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iDOOR3D: IMMERSIVE SKETCHUP LEARNING OF DOOR CONSTRUCTION IN QUANTITY SURVEYING EDUCATION

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ABSTRACT

Measurement work is a fundamental aspect of quantity surveying, particularly in taking of quantities for building elements such as doors. Traditional methods used in the Measurement of Construction Works II (QSA151) course rely heavily on textbooks with static illustrations and classroom hand sketches based on two-dimensional (2D) diagrams. While these may benefit students with strong spatial imagination, they pose challenges for those lacking such skills, resulting in reduced engagement and difficulty in grasping practical applications. To address this, iDoor3D—an immersive SketchUp-based learning tool was developed to enhance visual learning through interactive three-dimensional (3D) animation, thereby improving students' competency in measuring door elements. The tool integrates with the UFUTURE platform and YouTube for ease of access and navigation. This innovation aims to strengthen students' drawing interpretation skills, foster active learning, and enhance technical practices through an engaging, interactive approach.

Keywords: iDoor3D, SketchUp, QS education, Three-dimensional (3D), Door element

INTRODUCTION

Students in built environment disciplines such as architecture, engineering, surveying, and construction management are vital to the development of the construction industry. Their problem-solving abilities, teamwork, leadership skills, technical knowledge and adaptability to technological advancements directly influence industry credibility. Halid (2025) reported that over 70% of graduates are not adequately prepared for the work force, as highlighted in the *Pusat Kajian Pasaran Buruh Masa Hadapan* (EU-ERA) study. This finding underscores the urgent need for innovative teaching approaches that cater to today's learners who are highly visual and influenced by social media. Teaching tools must therefore evolve to become more interactive and visually engaging to align with modern learning preferences.

In quantity surveying (QS), accurate measurements impact cost estimation, material planning, and project execution. However, 2D drawings, manual exercises, and static visuals have proven insufficient

for preparing students for technology-driven work environments. For beginners, understanding technical drawings and performing quantity take-offs is often challenging (Chia et al., 2012). Vernadakis et al. (2011) noted that conventional lectures and demonstrations do not sufficiently engage students in hands-on and interactive learning. An interview with the teaching team of the QSA151 course in February 2025 confirmed that students struggle with visualising and interpreting 2D diagrams. These challenges call for creative teaching tools—such as iDoor3D—to enhance students' visual literacy and measurement competency. This paper introduces iDoor3D as an innovative solution designed to develop technical skills in taking measurements for door elements.

METHODS

The study focused on the panel door element and involved the following development stages:

- A) Needs Analysis: A preliminary study identified challenges students face in understanding, visualising, and measuring door elements. Data were collected through informal interviews with the teaching team and a review of current instructional tools.
- B) Content Creation: Based on existing lecture notes aligned with the QSA151 syllabus, iDoor3D content was developed using SketchUp for Web. The material provides step-by-step visual guidance.
- C) Platform Development: The UFUTURE platform, integrated with YouTube, was selected to facilitate user friendly access and enhance the learning experience.

RESULTS AND DISCUSSION

Measurement is a core responsibility of assistant quantity surveyors. Needs analysis revealed that students often struggle with interpreting 2D drawings, which hinders their ability to perform accurate take-offs in the QSA151 course. The lack of spatial imagination leads to limited visual engagement and practical understanding. The teaching team thus initiated the need for iDoor3D, a visual learning tool designed to improve student comprehension of door construction and measurement tasks.

iDoor3D enables users to visualise door components through 3D illustrations. By integrating SketchUp for Web, students can better interpret 2D drawings and perform accurate measurements. The UFUTURE platform and YouTube further ensure ease of use and flexible access. Figure 1 demonstrates the components of a panel door system.



Figure 1.: iDoor3D which shows components of a panel door system

Door Components Visualised in iDoor3D are as the followings:

a) Head and Jamb (Frame):

Illustrates how these elements connect structurally, including the groove or rebate for the door leaf.

b) Rebated Stopper:

Shows the indentation that accommodates door thickness and ensures alignment.

c) Architraves:

Displays decorative mouldings and their structural/aesthetic purposes.

d) Panel Door Leaf:

Depicts clearance, swing direction, hinge placement, and moulding types.

Figure 2 outlines the iDoor3D development framework. The tool's visual animations, when combined with traditional lectures, help students overcome interpretation challenges. The UFUTURE platform, along with YouTube, facilitated easy access and navigation for students to materials, enabling them to revisit content and engage in self-paced learning. The integration of traditional educational content with digital delivery methods utilising SketchUp for web in the development of iDoor3D presents a flexible learning model that is in harmony with contemporary educational trends. The iDoor3D provides a practical and significant method for teaching one of the essential components of Measurement of Construction Works II (QSA151). This approach seamlessly integrates visual learning, technical training, and the cultivation of soft skills, all presented in an engaging and cost-effective manner. This innovation enhances students' grasp of measurement tasks while equipping them to emerge as skilled

and self-assured assistant quantity surveyors in practical construction environments. In addition, iDoor3D has strong potential for commercialization within colleges, universities, polytechnics, and TVET institutions offering courses in Quantity Surveying, Construction Management, Architecture, or Building Technology, as an innovative tool for teaching and learning.

