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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

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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)
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SELF- DIRECTED LEARNING MATHEMATICS WITH V-MINDMAP

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ABSTRACT
The V-Mindmap tool is a novel approach to teaching and learning Mathematics that includes instructional videos and tutorial questions based on the Four-Semester System (SES) syllabus in the Matriculation Programme for the academic session 2022/2023. Developed using the Directed Creative Process Model application, the V-Mindmap tool aims to assist matriculation students in learning Mathematics and to stimulate self-directed learning. It has been evaluated by a sample of 104 SES students (academic session 2022/2023), with four factors used to measure its effectiveness: presentation, efficiency, ease of use, and reliability. The results indicate that the V-Mindmap tool has been positively received by the respondents, with a minimum value of 3.25. Additionally, by providing a novel and effective tool for learning Mathematics, the V-Mindmap tool has the potential to benefit society by producing students who are better equipped to apply mathematical concepts in their future endeavours. The V-Mindmap tool aims to promote self-directed learning and the concept of a "flipped classroom" in the new norm, and represents an innovative approach to Mathematics education that could have far-reaching implications for the Matriculation Programme and beyond. The positive results of the evaluation, coupled with the copyright registration, suggest that the V-Mindmap tool has significant commercialization potential in the education market, which could be further explored to promote the tool's widespread use and adoption. With its innovative approach to teaching and learning Mathematics, the V-Mindmap tool has the potential to produce a new generation of mathematically competent students who can contribute positively to society in a wide range of fields.

Keywords: v-mindmap, matriculation students, four factors, self-directed learning, “flipped classroom”.

BACKGROUND

The implementation of 21st-century learning demands educators to create more creative and innovative teaching methods to establish effective and engaging classroom experiences. Multimedia technology allows for educational processes that enhance interactions between teachers, students, and course software, offering innovative ways to make learning more dynamic and relevant to the world beyond the classroom (Almara'beh et al., 2015).

To address the challenges of online teaching and learning, innovative solutions are needed. Therefore, the team employs V-Mindmap as a hybrid approach that combines synchronous and asynchronous learning. This means that learning can occur at any time, either within the online classroom or when students have flexible schedules. As a result, educators can adopt the flipped classroom teaching method, which involves shifting lecture or tutorial time from in-person classes to pre-recorded videos that students can access outside of class before engaging in face-to-face sessions.

V-Mindmap is a digital mind map integrated with academic videos from YouTube that align with the Matriculation Program syllabus. It presents a new idea to guide students in self-directed learning, especially in the new normal. Chin and Maskat (2010) have listed the advantages of using mind maps in the fields of psychology, science, mathematics, and accounting. Pehkonen (1997) stated that mind maps benefit students in mathematics education. Mind maps allow both hemispheres of the brain to collaborate, achieving a balance between logic and creativity. Keles (2012) also supports mind map-assisted learning in developing creative and innovative thinking skills. According to Ramlogan et al. (2014), the visual advantages of videos provide a means to enhance access to practical demonstrations. Students can learn from field experts and have the opportunity to closely observe expert illustrations by watching them repeatedly if necessary. V-Mindmap combines the benefits of mind maps and visual videos to support students' learning process free of charge.

PROBLEM STATEMENT

During the Covid-19 pandemic in 2019, the shift to fully online home-based teaching and learning (PdPR) in Malaysia raised concerns about the effectiveness and engagement of educational delivery methods. The reliance on traditional PowerPoint presentations proved to be inadequate in capturing students' interest and maintaining effective learning outcomes. Therefore, there is a need to explore innovative and engaging approaches, such as the adoption of V-Mindmap as a hybrid synchronous and asynchronous learning method, to address the challenge of ensuring meaningful and accessible education during prolonged periods of remote

learning.

OBJECTIVE

This innovation is implemented with the aim of:

(i) Empowering one of the flipped classroom techniques, which is the use of mind map videos in student-centered learning and facilitation.

ii) Enhancing the involvement of Matriculation students and their self-responsibility towards Mathematics learning.

INNOVATION

4.1 Novelty

In the process of creating V-Mindmap, our team implemented the Directed Creative Process Model (Figure 4.1).

