

E-BOOK OF EXTENDED ABSTRACT

THE 14TH INTERNATIONAL INVENTION, INNOVATION & DESIGN COMPETITION 2025



14TH **INDES** 2025

ENVIRONMENTAL • SOCIAL • GOVERNANCE



E-BOOK OF EXTENDED ABSTRACT

THE 14th INTERNATIONAL
INVENTION, INNOVATION &
DESIGN COMPETITION 2025

Organized by:

Office of Research, Industry,
Community & Alumni Network
UiTM Perak Branch

© Unit Penerbitan UiTM Perak, 2025

All rights reserved. No part of this publication may be reproduced, copied, stored in any retrieval system or transmitted in any form or by any means; electronic, mechanical, photocopying, recording or otherwise; without permission on writing from the director of Unit Penerbitan UiTM Perak, Universiti Teknologi MARA, Perak Branch, 32610 Seri Iskandar Perak, Malaysia.

Perpustakaan Negara Malaysia

Cataloguing in Publication Data

No e- ISBN: 978-967-2776-52-9

Cover Design: Dr. Mohd Khairulnizam Ramlie

Typesetting : Georgia

EDITORIAL BOARD

Editor-in-Chief

MUHD SYAHIR ABDUL RANI

Managing Editors

NUR FATIMA WAHIDA MOHD NASIR

SYAZA KAMARUDIN

NORASYIKIN ABDUL MALIK

Copy Editors

SHEEMA LIZA IDRIS

AZURAWATI ZAIDI

HALIMATUN SAADIAH ABD MUTALIB

HALIMATUSSAADIAH IKSAN

IZA FARADIBA MOHD PATEL

MOHAMAD SAFWAT ASHAHRI MOHD SALIM

MUHAMMAD WAJIHUDDIN JOHARI

NAZIRUL MUBIN MOHD NOOR

NORAZIAH AZIZAN

NOOR AILEEN IBRAHIM

NOOR FAZZRIENEE JZ NUN RAMLAN

NOORLINDA ALANG

NURAMIRA ANUAR

NURDIYANA MOHAMAD YUSOF

NURSHAHIRAH AZMAN

NURUL FARHANI CHE GHANI

NURUL MUNIRAH AZAMRI

ONG ELLY

PAUL GNANASELVAM

SITI SYAIRAH FAKHRUDDIN

WAN FARIDATUL AKMA WAN MOHD RASHDI

WAN NURUL FATIHAH WAN ISMAIL

ZARLINA MOHD ZAMARI

AMIRUL FARHAN AHMAD TARMIZI

IMRAN TORIQ

ENHANCING ANATOMY EDUCATION THROUGH ANATOMY MODEL-MAKING USING RECYCLED MATERIALS: INNOVATIVE APPROACH BY PRECLINICAL UITM DENTAL STUDENTS

Norhayati Liaqat Ali Khan^{1,2*}, Muhammad Zaid Zainuddin¹, Noor Azliza Wani Abd Aziz¹, Mohd Maaruf Abd Malik¹, Aimi Nadia Razlan¹, Andrean Husin³

¹Centre of Preclinical Science Studies, Faculty of Dentistry, Universiti Teknologi MARA, 47000 Sg Buloh, Selangor, Malaysia

²Cardiovascular Advancement and Research Excellence Institute (CARE Institute), Universiti Teknologi MARA, Selangor, Malaysia

³Centre for Oral & Maxillofacial Surgery Studies, Faculty of Dentistry, Universiti Teknologi MARA, 47000 Sg Buloh, Selangor, Malaysia