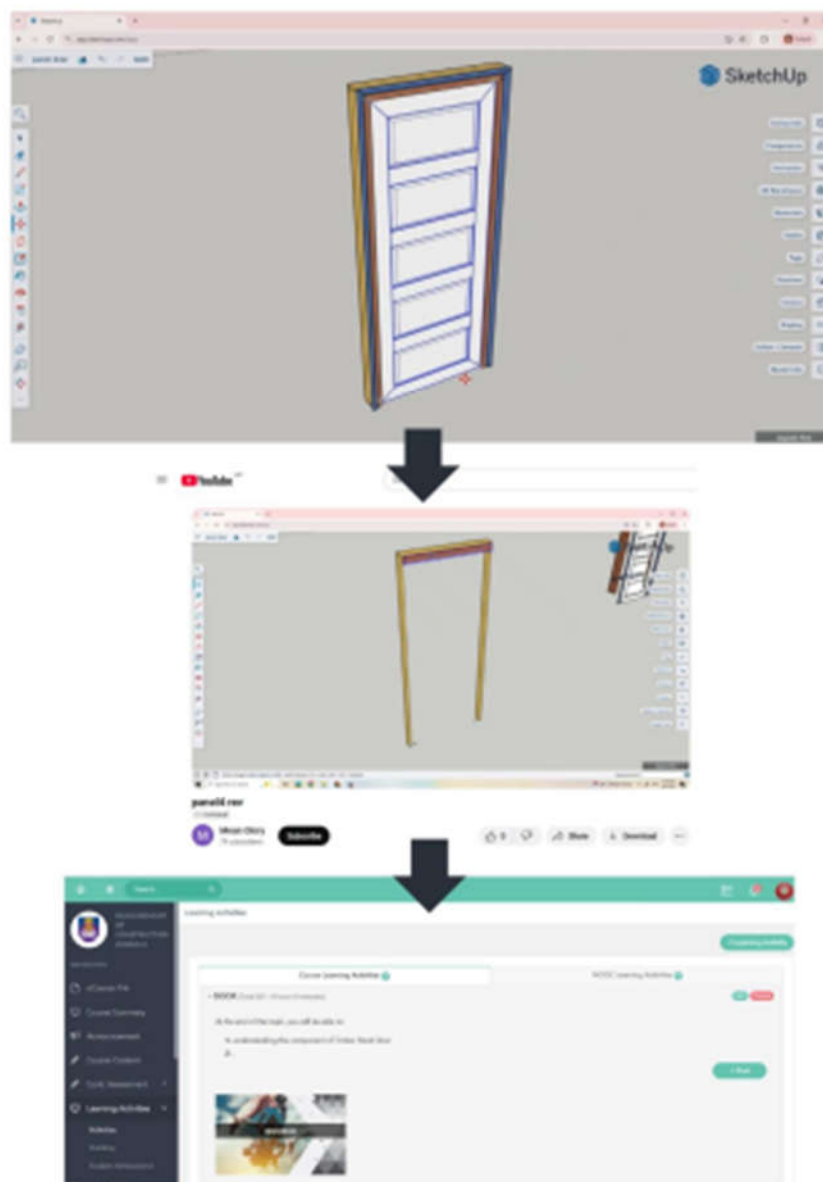


Figure 2.: The design and development of iDoor3D

CONCLUSION

iDoor3D demonstrates how simple yet innovative teaching tools can transform traditional classrooms into interactive and impactful learning environments. By focusing on the panel door, a fundamental building element, this tool enhances technical practices skills. The iDoor3D model can be extended to other construction elements such as windows, walls, and finishes. Integrating creativity into technical education through tools like iDoor3Dbetter prepares students to meet real-world measurement challenges in construction.

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REFERENCES

- Chia, F. C., Skitmore, M., Runeson, G., & Bridge, A. (2012). An analysis of construction productivity in Malaysia. *Construction Management and Economics*, 30(12), 1055–1069. <https://doi.org/10.1080/01446193.2012.711910>.
- Halid, S., (2025, June 9). 78.7 peratus graduan tidak sedia bekerja. *Berita Harian*, 8.
- Vernadakis, N., Antoniou, P., Giannousi, M., Zetou, E., & Kioumourtzoglou, E. (2011). Comparing hybrid learning with traditional approaches on learning the Microsoft Office PowerPoint 2003 program in tertiary education. *Computers & Education*, 56(1), 44–52. <https://doi.org/10.1016/j.compedu.2010.08.007>