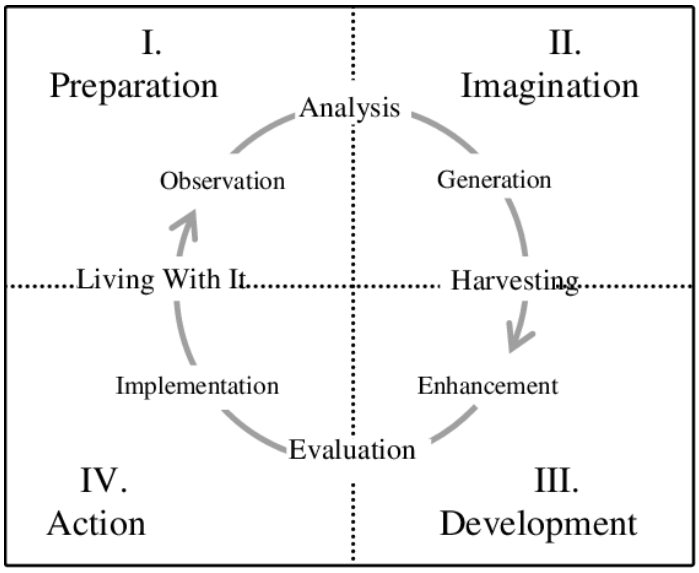

Figure 4.1. Directed Creative Process Model

This model provides a systematic guideline through 4 phases: the preparation phase, the imagination phase, the development phase, and the action phase. Each phase is explained in a suitable manner to implement the desired innovation. Table 4.1 illustrates the application of

this model in the development of the V-Mindmap project.

Table 4.1. Developing Innovation Throughout 4 Phases in Directed Creative Process Model

Phase	Action
1. Preparation	● The emerging norm promotes online learning, necessitating the use of a digital learning tool. ● Brainstorming sessions are conducted with group members using Starbusting (Refer to Figure 4.2). ● Six key questions are considered to identify the problems: who, what, where, when, why, and how. ● Suggested software: Microsoft Word, Screencast-o-matic. ● Suggested platform: YouTube, Google Drive, Google Site.
2. Imagination	● Developing a "1-stop" digital learning tool in the form of a diagram. ● Easily accessible by students. ● Does not consume excessive data. ● Does not require high costs - utilizing existing free applications.
3. Development	● The concept of mind maps is used to organize all subtopics of a particular topic into a single colored diagram. ● The "Drawing canvas" feature in WORD is utilized to create neatly drawn mind maps. ● YouTube videos are filtered according to syllabus relevance. ● Tutorial videos are created using the Screencast-o-matic application. ● Links are inserted into the mind map, and the mind map is saved as a PDF file. ● The mind map is uploaded to Google Drive. ● All topic mind maps are compiled and included on the V-Mindmap website.
4. Action	● V-Mindmap was introduced to the Four Semester System (SES) Matriculation Students for two semesters in the academic session of 2020/2021 via Google sites by sharing QR codes. ● Four factors (Presentation, Efficiency, Convenience, and Reliability) were outlined to assess students' reception towards V-Mindmap. ● A total of 104 random samples were taken to answer a survey questionnaire consisting of 19 items using a 4-point Likert scale. ● Pilot testing was conducted.

	• One-sample t-test was conducted. • V-Mindmap was developed using existing resources. No additional cost was required.

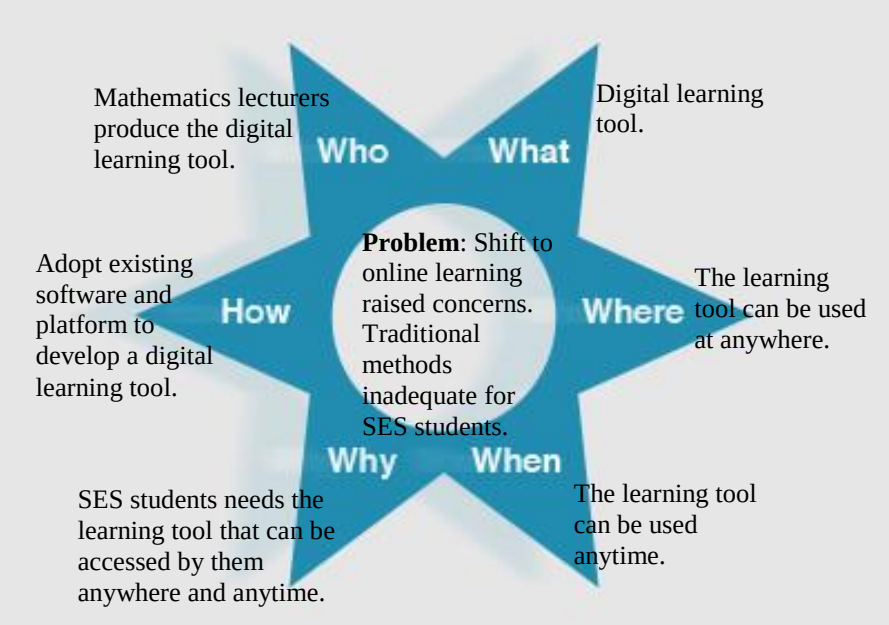

Figure 4.2. Brainstorming using Starbursting Technique.

