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International Teaching Aid  
**Competition 2023**

Reconnoitering Innovative Ideas in Postnormal Times

**iTAC**

**2023**

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



## **STEM-MODULES USING GAMIFICATION AS INDUCTION TEACHING AIDS FOR NON-ACADEMIC TAHFIZ STUDENTS**

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## ABSTRACT

The absence of academic subjects throughout the three-year of tahfiz memorization may cause the students to lose interest in STEM subjects. As a result, a non-digital game-based module is developed to support their teaching and learning. The main objective of this innovation is to increase students' interest in STEM subjects, particularly Mathematics, and to equip them with the fundamental foundation prior to returning to upper secondary school. [methodology] This module includes four selected non-digital real-world relatable games: arithmetic-fractions of a cafe and restaurants, geometry puzzle block and draw speed and velocity games of Tic-tac-toe, and strategic-coordinate military game. These games are chosen based on the lower secondary school mathematics curriculum and are introduced to students based on their level of comprehension. This module is applied to Maahad Riyadhil Quran (MRIQ) students during a prescribed program. The uniqueness of this module is that it incorporates cognitive and psychomotor skills for each of the non-digital games, making it an interesting teaching and learning aid to overcome interest gaps in STEM courses for non-academic tahfiz students. This module has positively affected students' interest to comprehend the value of mathematics, as seen by the results. This method, in the students' opinions, increased their interest in mathematics and widened their perspectives on the topics. Non-digital games have societal potential benefits, such as improving students' engagement by making learning more dynamic, interactive, enjoyable, and at the same time, more challenging. Students are incentivized to participate and strive for excellence, which enhances interest not only in mathematics, but also in retention, motivation, personalized learning, and social interaction. The innovative module has a commercial potential, where workshops or events can be hosted to create enthusiasm and interest among students and parents, while also engaging them in the design process by soliciting their thoughts and opinions to increase excitement and ownership.

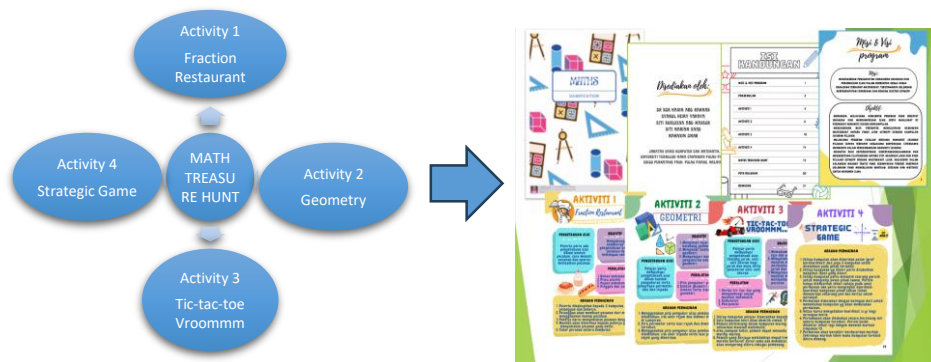
**Keywords:** STEM, Tahfiz, non-digital game-based learning, math-game, action-learning

## INTRODUCTION

Students may find STEM subjects hard and boring, leading to a decrease in interest. STEM education focuses on developing critical thinking, problem-solving, and creativity through hands-on learning and real-world applications. To increase interest in STEM, integrating mathematics teaching with educational games, also known as game-based learning and teaching approach, can be effective. Many studies have been conducted by past researchers concerning the effectiveness of game-based teaching and learning (AlSaad & Durugbo, 2021; Park et.al., 2019; Moon & Ke, 2020; Zainuddin et.al, 2017). Digital game-based learning (DGBL) and non-digital game-based learning (NDGBL) are two distinct approaches to using games for educational purposes. DGBL uses digital technologies like computers and mobile applications as learning tools, while NDGBL uses non-digital games like role-playing and board games. This comprehensive approach to game use is essential for effective educational outcomes. Naik, N. (2014) mentions that game-based learning is commonly thought of as digital (or computer-mediated), however, there are many educational games that do not require a computer host. Although NDGBL is no longer in vogue, it has many advantages over DGBL, such as cost efficiency and reduced administrative burden. Furthermore, in investigating the effectiveness of non-digital game-based learning techniques, Mohd Yusof and Shahrill (2021) used pretest-to-test exponents to determine differences in student performance on the subject of multiplication and division and concludes that integrating the NDGBL approach into mathematics education actually had a positive impact on student achievement the game helped improve the academic performance. Furthermore, In Malaysia, tahfiz refers to the Islamic education system that involves memorizing the entire Al-Quran, including verses, chapters, and punctuation. Students, known as Hafiz or Huffaz, are considered significant achievements in the Islamic education system. Some tahfiz schools are registered and accredited by the Malaysian Ministry of Education, while others, like Maahad Riyadhil Quran (MRIQ) do not offer formal certification or secular academics, even though they are run by reputable and experienced Ustaz or teachers. Maahad Riyadhil Quran (MRIQ) although registered under *Jabatan Hal Ehwal Agama Islam Negeri Kedah (JHEAIK)* since 2016, it is one of many tahfiz schools that falls under the latter category. Graduates are expected to continue academic studies and sit for Sijil Pelajaran Malaysia (SPM) after three years. However, concerns arise about the graduates' ability to adapt to higher secondary subjects without lower secondary secular-STEM academics. To address this issue, a non-digital game-based learning module for mathematics teaching for non-academic Maahad tahfiz schools will be introduced, arguing for its pedagogical effectiveness and improved learning outcomes.

