

# Developing a learning video of the total station for building stake out

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**Abstract.** This study aims to develop a learning video of the total station for building stake out, and evaluating its feasibility. This study applied a Define, Design, Develop and Disseminate (4D) research and development model by Thiagarajan. The findings are as follows. (1) The developed product is a learning video of 351,690 kilobyte (KB) in an MP4 format with the duration of 10 minutes 18 seconds. (2) The feasibility scores of the developed learning video, on a scale of 1-4, are 3.64 by the learning media expert, 3.64 by the learning material expert, and 3.24 by the students.

## 1. Introduction

Construction works such as building and road constructions need measurement especially for stake out phase. The stake out process include mainly the measurement to lay out the construction points in the planned field. Stake out is an initial step on each construction work including building construction. There are some methods for building stake out and one of them is the coordinate method being applied in this study.

Based on the technology development for the stake out, the use of optical-conventional devices has shifted to digital electronics such as total station. This shift has been triggered by effectiveness and efficiency consideration. Total station is a combination of the angle and distance-measuring equipment.

The competency demands related to the total station use for construction work should be met, so vocational education remains relevant to the industry. However, the topic on conventional-optical device use cannot be easily removed from the syllabus of the Geomatics subject. It is due to an easier adaptation to move from conventional-optical to digital-electronic measuring equipment, compared to the other way around. Moreover, some schools or industries still use conventional-optical measuring equipment.

Regarding the allocated time for students, a dilemma has appeared. If the practicum topic on total station use for stake out is added, it will significantly reduce the time to master the other topics. Taking into account this, it is necessary to accommodate the additional topic about the total station use for stake out. Therefore, it is urgent to enhance the Geomatics topics without time allocated addition, by exploring more effective learning media.



Audio visual media in the form of learning videos can be used to accommodate these needs. On the internet nowadays, like on *youtube.com*, there have been many videos about the total station for construction works. However, the existing videos have not completely applied the learning standard, such as the learning objectives, the learners, the learning preconditions, and the learning implementation. Furthermore, the manual of the total station equipment, which can be downloaded, cannot be easily understood by students.

To clearly show the work stages in the vocational learning, a video can be employed [1]. Animation in videos can provide illustrations of fast and invisible processes. For example, due to a relatively small tool, a process is hidden by the person. Information obtained by the students through knowledge construction and understanding will be stored in the long-term memory [2].

As mentioned in the competencies in Geomatics subject, students should be able to stake out construction plan. In addition, the students of Civil Engineering and Planning Education Department should master the competencies to plan the construction works and to teach the construction vocational students.

A screencast-based spreadsheet learning media has been developed [3]. The development is carried out in the following stages: (1) preparation of the needed devices and materials; (2) recording all activities carried out on the monitor screen; (3) editing by adding text, audio or narration, zoom and animation effects; (4) publishing by creating the video into one unit and converting it into mp4 format, and (5) finishing by making quizzes and combining them with the video.

A learning video of the total station set up has produced to improve the students' competencies in geomatics practicum [4]. The learning video, developed through this study, consists of five main components including opening page, introduction, table of contents, materials, and closing page. The dissemination of the developed media were conducted by implementing the video in Geomatics Practicum and uploading it on *youtube.com*.

A study has proven the effectiveness of instructional media using Digital Video Disc (DVD) and videos in nutrition education [5]. The result indicates the learning outcomes of the instructional media using DVD and videos was higher than using handouts. The media is able to improve the learning outcomes of nutrition education including the knowledge and the skills.

A study of the trainee teachers in Morocco, the learning activities using video may constitute 79% of their activities, consisting of 59% video clip (content) and 20% YouTube (shared video) [6]. The other activities include assignment (12%), note-taking (5%), and discussion (4%).

The learning media can be used to convey knowledge and skills. The video can deliver the learning materials, so the learning approach shifts from teacher-centered to learner-centered, the teacher as a facilitator and students as the actors in the learning process. This study aims to develop a learning video of the total station for building stake out and evaluate its feasibility.

## 2. Method

This study employed four main stages, namely defining, designing, developing, and disseminating (4D) research and development model according to Thiagarajan [7]. The subjects of this study were the students in the Civil Engineering and Planning Education Department, Faculty of Engineering, Universitas Negeri Yogyakarta, having had the Geomatics Practicum II course. The objective of this study was to develop a learning video of the total station for building stake out. The data were collected to evaluate the feasibility of the developed media. Furthermore, the data were collected by observation, questionnaires, and interviews.

The data were analyzed qualitatively and quantitatively. A qualitative descriptive analysis was applied to the observation and interview data. The questionnaire data were analyzed using a quantitative descriptive analysis. The results of the analysis were used as the input to revise the developed learning video.