4.2 Practicality and Usability

V-Mindmap offers a practical and user-friendly solution for students to enhance their understanding and memory of mathematics topics. By presenting the content in visual diagrams, it engages students and sparks their interest in the subject matter. This practical approach not only improves comprehension but also supports long-term retention of information.

The platform's usability is evident through its seamless integration of curated YouTube videos. These videos, carefully selected and reviewed by experienced mathematics lecturers, provide in-depth explanations and clear examples that reinforce concepts. By connecting each subtopic to relevant videos, V-Mindmap ensures that students have access to valuable supplementary resources that enhance their learning experience.

Furthermore, V-Mindmap's accessibility adds to its practicality and usability. Students can access the platform anytime, anywhere, using their smartphones or laptops with an internet connection. This flexibility empowers students to engage with the material at their own

convenience, making it easier for them to incorporate learning into their daily routines.

The platform's user-friendly design is another aspect of its usability. With a simple scan of a QR code, students can quickly find the desired topic, streamlining the navigation process. This intuitive interface allows students to easily locate and explore various mathematics subjects, creating a seamless learning experience.

V-Mindmap's practicality is further enhanced by its cost-effectiveness and minimal resource requirements. By utilizing existing online platforms and materials, it provides an affordable solution for both students and educational institutions. This practical approach ensures widespread access and usability without compromising the quality of the learning experience.

In summary, V-Mindmap's practicality lies in its ability to present mathematics content in a visually engaging manner, while its usability is demonstrated through its curated videos, accessibility, user-friendly design, and cost-effectiveness. By combining practicality and usability, V-Mindmap offers students an effective and enjoyable learning tool that enhances their understanding and memory of mathematics topics.

Here is the procedure of using V-Mindmap:

- Accessing V-Mindmap: Users can access V-Mindmap through their smartphones or laptops with an internet connection. They can visit the V-Mindmap website or download the V-Mindmap mobile application from their respective app stores.

- Topic Selection: Once on the platform, users can browse or search for the desired mathematics topics they wish to explore. They can navigate through the available categories to find specific topics.

- Exploring Mindmaps: After selecting a topic, users will be presented with a visual mindmap that illustrates the subtopics and their connections. They can click on each subtopic to access more detailed information.

- Video Integration: Within each subtopic, users will find curated YouTube videos related to the specific concept. These videos provide additional explanations and examples to enhance understanding. Users can watch these videos directly on the V-Mindmap platform.

- Tutorial Questions: V-Mindmap provides tutorial questions for each topic to help users practice and reinforce their learning. Users are encouraged to attempt these questions to test their understanding and proficiency.

- Tutorial Solution Videos: For each tutorial question, V-Mindmap offers corresponding video solutions. Users can access these videos to review the step-by-step solutions,

gaining clarity and confidence in their problem-solving skills.

- Learning at Own Pace: One of the advantages of V-Mindmap is the flexibility it offers in learning. Users can progress through the topics and tutorial questions at their own pace, taking as much time as needed to grasp the concepts effectively.

4.3 Impacts to Teaching and Learning

V-Mindmap was introduced to SES students in the 2022/2023 academic session for two semesters. A total of 104 randomly selected samples were surveyed using a questionnaire containing 19 items with 4-point Likert-scale. The questionnaire aimed to assess the impact of four factors, namely "presentation," "efficiency," "ease of use," and "reliability," on the reception of V-Mindmap among SES students. The survey data were analyzed by calculating the minimum score, standard deviation, and *p*-value using t-tests. From the obtained results (Table 4.2), all factors received scores above 3.0 with low standard deviations. The low standard deviation (less than 1.0) indicates a high level of consistency in student responses, which aligns with Kaufmann's findings (2014). Additionally, all factors showed small *p*-values ($p < 0.05$), indicating a significant difference between the mean scores for each factor and the test value of 2.5. Overall, the findings suggest that V-Mindmap received positive and favorable responses from the surveyed respondents.

Table 4.2. Mean, standard deviation and *p*-value by t-test.