Email:

norhayati_liaqat@uitm.edu.my

ABSTRACT

Anatomy education is essential in medical and dental training but often relies on costly resources like cadavers and digital tools, which may not be accessible to all institutions. To overcome these limitations, this study introduces an innovative, sustainable approach by using recyclable materials to build anatomy models. This method also aligns with Gen-Z students' preference for active, hands-on, and exploratory learning experiences. Therefore, this study aims to evaluate the effectiveness of practical model-making using recycled materials in enhancing anatomical understanding, engagement and satisfaction among UiTM preclinical years dental students. 76 undergraduate dental students attended standard didactic anatomy lectures delivered by the lecturers, followed by a practical activity involving the creation of anatomical models using recycled materials. Guided by the knowledge acquired during lectures, students worked in groups to design a model based on the assigned anatomy topics. Students were surveyed to assess their understanding, engagement and satisfaction on the novel teaching initiative. The post-activity questionnaire showed that most students reported high engagement, improved understanding, and overall satisfaction with the model-building activity using recyclable materials. Students appreciated the hands-on, creative approach, collaborative teamwork, and active learning format, which enhanced their retention and enjoyment. Many also valued the sustainable aspect of the activity, noting increased environmental awareness in an academic setting. This model-making initiative using recycled materials demonstrates that with innovation and collaboration, quality anatomy education can be delivered effectively regardless of resource limitations. It reinforces the importance of active learning strategies in medical education while promoting sustainability, creativity, and student engagement.

Keyword: anatomy education, active learning, recycled materials, student engagement, student satisfaction

1. INTRODUCTION

Anatomy forms a fundamental component of both medical and dental education, historically supported by resource-intensive modalities such as cadaveric dissection, plastinated specimens, and increasingly, high-fidelity digital simulations (1). However, limited access to these teaching aids, particularly in resource-constrained settings, poses significant challenges to equitable and effective anatomy instruction. In response, educators are exploring sustainable, low-cost innovations that align with the learning preferences of Generation Z students, who thrive in environments that support active learning, creativity, and project-based exploration (2). Integrating recyclable materials into the construction of anatomical models offers a pedagogically sound and environmentally conscious alternative that

enhances student engagement and understanding while reducing financial and logistical burdens. This study aims to explore the relationship between active learning, via constructing anatomical models from recyclable materials, and students' engagement and satisfaction.

2. METHODOLOGY

76 undergraduate dental students were given their standard didactic anatomy lectures on topics of interest. Within the same week, students were given the task of constructing a specific component of the anatomical system of interest. Models had to represent anatomical structures that were discussed, anatomical structures had to be labelled accordingly and had to be constructed from recycled materials. After completion of the anatomical model, students had to present the constructed models to their peers and lecturers. Understanding and accuracy of the information were assessed by the lecturers present. At the end of each module, students were asked to answer a questionnaire on student engagement and satisfaction. The questionnaire was adapted from Lane et al. (2021) (3).

3. FINDINGS

The constructed anatomical models are as shown in Figure 1. Regarding students' understanding and presentation accuracy, lecturers observed that the majority of students demonstrated a clear understanding of spatial relationships and functional anatomy, as evidenced by the anatomical accuracy and detail of the constructed models. Lecturers noted that the process encouraged deeper critical thinking, as students were required to justify the placement, proportion, and interconnectivity of each anatomical component. While some variability in model precision was acknowledged, the overall quality of work exceeded expectations. Lecturers also emphasized the pedagogical value of the activity in promoting diagnostic reasoning and peer discussion, reinforcing complex concepts through tactile, visual, and collaborative learning experiences.

The post-activity questionnaire revealed that 94.7% of students (n=72) reported high levels of engagement during the model-building process, citing the hands-on nature of the activity and the opportunity to apply anatomical knowledge in a creative context as key motivating factors. Furthermore, 97.4% of respondents (n=74) indicated that the activity increased their understanding of anatomical structures on top of the traditional didactic methods. In terms of satisfaction, all students (n=76) rated the overall experience as satisfying, highlighting the novelty of using recyclable materials, the collaborative team environment, and the active learning format as major contributors. Open-ended responses supported these findings, with recurring themes including enhanced retention, enjoyment, and a sense of accomplishment. Several students also expressed appreciation for the sustainable approach, noting increased awareness of environmental responsibility within academic practices. These findings suggest that integrating recycled material-based model construction into anatomy education not only promotes engagement and satisfaction but also aligns well with pedagogical goals of active and sustainable learning.

