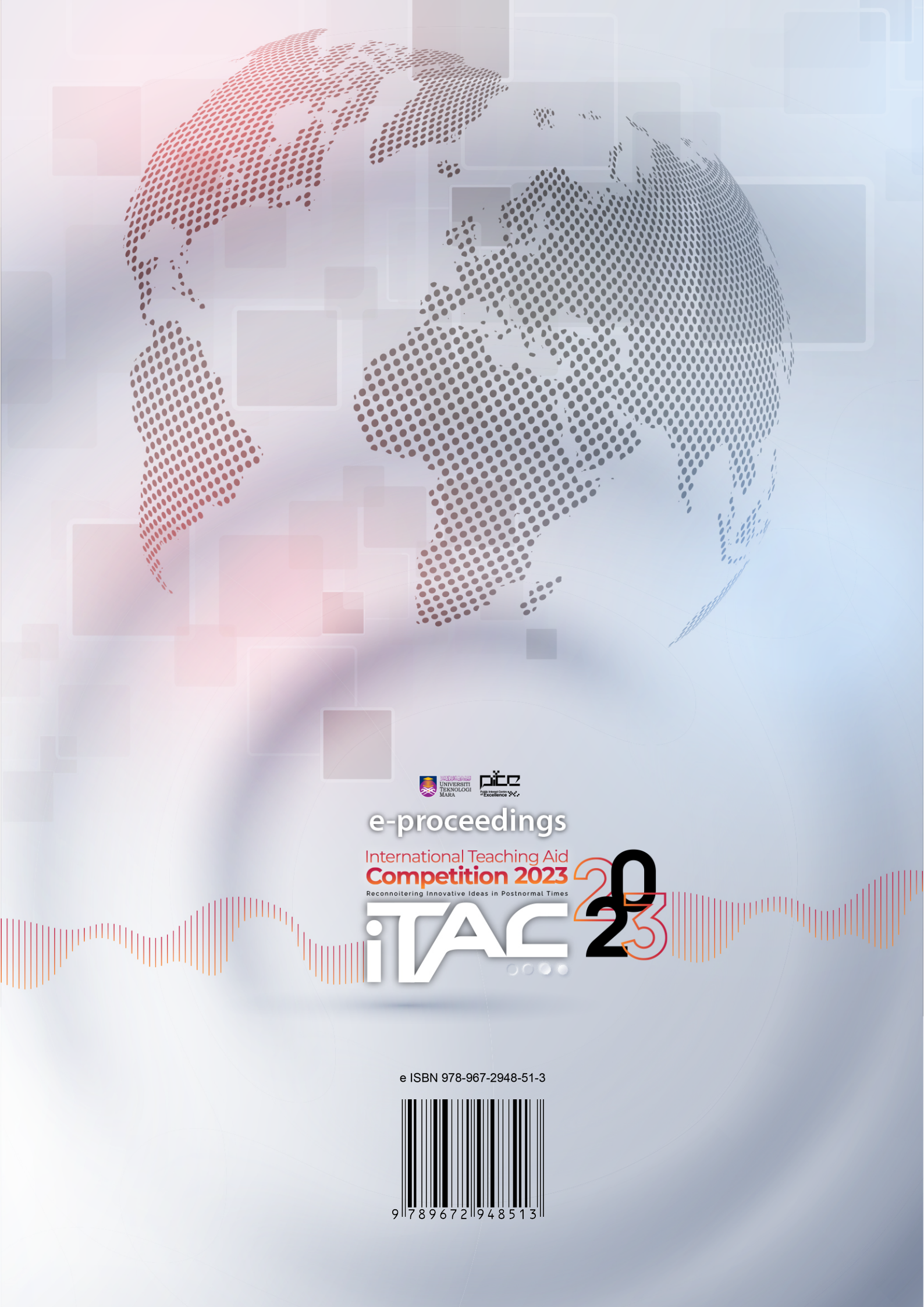

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