Factor	N	Mean	Standard Deviation	Test value = 2.5 *p*-value
Presentation	104	3.2505	.36307	.000
Efficiency	104	3.2038	.41052	.000
Ease of Use	104	3.2788	.40427	.000
Reliability	104	3.2668	.38362	.000

4.4 Benefits and Commecialization Potentials

V-Mindmap offers significant benefits to society and holds promising potential for commercialization.

From a societal perspective, V-Mindmap contributes to the advancement of education by providing a visually engaging and effective learning platform for students. Its innovative approach of presenting mathematical topics through diagrams and curated videos enhances students' understanding, memory retention, and problem-solving skills. By making learning more enjoyable and accessible, V-Mindmap has the potential to improve educational outcomes and foster a stronger interest in mathematics among students. This, in turn, can contribute to

the development of a more mathematically proficient workforce, benefiting society as a whole.

In terms of commercialization potential, V-Mindmap presents opportunities for various revenue streams. The platform can be monetized through subscriptions, where users pay a fee to access premium features, additional content, or personalized learning options. Collaborations with educational institutions, such as licensing agreements or partnerships, can also be explored to expand the reach of V-Mindmap and generate revenue. Additionally, the platform's user-friendly design and adaptable framework open doors for potential integration into existing educational systems or partnerships with textbook publishers and online learning platforms. These avenues provide avenues for commercialization and scalability, allowing V-Mindmap to grow its user base and establish a sustainable business model.

Overall, V-Mindmap's benefits to society lie in its ability to enhance education and student engagement, while its commercialization potential arises from its innovative approach and market demand for effective learning tools. By combining educational impact with viable revenue opportunities, V-Mindmap demonstrates its potential to create positive societal outcomes while achieving commercial success.

4.5 Achievement

V-Mindmap has achieved notable milestones and recognition in its journey. Here are some of the accomplishments of V-Mindmap:

Implementation in SES: V-Mindmap was successfully introduced to SES students during the 2022/2023 academic session for two semesters.

Positive Reception: A survey conducted among 104 randomly selected students using a questionnaire revealed that V-Mindmap received positive and favorable responses. Factors such as "presentation," "efficiency," "ease of use," and "reliability" were assessed, and all factors scored above 3.0 with low standard deviations, indicating consistent and satisfactory reception.

International Recognition: V-Mindmap was awarded the gold prize at the International Innovation Competition within the International Medical University (IMU) Learning Resources Festival 2020. This achievement highlights the innovative and impactful nature of V-Mindmap.

Research Presentations: The concept and research behind V-Mindmap have been shared through research presentations and posters at notable events. It has been presented at the International Conference in Science, Technology, Engineering, and Mathematics, showcasing its academic relevance and contribution to the field.

Publication: A research paper titled "New Norms: Self-learning with V-Mindmap" will be published in the Malaysian Journal of Education (MJE), demonstrating the scholarly recognition and dissemination of V-Mindmap's findings and impact.

Integration in Educational Resources: V-Mindmap has been incorporated into the mathematics tutorial book (DM025) at Kolej Matrikulasi Pulau Pinang for the 2021/2022 and 2022/2023 academic session. This integration signifies the practical applicability and endorsement of V-Mindmap by educational institutions.

Collaboration and Adaptation: The concept and ideas of V-Mindmap have been adopted by lecturers at Kolej Matrikulasi Pulau Pinang's System Dua Semester for the development of digital learning materials on the DELIMa Portal. This collaboration demonstrates the scalability and adaptability of V-Mindmap in different educational contexts.
Copyright Protection: V-Mindmap has been registered under the Copyright Act 1987, ensuring legal protection of its intellectual property. The registration is represented by the Notification Number: CRLY00027024 (Figure 4.3). This emphasizes the commitment to safeguarding V-Mindmap's copyright and maintaining its exclusivity.

AKTA HAK CIPTA 1987
PERATURAN-PERATURAN HAK CIPTA (PEMBERITAHUAN SUKARELA) 2012

SIJIL PEMBERITAHUAN HAK CIPTA
[Subperaturan 8(2)]

No. Pemberitahuan : CRLY00027024
Tajuk Karya : V- MINDMAP
Jenis Karya : SASTERA
Tarikh Pemberitahuan : 28 SEPTEMBER 2020

Saya dengan ini mengesahkan di bawah Akta Hak Cipta 1987 [Akta 332] dan Peraturan-Peraturan Hak Cipta (Pemberitahuan Sukarela) 2012 bahawa karya hak cipta dengan No. Pemberitahuan seperti di atas bagi pemohon **LIM AI HUI (791102075606), CHOO HUI NEE (760922075044, SITI SHAFIQA SHAFIRA BINTI HASHIN (920426106382), NURUL AMANI BINTI ZAINUL ABIDIN (860801025356), MD RODHI BIN MD REJAB (880510355257), AHMAD AFIF BIN MOHD NAWAWI (891117875049)** sebagai **PEMUNYA** dan **PENCIPTA** telah didaftarkan ke dalam Daftar Hak Cipta menurut seksyen 26B Akta Hak Cipta 1987 [Akta 332].

