Journal of Education and Practice
ISSN 2222-1735 (Paper) ISSN 2222-288X (Online)
Vol 3, No 11, 2012

Innovative Teaching: Using Video Demonstration for Classroom Teaching and Learning Engineering Surveying

Goh Boon Hoe* Yeong Tuck Wai
University of Nottingham (Malaysia Campus), Jalan Broga, 43500 Semenyih, Malaysia
* E-mail of the corresponding author: Boon-Hoe.Goh@nottingham.edu.my

Abstract
Teaching Engineering Surveying in university without demonstrating any surveying instrument is a challenging task. Students are unable to visualise the principle and operation of surveying instruments and as a result, they are incapable of measuring and collecting land surveying data, even if they are able to perform calculations and design engineering works appropriately. Moreover, due to the growth of student numbers and limited ~~of~~ supporting resources in university, academicians always face difficulties to explain and guide engineering students to operate the instruments effectively. To enhance and encourage an effective learning environment, an attempt has been made to incorporate video clips into normal lecture hours. This paper describes the efforts made by Department of Civil Engineering in the University of Nottingham (Malaysia Campus), to introduce video clips for demonstrating the surveying instruments (level and total station), as supplement for student learning.
Keywords: Teaching Methods, Engineering Surveying, Video clips, Level, Total Station.

1. Introduction

Engineering Surveying is a Year 1 Semester 2 module introduced in BEng/MEng in Civil Engineering, in University of Nottingham. The main objective of this module is to engage students with technical knowledge in the principle of land surveying, operation of surveying instruments (level and total station) and its associated calculation. These knowledge and skills are required in the 1-week Survey Field Course, conducted during Summer semester as one of the problem based learning module.

Engineering Surveying is a compulsory module in Civil Engineering programme that require hands-on skills to handle surveying instruments for measuring and calculating construction features. This module comprises of two essential elements, which are theory and practical, both equally important for students' learning and understanding. Insufficient practical exercises on field will cause students to be unable to appreciate the theory and principles behind this module. Hence, practical session must be conducted correctly and effectively to strengthen students fundamental in engineering surveying.

The recent increase in student intake has led to a corresponding increase in the number of students per practical group. This has resulted in a shortening of time available for direct supervision and guidance to use surveying instruments, such as levelling instrument and total station.

Often, students find it difficult to understand the operation of surveying instruments during lecture hour, without the presence of actual instruments. These instruments are difficult to set-up in the classroom environment and even if one managed to do so, it is not always visible to everyone due to large size of class. Therefore, lecturers need to rely instead on field demonstration and practical session to assist their teaching on this aspect. Unfortunately, field demonstration must be conducted several times and sufficient guidance must be given to ensure all students in their group are capable to operate these instruments independently. It is fairly labour intensive and time consuming to achieve the teaching and learning objectives. Combination of the constraints and difficulties result in the students losing interest in learning, as well as a decline in the teaching quality of lecturers. Video demonstration is globally recognized as an interactive teaching aid to promote effective teaching and learning (Dolars and Melinda, 2011; Kassie, 2011). By incorporating this effort into Engineering Surveying module, teaching will be more interesting and effective in classroom environment (Sharon et. al, 2009). Practical session can be easily conducted and monitored with minimum support from technician.

The main idea of solving the existing problems is to introduce the video demonstration on surveying instruments during lecture hour, in order to enhance students' learning (Kuo et. al, 2007). It can also be served as personal development for lecturer to create livelier and more conducive learning environment. This paper discusses on the introduction of video demonstration on operating the engineering surveying instruments during lecture hour to support and enhance students learning.

2. Teaching and Learning Activity

The teaching activity involved in this study can be subdivided into three major tasks: (1) Video production; (2) Video demonstration in classroom; (3) Performance in Surveying Practical Session and (4) Feedbacks from students.

2.1 Video Production

The intention of incorporating the video demonstration has been presented and assistance has been allocated. Two videos were created; the first video content is to set-up a levelling instrument and demonstrates the basic procedures to collect field data, such as determine the elevation of ground and building. Meanwhile, the second video will be more sophisticated to demonstrate the application of total station. Step-by-step procedures to set-up the total station and measuring methods were included into this video. With the assistance of technician as cameraman, the entire procedure was captured while demonstrating on field. The video was edited and two short video clips were created (see below for the print screen of both video clips).

Figure 1 : Print screen of Setting-up Levelling Instrument Video Clips (18 minutes duration with size of 102,469 kb, in windows media video format)

Figure 2 : Print screen of Setting-up Total Station Video Clips (13 minutes duration with size of 279,856 kb, in windows media video format)

2.2 Video Demonstration in Classroom

The main idea of this video production is to assist students' understanding and prepare them for practical session. During lecture hour in class, these videos were displayed several times, with step-by-step explanation, after the

introduction of surveying instruments (levelling and total station), without the presence and display of real instruments. This allows students to visualize and familiarize with these instruments even without touching or operating the instruments. Students' reaction and response were observed during and after the video session.