The quantitative analysis was applied on the questionnaire data. The data were in the assessment scale forms consisting of four scales, namely very feasible, feasible, quite feasible, and less feasible. The data analysis was in the following stages: (1) data tabulation, obtained from the media assessment

items from each expert and users, and (2) calculation on the average total score of each assessment aspect. The questionnaires used the options of strongly agree (4), agree (3), disagree (2), and strongly disagree (1).

### 3. Research findings and discussions

The developed product is a learning video of 351,690 kilobyte (KB) in an MP4 format with the duration of 10 minutes 18 seconds. The video has been published and can be accessed in <https://www.youtube.com/watch?v=dQvyVaWSC-k&t=102s>. The produced learning video describes the steps of total station using for building stake out. The video combines moving the pictures of the equipment using, supporting pictures, informative texts, and the appearance of total station simulator. The video can also be played using Windows 7, Windows 8, Windows 10, and the standard android system smartphone.

The product of the developed learning video includes the following four components: (1) opening page (0.50 minute), containing the title and learning objectives; (2) introduction (2.75 minutes), containing a description of total station, working safety matters, the equipment used, and the components of total station; (3) core video material (6.50 minutes); and (4) closing page (0.50 minute), containing the acknowledgement and message to the user. The core video material is demonstrations of: (1) setting up the tripod; (2) mounting the total station on the tripod; (3) leveling and centering the total station on the measuring point; (4) explaining the stake out point names; (5) setting the job and measurement on the total station menus; (6) explaining the stake out drawing; (7) explaining the building axis calculation table; (8) measuring the reference line; (9) choosing the stake out method on the total station menu; (10) inputting the stake out data, and (11) staking out the building axis points.

The validation by the learning material expert is based on the four aspects, namely learning objective, material delivery, material relevance, and students' competence level. With a scale of 1-4, 10 indicators obtain a score of 4, and four indicators achieve a score of 3. Overall, the feasibility score by the learning material expert is 3.64. However, before implemented, the learning media needs to be evaluated and improved based on the material expert's advice.

The validation was also conducted by the learning media expert in terms of three aspects, namely software engineering, learning design, and visual communication. With a scale of 1-4, 16 indicators obtain a score of 4, nine indicators achieve a score of 3, and three indicators only achieve a score of 3. Overall, the feasibility score given by the learning media expert was 3.46. Therefore, before implemented, the learning media needs to be evaluated and improved based on the media expert's input.

The data collection regarding the product feasibility analysis used questionnaires filled by the users. The users were the students having had the Geomatics Practicum II, after watching the developed learning video. There were two aspects assessed, namely material and media aspects.

The score of the overall feasibility assessment by the users is 3.24 on a scale of 1-4. The seven indicators scoring less than 3.00 are presented on Table 1. All of them are included in media aspects.

**Table 1.** Indicators scoring less than 3.00 by the users.

	Indicators	Average Scores
1	The video does not need high specification software.	2.82
2	The video is effective to make the students easier in understanding the material in a relatively short time.	2.94
3	The learning strategy used in the video has been appropriate.	2.76
4	The texts in the video are clearly read.	2.71
5	The pictures quality can be clearly observed.	2.94
6	The video appearance is simple but attracting the student attention.	2.76
7	The voice in the video can be clearly heard.	2.65

The feasibility scores of the learning video, in the 1-4 rating scale, are 3.64 by the material expert and 3.46 by the media expert. However, the score by the users only 3.24. There are even seven indicators scored less than 3.00. The less scores by the students than those of the teachers are common in learning media utilization, such as in the content aspect of mobile learning [8].

Considering the students are the main users of the developed video, improvements are needed. The video should be improved based on the inputs by those users. The inputs from the users can be categorized into two groups, namely the voices, the pictures and the texts that need to be made clearer, and the explanations that need to be made easier to understand.

The users' responses to this learning media indicated that they agree to use the learning video. Nevertheless, regarding the lower score of the media aspects by the users, the learning video cannot completely replace the roles of the lecturer in explaining and demonstrating the material, but it just complement and assist the learning process. It could be said that the learning video can be used as a supplementary material, it cannot substitute the explanation and demonstration by the lecturer. A similar research proves that video tutorial applied in the learning process does not completely replace but support the learning of theory and module [9].

#### 4. Conclusion

The conclusions of this study are as follows. (1) The developed product is a learning video of the total station for building stake out of 351,690 kilobyte (KB) in an MP4 format with the duration of 10 minutes 18 seconds (2) The feasibility scores of the developed learning video, on a scale of 1-4, are as follows. (a) The score by the learning media expert is 3.64, based on the aspects of software engineering, learning design, and visual communication. (b) The score by the learning material expert is 3.64, based on the aspects of learning objective, material delivery, material relevance, and students' competence level. (c) The score by the users is 3.24, based on the material and media aspects. In addition, the students' responses to this learning media indicate that they agree to use the video. However, the use of the learning video cannot completely replace the explanation and demonstration by the lecturer, but it can be the supplementary material in their learning process.

## 5. References

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