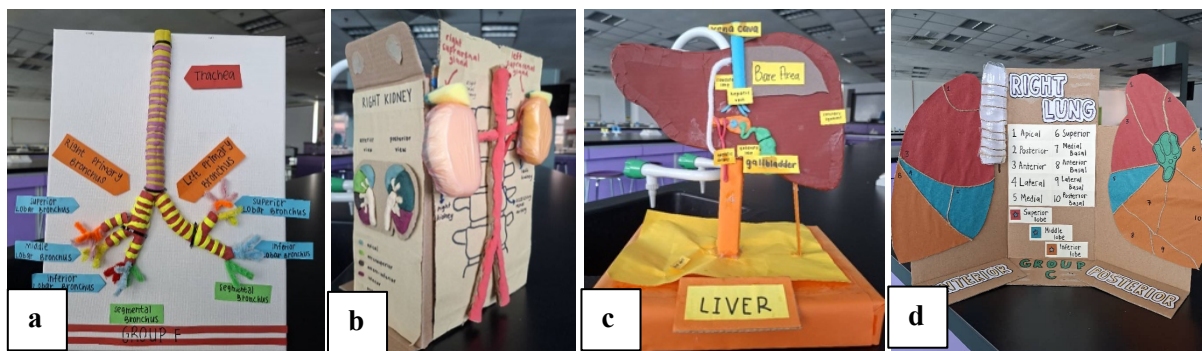


Figure 1 Anatomical models made from recycled materials showing the a) respiratory system, b) urinary system, c) gastrointestinal system, and d) respiratory system.

Table 1 Students responses to emotional, cognitive and behavioural engagement during anatomy practical sessions.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Emotional Engagement					
I felt isolated during practical sessions.	37	22	11	6	0
I felt anxious in practical sessions.	25	26	12	11	2
I liked taking part in practical session.	0	1	12	24	39
I felt the amount of my interaction with other students in this practical session was appropriate.	0	0	4	33	39
I feel that the amount of my interaction with the instructor in this practical session was appropriate.	0	2	10	27	37
I felt connected with other students in this practical session.	0	2	6	23	45
Cognitive Engagement					
I was engaged in practical sessions.	0	0	4	37	35
This practical session has improved my understanding of key concepts.	0	1	1	32	42
When I read or viewed the practical materials, I asked myself questions to make sure I understood.	0	1	18	37	20
I read extra materials to learn more about the topics covered in practical sessions.	1	20	21	24	10
If I did not understand a concept in the practical session, I did something to figure it out.	0	2	8	36	30
Behavioural Engagement					
I am likely to ask questions in practical sessions.	1	2	20	38	15
Practical sessions required more time and effort compared with my other subjects.	0	7	20	35	14
I can consistently pay attention during practical sessions.	0	3	19	36	18

4. CONCLUSION

In conclusion, the integration of recycled materials into anatomy model-making not only addresses the challenges posed by limited educational resources but also exemplifies how innovative, student-centered approaches can enrich medical and dental education. This initiative highlights the potential of collaborative, hands-on learning experiences to foster deeper understanding, creativity, and environmental consciousness among students. By aligning with the values and learning preferences of today's learners, such sustainable educational practices ensure that high-quality anatomy instruction remains accessible, engaging, and impactful across diverse academic settings.

REFERENCES

- Estai, M., & Bunt, S. (2016). Best teaching practices in anatomy education: A critical review. *Annals of Anatomy-Anatomischer Anzeiger*, 208, 151-157.
- Hernandez-de-Menendez, M., Escobar Díaz, C. A., & Morales-Menendez, R. (2020). Educational experiences with Generation Z. *International Journal on Interactive Design and Manufacturing (IJIDeM)*, 14(3), 847-859.
- Lane, S., Hoang, J. G., Leighton, J. P., & Rissanen, A. (2021). Engagement and satisfaction: Mixed-method analysis of blended learning in the sciences. *Canadian Journal of Science, Mathematics and Technology Education*, 21(1), 100-122.

E-Book of Extended Abstract THE 14th INTERNATIONAL INVENTION, INNOVATION &
DESIGN COMPETITION 2025

e ISBN 978-967-2776-52-9



Unit Penerbitan UiTM Perak

(online)