2.3 Surveying Practical Session

During the practical session, students were divided into several groups of seven members each. Each group was assigned a level and a total station, both on loan basis. Apart from this, a printed instruction on the procedure to set-up both instruments and another on tasks of the day were issued, as their activity for the practical session. Before they can start their works, everyone was gathered and a real demonstration was done to enhance their understanding. After the field demonstration, students were required to initiate their practical activity within the specified timeframe.

2.4 Feedbacks from Students

Qualitative study was conducted in this study by compiling the students' feedbacks and comments. At the end of the practical session, students were gathered again and feedbacks on this teaching approach were collected.

3. Results and Discussion

3.1 During 2-hours Lecture in Classroom

Before displaying the video clips, the lecture was mainly emphasizing on the explanation of surveying instruments with the aids of photos and illustrations. Not many questions were asked at that moment for it was difficult to visualize the instruments. Some students drifted their attention to read the printed lecture notes rather than to participate in class; few students started talking and interrupting the class. The major issue was, they could not really appreciate in learning this particular topic by looking at the photo or illustrations, and they had difficulties to concentrate when they had lost their interests at this topic.

However, this situation was obviously improved when the video clips were displayed. Students tend to concentrate when there were animation graphics shown to them. Everyone was surprised with these video clips and developed their curiosity on this topic spontaneously. They enjoyed the videos and demanded to repeat several times in order to have a good view and understanding of these surveying instruments. Students were actively participating in discussion after the display; they asked questions in relation to these instruments and their usage, and responded to questions aggressively.

The ambience of learning environment was absolutely different and had changed before-and-after displaying the video. Inevitably, some irrelevant questions were raised, such as the quality of video, location of shooting, etc. Since the author is the demonstrator in the video clips, the author found that students were more confident to participate in the conversation and discussion.

3.2 During Practical Session on field

The assembly of students for briefing was easily conducted. Students seem to be confident with the objectives of the practical session, they were well prepared and they knew roughly what had to be done during the practical session. Even before the demonstration, students attempted to try on the setting-up and operation of surveying instruments on their own, without any guidance. Looking at this situation, the demonstration was made once only in front of all groups, instead of group-to-group demonstration and supervision.

The demonstrators also realised that, this group of practical session was easily conducted as compared to previous batches. The briefing and demonstration were quicker than previous batches and students were cooperative and active in participating.

After the briefing, students were split according to their group to start their practical session. On average, all groups took less than 45 minutes to set-up both instruments, with minimum guidance and supervision. In previous batches, their seniors took more than an hour to complete the similar tasks, which required longer supervision period. This was observed and confirmed by their seniors present during the practical session. It's observed that students tend to be more independent, confident and competent in the current group of practical session as compared to previous batches.

Before dismissing the practical session of the day, students were invited to response and provide feedbacks on this teaching approach. The compiled comments are as follows:

1) Watching videos in class was comfortable and they could easily concentrate on learning, without distraction of surrounding environment, such as hot weather, noises, etc.
2) Watching videos in class allowed students to overview and visualize the learning objectives clearly.
3) Video demonstration was displayed on big screen in class and everyone was able to observe clearly the whole process and details, which was totally different on field demonstration. Sighting was limited when demonstration on field and hearing was distracted due to open space.
4) Students found it interesting in learning with this approach and very time efficient. They were able to learn something that was complicated and sophisticated in the shortest duration.

5) Students were confident and knew the expectations prior to practical session, after attending the video demonstration lecture class.
6) Students were more confident and trusted on their lecturer and instructor for the commitment of teaching.
7) Students didn't need much guidance and supervision since they could clearly understand the instructions of practical session.
8) Teamwork was improved and the communication within group members was established, since everyone was clear of their role.
9) Some students demanded to repeat the field demonstration at least twice to help their understanding.
10) Some suggested incorporating the subtitle and explanation in both video clips.
11) Some requested to display the real surveying instruments simultaneously with video demonstration in class.

Some findings are almost similar as reported by Francisco et. al (2003), Dolors and Melinda (2011) and Peter and Tim (2000).

4 Reflection on Teaching Approach

Video demonstration in class prior to practical session creates a good platform for teaching development. In general, observation has shown that this teaching approach is cost effective and time efficient. Although the production of video is time and labour intensive, however this effort is worthwhile for effective learning. The production of video is one time effort of preparation, but it can be used repeatedly by all lecturers, at anytime, anyplace to enhance their teaching, and it can be considered as part of the knowledge transfer.

