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3-D SKETCHUP STEEL STRUCTURAL ANIMATION VIDEO

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ABSTRACT

Colleges and universities have been using traditional approaches in teaching and learning using printed drawings and whiteboard hand sketches to understand construction drawings. These approaches may be good for students with good imaginary thinking but not for students lacking imaginary skills. The survey result focusing on the steel structural topic under Measurement of Construction Works IV (DQS251), shows that this topic has a low understanding level among the students if this topic is being lectured only by using printed and hand sketched drawings. Thus, 3-D SketchUp design software is used to create 3-D animations based on the previous examination question of the course on the selected topic of steel structure. The animation is then presented in class involving 58 students to increase the level of students' understanding of steel structural drawing. After the video presentation session, positive perceptions and feedback from the students were obtained through questionnaires and reflective assessment. To conclude, the steel structural video animation has proven to enhance students' understanding and visualisation skills on construction steel structural drawing and if designed properly will hopefully help to improve their understanding of drawing for this course.

Keyword: 3-D SketchUp, Animation, Steel Structure, Measurement

1.   INTRODUCTION

Nowadays, the majority of colleges and universities have been using traditional lecture methods in their teaching and learning processes by using printed drawings and whiteboard hand sketching to help students comprehend construction drawings. These types of drawings serve as visual guides for understanding construction plans. Though this approach may be good for some people with good imaginary thinking, it may not be so for students with a lack of imaginary and visuo-spatial skills.

In the construction education area, the ability to visualise a building is crucial to enable students to understand construction drawings. Students who lack imaginary and visuospatial skills might find it hard to visualise construction elements (Glick, Porter, & Smith, 2012). Even in the medical education sector, students frequently struggle to visualise three‑dimensional or 3D anatomy just by referring to two‑dimensional or 2D images found in anatomy books and images online (Battulga et al., 2012; Berney et al., 2015). Hence, the importance of having 3-dimensional video animation technology helps improve students' drawing or image understanding and visuospatial skills.

In this research, the focus is placed on UiTM Quantity Surveying students to improve their understanding and visuospatial skills to facilitate them throughout their study. During the course of the

Diploma in Quantity Surveying, the students need to register a core subject of DQS251 (Measurement of Construction Works IV) which consists of 4 main sections. Most of the sections of the topics listed are based on drawing and measurement and Steel Structural Works is seen to be the most difficult to understand due to it involves technical construction drawing to be understood among the students. Therefore, it is a necessity for this research to determine the resolution to improve students' visuospatial skills. This will hopefully improve and produce better-quality Quantity Surveying graduates from UiTM which will help increase their marketability in the future.

2.   MATERIALS & METHODOLOGY

The study was conducted concerning the element of Steel Structural Works. A purposive sampling method survey is used which refers to a group that has characteristics desired by the researcher. The purposive sampling method was adopted in this exercise as the selected respondents were from the fourth semester of Diploma in Quantity Surveying students.

2.1 Product Objectives

The objectives of the development of 3-D SketchUp Animation Video are as follows:
   a) To identify the difficult topic faced by the students if only taught by using printed or hand sketching.
   b) To develop a 3-D animation video to develop visuospatial and drawing understanding skills.

2.2 Benefit to Society

The 3-D SketchUp animation video will be of value to Quantity Surveying students from public and private universities in Malaysia which will improve the level of the students' visuo-spatial skills. This will help students improve their skills and ability for measurement especially during the working phase.

2.3 Novelty and Uniqueness

There are many videos and animations posted online regarding the construction industry, however, none of these videos were found to give both 2-D and 3-D dimensional views. This makes it hard for the students to imagine and understand the relation between 2-D construction plan drawing with real-life construction. The novelty of this 3-D SketchUp animation video is served in continuation of teaching and learning for the student's improvement in imaginative capability and their visuospatial skills.

2.4 Research Development

The research development was as follows:

Figure 1 Research development in accomplishing the innovation.

