Developing a learning video of the total station set up to improve the students’ competencies in geomatics practicum

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Abstract. This study aimed to develop a learning video of the total station set up, trying out, and evaluating the feasibility of it. This study applied a Define, Design, Develop and Disseminate (4D) research and development model by Thiagarajan. The findings are as follows. (1) The learning video, developed through this study, consists of five main components including opening page, introduction, table of contents, materials, and closing page. (2) The dissemination of the developed media were conducted by implementing the video in Geomatics Practicum. (3) The feasibility of the developed learning video, using 1-4 scale, were scored 3.62 by the learning material expert and 3.44 by the learning media expert. However, the score by the users in Geomatics Practicum was only 3.14.

1. Introduction

Surveying and mapping works, the main topics of Geomatics, are carried out to obtain spatial data and information which are generally presented in maps. These works include three stages, namely data collection, data processing, and data display. Based on the technology development for the terrestrial data collection, the use of optical-conventional devices has shifted to digital electronics such as total station. Total station is a combination of the angle and distance-measuring equipment.

The competency demands related to the total station use should be met, so vocational education remains relevant to the industrial world. However, the topic on conventional-optical device use cannot be easily removed in Geomatics Practicum. 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 practicum, a dilemma has appeared. If the practicum topic on total station use is added, it will significantly reduce the time to master conventional-optical equipment. Taking into account this, it is necessary to accommodate the additional practicum topic about the total station use. Therefore, it is urgent to enhance the practicum 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 set up. However, the existing videos have not completely applied the learning standard. For example, it is not clear about what the learning objectives are, who the learners are, how the learning preconditions are, and how the learning implementation and evaluation are. 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 safety reason, the process is covered by a case. 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 Practicum, students should be able to carry out surveying and mapping works. In addition, the students of Civil Engineering and Planning Education Department should master the competencies of surveying and mapping to plan the construction works, and to teach the construction vocational students.

A screen cast-based spreadsheet learning media has been developed [3]. The development is carried out in the following stages: (1) preparation (the devices and materials needed are prepared); (2) recording (all activities carried out on the monitor screen are recorded); (3) editing (text, audio or narration, zoom and animation effects are added); (4) publishing (the video is created into one unit and converted into mp4 format, and (5) finishing (quizzes are made and combined with the video).

A multimedia-based interactive media in the Basic Electricity course has been developed [4]. The development stages are: (1) conducting a needs analysis, (2) designing, (3) translating the design module into an application, (4) testing the learning media software, (5) trying out the product, and (6) evaluating the learning media based on the user’ input.

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: (1) develop a learning video of the total station set up to improve the students’ competencies in Geomatics Practicum, (2) try out, and (3) evaluate the feasibility of the product.

2. Method

This study employed four main stages, namely defining, designing, developing, and disseminating (4D) research and development model according to Thiagarajan [5]. The subjects of this study were the students in the Civil Engineering and Planning Education Department, Faculty of Engineering, Yogyakarta State University, taking the Geomatics Practicum II course. The objective of this study was to develop a learning video of the total station set up. 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 feasible, quite feasible, less feasible, and not feasible. The data analysis was in the following stages: (1) data tabulation, obtained from the media assessment items from each expert, 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.

3. Result and Discussions

The developed product is a learning video of 724,902 kilobyte (KB) in an MP4 format with the duration of 10 minutes 6 seconds. The video can be accessed in https://www.youtube.com/watch?v=UxWfoxRskDM. The contents of the learning media emphasize the introduction of equipment used in the total station such as tripod, reflector prism, thumbtack, and
umbrella. Furthermore, the total station set up is explained, as well as how to set up the tripod, set the total station on the tripod, get the total station ready to measure, and read the measurement.

The product of the designed and systematic media development includes the following components: (1) opening page, containing the title, design team, competencies, and objectives; (2) introduction, containing a description of the competencies and objectives of the learning media; (3) video materials, containing an explanation of the total station use, starting from determining the measuring point, setting the instrument on the tripod, centering the total station to the measuring point, setting the total station to be ready to measure, and reading the measurement; and (4) closing page, containing the acknowledgement to the user.

The validation by the learning material expert is based on the three aspects, namely learning objective, material delivery, and motivation quality. With a scale of 1-4, eight indicators obtain a score of 4, and five indicators achieve a score of 3. Overall, the feasibility score by the learning material expert is 3.62. 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, twelve indicators obtain a score of 4, and fifteen indicators achieve a score of 3. Overall, the feasibility score given by the learning media expert was 3.44. However, 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 participating in the Geomatics Practicum II, after watching the developed learning video. There were four aspects assessed, namely generality, material, appearance, and learning.

The score of the overall feasibility assessment by the users is 3.14 on a scale of 1-4. The three indicators scoring less than 3.00 are presented on Table 1.

| Indicators                                                                 | Average Scores |
|---------------------------------------------------------------------------|----------------|
| 1  The material presented in the learning video attracts the students’    | 2.47           |
|    interest to learn further materials.                                  |                |
| 2  The material presented in the learning video is easy to understand.    | 2.88           |
| 3  The material scope presented in the learning video is sufficient for   | 2.88           |
|    the students to learn the next material.                             |                |

The feasibility scores of the learning video, in the 1-4 rating scale, are 3.62 by the material expert and 3.44 by the media expert. However, the score by the users only 3.14. There are even three indicators scored less than 3.00.

The inputs from the users can be categorized into two groups, namely the sounds that need to be clarified and harmonized, and the explanations that need to be made more detailed and easier to understand. In addition, the users’ responses to this learning media showed that they agree to use the learning video. Nevertheless, regarding the low score by the users, the learning video cannot replace the explanation and demonstration by the lecturer, but it complement and assist the learning process. It
is said that the learning video can only be used as the supplementary material, because it cannot substitute the explanation and demonstration by the lecturer.

4. Conclusion

The conclusions of this study are as follows. (1) The learning video of the total station use to improve the students’ competencies in Geomatics Practicum has been developed. (2) The learning media has five main components such as opening page, introduction, table of content, video materials, and closing page. (3) 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 3.44, based on the aspects of software engineering, learning design, and visual communication. (b) The score by the learning material expert is 3.62, based on the aspects of learning objectives, material delivery, and motivation quality. (c) The score by the users is 3.14, based on all of the aspects. In addition, the students’ responses to this learning media show 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

[1] Howe F and Staden C 2015 Work process oriented and multimedia-based learning in vocational education and training ed Gessler M and Freud L Crossing boundaries in vocational education and training: Innovative concepts for the 21st century. Conference Proceeding, Institute Technology and Education (Bremen: University of Bremen) p 25-32
[2] Santrock J W 2008 Psikologi Pendidikan Edisi kedua terjemahan Tri Wirnowo B S (Jakarta: Kencana Prenada Media Group)
[3] Munir M 2013 Analisis pengembangan media pembelajaran pengolah angka (spreadsheet) berbasis video screencast Jurnal Pendidikan Teknologi dan Kejuruan 21 (4) p 307-313
[4] Mustholiq I, Sukir and Chandra A 2007 Pengembangan media pembelajaran interaktif berbasis multimedia pada mata kuliah Dasar Listrik Jurnal Pendidikan Teknologi dan Kejuruan 16 (1) p 1-18
[5] Thiagarajan S, Semmel D D and Semmelpp M I 1974 Instructional Development for Training Teachers of Exceptional Children (Minnesotta: U.S. Office of Education)