Using this teaching approach, the class and lecture will be more interesting and indirectly, encouraging two ways communication of students with lecturer. When students developed their confidence and interest, they tend to participate in class by questioning or answering.

Apart from this, introducing such alternative teaching approach enables the lecturer to gain the trust and confidence from students, as well as capture their attention in class.

Incorporating animation graphic or video in teaching slides to differentiate from the conventional teaching materials (purely based on text and static illustration), enables the lecturer to gain the trust and confidence from students, as well as increase student attention in class. Motion graphic really motivates students' attention to learn. To make this effort more successful, perhaps bring along the instruments to class and demonstrate simultaneously with video will achieve better learning effort. However, we should balance the time appropriately for lecture and practical session. We cannot ignore the theory behind the topic by overstressing on the practical part. Some students recommended to include the English subtitle in the video clips, together with audio explanation from lecturer will improve the video production.

On practical session, the amount of demonstration can be reduced effectively even with the large class of students. Students have very clear vision on the aim of the practical and very confident of their work. However, the video demonstration should not be the substitute of field demonstration. Field demonstration is still required to ensure students' understanding and remind them on the objectives of the practical. When the frequency of field demonstration declines, the effort of supervision reduces as well, with minimum guidance required by students.

Based on the performance of previous batch of students, some comparisons can be made. In previous semester before the introduction of video demonstration, field demonstration was conducted several times to ensure students' capability to operate on their own. Even with field demonstration, students were still seeking for supervision and assistance during the practical session. On average, they took approximately an hour to completely set-up the surveying instruments, such as the level and total station. Current batch took lesser time with minimum guidance to complete the similar tasks. Furthermore, the current batch worked in team perfectly and communicated well as a group. Everyone was very clear on his/her individual role in practical session, which was lacking in the previous batch. The most impressive performance of current batch was they did fewer mistakes in setting-up and operating the instruments.

On the other hand, there were a few negative aspects that had to be addressed in the practical session. For some students, video and field demonstrations were redundant efforts and they were unwilling to pay attention. They ignored the field demonstration and turned their attention to do other matters. However, it doesn't mean that they don't understand. They were over-confident and reluctant to engage with new knowledge. I always find this group of students face difficulty to fit in their group and communicate with their group members.

5. Conclusion and Recommendations

The introduction of video demonstration in class has greatly improved the learning of students to gain substantial knowledge and enhanced the teaching of lecturer. The intention of video demonstration is not to substitute the

conventional field demonstration, but is served as an option to overcome current constraints of learning and management.

The major advantage of this teaching approach not only improves the students learning, but it can be adopted by other new lecturers to improve their teaching. New or fresh lecturer always struggle on their first time teaching. They need to perform and maintain the quality of previous lecturer. Using this video as their pre-teaching aid, the quality of teaching on the surveying instruments will be consistent and more effective, even if they are teaching for the first time.

The initial stage of video production is to investigate the effectiveness of using video demonstration in class, hence the video is captured by normal camera with low resolution. The videos are then edited with simple software that does not enable the insertion of English subtitle. By incorporating these limitations, the quality of video clips can be upgraded and the teaching will be more effective (Peter and Tim, 2000). Secondly, the video clips can be uploaded to internet to make it accessible to all students for their early preparation (Sharon et. al, 2009). This innovative teaching aid can be extended by widening the accessibility of users and they will find it beneficial in adoption to their teaching and learning.

References

Dolors Masats, Melinda Dooly. (2011). Rethinking of use of Video in Teacher Education : A Holistic Approach. Volume 27, pages 1511–1162. Teaching and Teacher Education.

Francisco A. Candelas, Santiago T. Puente, Fernando Torres, Francisco G. Ortiz, Pablo Gil, Jorge Pomares. (2003). A Virtual Laboratory for Teaching Robotics. Volume 19, No. 3, pages 363-370. International Journal Engineering Education.

Hui-Lung Kuo, Shih-Chung Kang, Cho-Chieu Lu, Shang-Hsien Hsieh, Yong-Huang Lin. (2007). Feasibility Study : Using A Virtual Surveying Instrument in Surveyor Training. International Conference on Engineering Education – ICEE 2007.

Kassie McKenny. Using an online video to teach nursing skills. (2011). Volume 6, Issue 4, October 2011, pages 172–175. Teaching and Learning in Nursing.

Peter Walker, Tim Ibell. (2000) Case study – Concrete Laboratory Teaching Video. Teaching Development Fund 1999/2000. University of Bath.

Sharon G Brown, Peter J Lakin, Richard J Latham. (2009). Case Study – Use of Video Clips in a Virtual Learning Environment to enhance the Learning experience of our students. Volume XXXVIII-6/W7, 2009. Proceedings of the ISPRS working group VI/1 - VI/2, E-Learning Tools, Techniques and Applications.