## METHODOLOGY

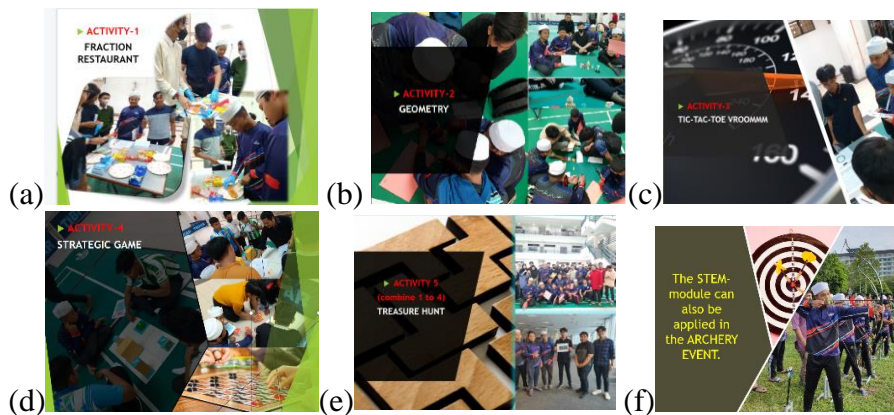
The study was conducted at the Universiti Teknologi MARA (UiTM), Pulau Pinang on October 13-15, 2022. The samples involved 40 students: 17 Maahad (Tahfiz) Riyadhil Quran, Sungai Petani, and 23 UiTM PPT-STEM first-semester students. However, for this particular study, we only focus on the 17 Maahad Tahfiz students. The research design is based on the cognitional theory of Bernard Lonergan, an action research approach and action learning approach, where mathematics education can be defined as learning through student individual work on a real problem followed by reflection on this work. Lonergan's focus is not the known-content, but the knowing-process. Intelligence operates in a variety of patterns of experience, including theoretical and practical or common-sense patterns (Connolly & Cosgrove, 2022). The module adopted a small number of popular games to the teaching of selected mathematical principles within the scope of the lower secondary school syllabus. Five selected non-digital games in all: arithmetic-fractions, geometry puzzle block and draw, speed and velocity Tic-tac-toe game, strategic-coordinate war-game, and treasure-hunting explore-race as featured in Figure 1. In order to identify the effectiveness of the module, Pre- and Post-questionnaires are also given to the tahfiz students.



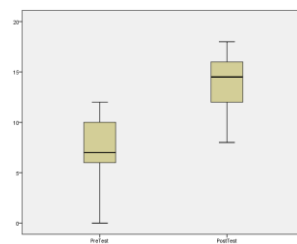
**Figure 1.** The Five Non-Digital Gamification 20-Page Modules

## RESULTS AND DISCUSSIONS

Generally, the students found these non-digital game-based learning modules fun, and they believed that they could improve their interest and skills in mathematics while playing the games. These concurred with Yang et al.'s (2018) statement regarding the effectiveness of educational games where the learners could gain enjoyment, self-confidence, and satisfaction if their skills and knowledge in game-based learning are equal to the given challenging tasks. Figures 2(a)-(f) show the applications of the NDGBL module involving the five activities.



**Figure 2(a) –(f).** The Tahfiz Students Were Playing the Games in Modules 1-5, Also Archery



**Figure 3.** The Boxplot Shows The Results Of The Pre-Test And Post-Test For The 17 Samples

In Figure 3, the boxplots indicate that there was an increase in the mean scores for MRIQ students. The study found that integrating NDGBL in mathematics lessons significantly improved students' achievement scores. The results in Table 1 showed a positive effect on students' achievement scores, making it a suitable lesson intervention. The mean and standard deviation of pre-test and post-test scores showed a significant average difference ( $t=5.617$ ,  $p < 0.001$ ). On average, post-test scores were 6.93 points higher than pre-test scores, with 95% of the confidence level range from 4.26 to 9.59.

**Table 1.** (a)The Mean, Standard Deviation and (b) Paired Sample Test of the Pre- and Post-Test

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	PostTest	13.9286	14	2.94734	.78771
	PreTest	7.0000	14	3.61620	.96647



### Paired Samples Test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1 PostTest - PreTest	6.92857	4.61543	1.23353	4.26370	9.59344	5.617	13	.000

### NOVELTY AND BENEFITS TO SOCIETY

This module incorporates cognitive and psychomotor skills in non-digital games, making it an interesting teaching and learning aid for non-academic tahfiz students. It positively affects students' interest in mathematics and broadens their perspectives on the subject. Non-digital gamification can improve engagement, engagement, and learning outcomes by making learning more dynamic, interactive, and challenging. Students are incentivized to participate and strive for excellence, enhancing interest in mathematics, retention, motivation, personalized learning, and social interaction. This module also provides personalized learning experiences and improved social interactions through collaborative learning and friendly competition. Team-based challenges and leaderboards encourage students to work together and support each other, ultimately fostering a love for learning STEM subjects, improving skills and knowledge, and enhancing overall academic and social development.

### COMMERCIALIZATION POTENTIAL

This innovative module has commercial potential for non-academic tahfiz schools, offering a fun and interactive way to learn about Islam. Parents and other non-academic schools can purchase non-digital gamification modules to supplement their children's religious education. Workshops and events can increase enthusiasm and engagement among students and parents, fostering ownership and ownership in the design process.

### CONCLUSIONS

Overall, the results suggested that non-digital game-based learning is both motivational and has a positive impact on learning outcomes. The pedagogical usefulness of these non-digital games must not be limited to mathematics, merely but adapted for the teaching of other STEM

subjects as well. Overall, the NDGBL approach with hardcopy modules in mathematics is a creative and engaging way to make math more fun and interesting for students, while also promoting important skills such as critical thinking, teamwork, and problem-solving.

## ACKNOWLEDGEMENTS

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