Figure 2 & 3 Steel Structural construction drawing studying and video animation viewing process

3.   RESULTS & DISCUSSION

A pilot study conducted by discussion with team teaching found that students had issues understanding the details of Steel Structural drawing through printed drawing. Therefore, the need to use effective teaching and learning methods, by using 3-dimensional visualisation tools to improve students' understanding and measurement skills through 3D SketchUp animation steel structure drawings. Then, two sets of questionnaires were distributed to second-year students (fourth semester) of the Diploma in Quantity Surveying program to gauge their improvement in understanding Steel Structural drawing before and after viewing the 3-D SketchUp animation. The results and discussions are presented below.
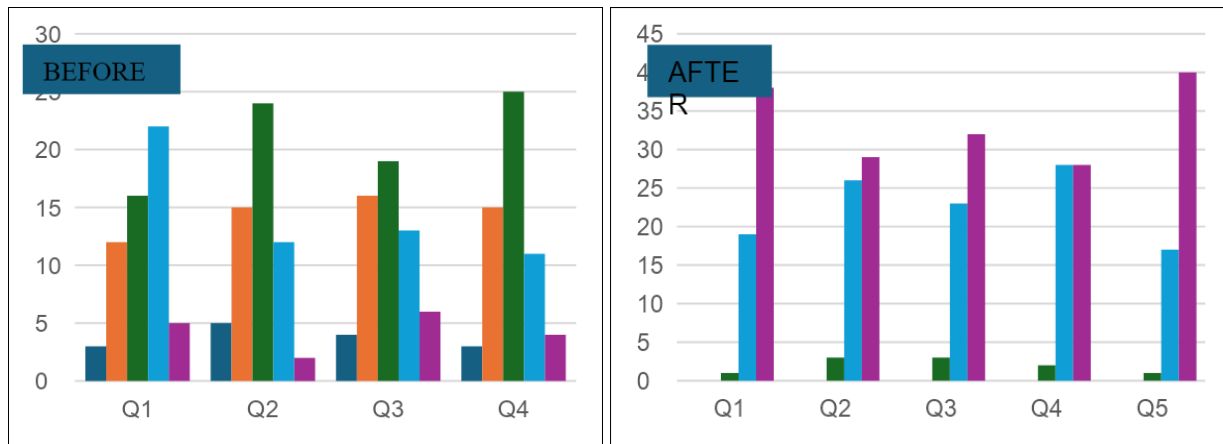
Figure 4 & 5 Students understanding on the Steel Structural drawing before and after viewing 3-D SketchUp animation video

Based on Figure 4, the result indicated that the majority of the students were not quite sure (Neutral) which represents 43% (25) regarding the details of the steel structural drawing in the early stage of viewing the drawing. Some did not agree that they could understand the steel structural drawing. Figure 5 presented the level of students' understanding as more than 90% of the students rated 'Agree' and 'Strongly Agree' in all the questions regarding their understanding of the steel structural drawing after viewing the animation video. This shows that a new approach needs to be implemented to ensure that students can understand technical drawing better and more effectively.

After the viewing of the 3-D SketchUp animation video ended, a reflection session was carried out by the organizer to identify any parts of the drawing which were still not understandable by students. Students' feedback on this video was also obtained from their comments given through a Google form questionnaire survey. Having their feedback is crucial to improve the video animation created thus enhancing the way of teaching and learning being held in future learning processes of students.

Very helpful
Clear
Sangat bagus
It's really help
Sangat membantu
banyakkan 3d animation hehe
Completely groundbreaking 3D animation, outstanding style of animation, can't wait for it's second season
easier to understand and very helpful
Make me easier to understand. Real no cap
sangat membantu
It is really helps the students who cannot imagine how the drawing is present.
this 3D animation make my mind realize about the drawing
Easy to understand. Helpful to improve my point of view of the drawing.
Video amat membantu cuma perlukan label kepada setiap compenent berikut
i understand easily the drawing after watch the 3D animation
Easy to understand and can consume to my assignment measurements soon
need more 3D animation in class for a better learning progress

Figure 6 Feedback regarding the 3-D SketchUp animation video

Figure 6 shows the students' feedback regarding the 3-D animation video from their perspective. Other than the feedback given through the Google Form questionnaire survey, students also verbally stated that this 3-D SketchUp video does help in improving their understanding of construction drawings. This supports the statement by Glick, Porter, and Smith (2012) that 3-D modeling helps improve students' understanding of new and challenging learning content.

4.   CONCLUSION

The development of the 3-D SketchUp animation for Steel Structural Drawings has been proven to help resolve the understanding of Steel Structural construction drawing issues. Technically, this product has undergone empirical testing via a questionnaire to provide an effective and holistic approach for the teaching and learning process. This product provides benefits and added value to university lecturers and students to ensure an improved level of students' understanding of construction drawings. Overall, the objectives of this project have been successfully achieved and hopefully, it can be implemented for other elements as well.

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