ZULKARNAIN MUHAMMAD
TIMBALAN PENGAWAL HAK CIPTA
MALAYSIA

Figure 4.3. Certificate from MyIPO for V-Mindmap's Copyright

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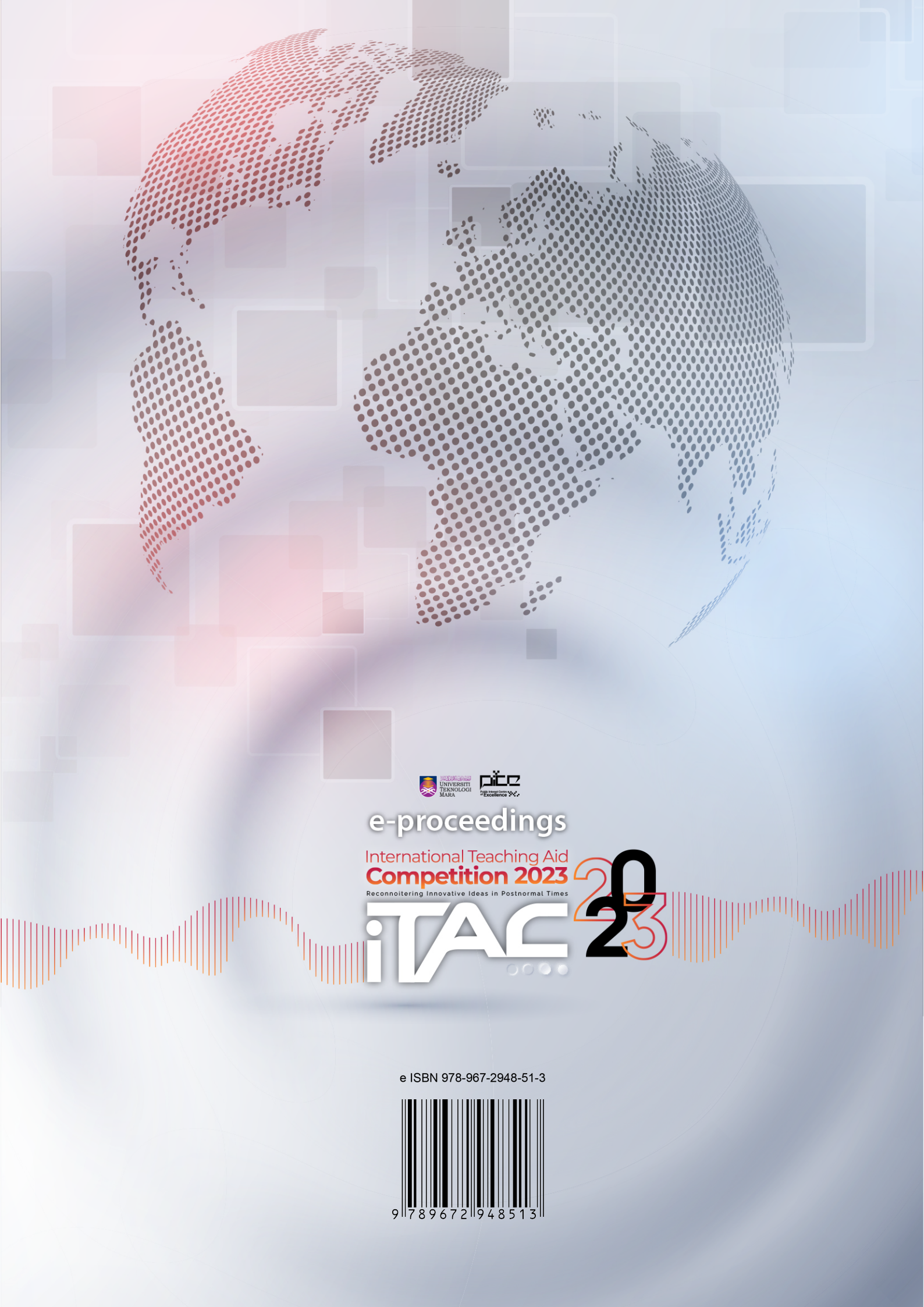

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