ICT-based learning media development

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Abstract. This research aimed at developing ICT-based learning media for independent learning. The subjects of the research were Mechanical Engineering students of Universitas Sarjanawiyata Tamansiswa. By adopting Borg & Gall’s research and development model, this research was done in four stages, namely: (1) identification stage; (2) design and development stage; (3) production stage; and (4) evaluation stage. Questionnaires were the instrument used for data collection techniques, and the descriptive quantitative method was the data analysis technique. The results of the development of ICT-based learning media earned positive appraisals on the ease of use aspect with a percentage of 50%, and the display aspect with a percentage of 62.50%. In conclusion, ICT-based learning media that was developed on several vocational materials can be used as a learning media for independent learning.

1. Introduction

The learning process needs to be designed in such a way as to achieve the objectives of the expected learning or quality outcome. Internal and external factors can influence the learning process. Internal factors such as attitudes, outlook on life, feelings of pleasure and displeasure, habits, and experiences in students themselves. External factors are stimuli from outside the students themselves through the senses they have, especially hearing and vision; namely, the instructor (teacher), facilities, environment, learning media, and learning methods used. Higher education in the advanced era is demanded to have outcomes in each category, student outcomes being a measure of the quality of higher education. Therefore, in getting outcomes from students who can compete in the world of work, the learning process in which quality learning media factors become the most important thing. The low student achievement does not only depend on the student itself, but other factors can influence it, namely the media, the dominant print media which by some teachers is still used as teaching material that dominates the reference of learning in this digital age. According to [1], print media is not appropriate to use, and there are still shortcomings such as slow, less flexible, and slow access.

From the weaknesses of the print media will affect: 1) the lack of student motivation to learn to follow the teaching and learning process in the classroom; 2) students who do not have the spirit of learning cause students to be less able to accept and understand the material delivered by the teacher;
3) lack of attention or concentration of students towards what is conveyed by the teacher; 4) the absence of ICT-based learning media that fits the characteristics of the field of study.

Learning media as a means to improve the quality of education is very important in the learning process. The use of instructional media can enhance the learning process of students in the learning process, which in turn can enhance the learning outcomes achieved. There are several reasons why learning media can enhance student learning achievement. Some of the benefits of learning media, according to experts, are building conditions that make students able to obtain knowledge, skills, or attitudes through tools that are physically used to convey teaching material [2] [3].

From the benefits, according to experts, it is expected that learning media can be influential in; 1) teaching will attract more attention of students so that it can foster student motivation; 2) teaching materials will be more explicit in meaning so that they can be better understood by students, and enable students to better master learning objectives; 3) the learning method will be more varied, not merely verbal communication through words spoken by the teacher, so students are not bored and the teacher is not exhausted; 4) students do more learning activities, because not only listen to the teacher's description but also other activities such as observing, doing, demonstrating and others.

The use of smartphones among students is still often used only for activities outside of learning activities, and many problems arise from the use of smartphones in learning activities such as gaming, chat, browsing, streaming, etc., from these activities, result in learning activities not well directed, based on these problems the authors utilise smartphone technology to make learning media so that learning activities are more targeted, well-targeted, and can achieve the expected learning competencies. This study aims to develop a technological science in education to improve the effectiveness and efficiency of learning by using media development where the media to be used in this study is a Website or Blog. Researchers will convey how to develop the media for the achievement of good learning. Learning media can be in the form of Website / Blog and ICT-based media. When science and technology develop very rapidly, the learning process is no longer monopolised by the presence of teachers in the classroom [4] Students can learn anywhere and anytime. Students can learn anything according to their interests and learning styles. A learning designer is required to be able to design learning by utilising various types of media and appropriate learning resources so that the learning process takes place effectively and efficiently. To provide such learning experiences, teachers need tools such as films or photographs, and so on.

The word media comes from the Latin, which is a plural form of the word medium, which can be interpreted as an intermediary or introduction. It was revealed that the media is a channel of communication [5]. Derived from the Latin word for "between," the term refers "to anything that carries information between a source and a receiver. The physical means of conveying instructional content books, films, videotapes, etc. Briggs further stated that the media is a tool to provide stimulation for students so that the learning process occurs [4].

The term ICT emerged in the mid-20th century. ICT (Information and Communication Technology) includes two aspects, namely information technology and communication technology which are two inseparable concepts. Information technology includes all matters relating to the process, use as a tool, manipulation, and management of information. Communication technology is everything related to the use of tools to process and transfer data from one device to another. Information technology is a technology that combines computing (computer) with high-speed communication lines that carry data, voice, and video [6]. It is not only limited to computer technology (hardware and software) that is used to process and store information but also includes communication technology for sending information.

Teachers can utilise ICT-based learning media to (1) replace the old paradigm; (2) describes real-life applications; (3) explain things better; (4) overcoming real-life problems; (5) add colour to the subject; (6) breaking the monotony of lectures; (7) using audio-visual channels; (8) sharing teaching tools with other teachers; (9) organises lectures better; (10) ask students to be more involved; (11) attract other students' interests; (12) improve students' long-term memory or memories related to the material being taught; (12) as a collaborative platform [7] [8]. [9] Also stated that ICT could be
accepted as a paramount part of the (new) education system that is turning into an ever-increasing and more challenging system with new challenges in education, especially at the school level due to the expansion of education and development of universal world standard education. ICT can empower teachers and learners by facilitating communication and interaction, offering new modes of delivery, and generally transforming teaching-learning processes [10].

Success in utilising ICT learning media depends on the teacher's IT skills. This was revealed [11] in his research that there is a relationship between teachers having ICT skills that can personalise, engage, and create an interactive atmosphere for students and purposeful implementation of ICT into the classroom. Seeing the benefits of ICT in the world of education, this research aims to develop ICT-based learning media for learning independence.

2. Research Method
Research and Development Methods are research methods used to produce certain products and obtain their benefits. The development model used is a procedural model adapted from the instructional design development model according to Dick & Carey and the development research model according to Borg & Gall with the following development stages include: identification stage, design and development stage, production stage, and evaluation stage.

3. Results and Discussion
This type of research is research and development (RD). Research and Development Methods are research methods used to produce specific products and test the effectiveness of these products [12]. The development model used is a procedural model adapted from the instructional design development model, according to Dick & Carey and the development research model, according to Borg & Gall, with the following development stages:

3.1. Identification stage
The identification phase includes: (a) identification of the objectives, characteristics of students, technical expertise, facilities, and equipment, and (b) identification of the curriculum, to determine teaching material.

3.2. Design and development stage
This phase of the activity is to design and develop a program in the form of a design document according to the steps which were adapted from the Dick & Carey model, including the preparation of flow charts, scriptwriting, and storyboards.

3.3. The Design Stage
The stages of designing ICT learning media based on technical drawing materials include:
3.3.1. Collection and study of technical drawing material based on KKNI.
3.3.2. Development of Learning Media Structure Framework Based on the competency map, a learning media content framework is developed, this framework has described the overall content of the material included in the development product and the order of presentation that contains:
   • Title of chapter/section: Technical Drawing
   • Complete material components such as introduction, description, and cover.
   • Learning aspects which include competencies, material, product usage instructions, evaluation.
3.3.3. **Draft Writing**

Writing the initial product draft of learning media is done in a part-by-part manner according to the framework that has been prepared. In this step, the software design, which includes storyboarding and flowchart view, is generated. Flowchart view shows the logic flow of the material presented. This manuscript is a clear and detailed written explanation of the material to be presented. While the storyboard is a form of translation of the manuscript that is poured into the layer by frame display on paper. The storyboard in question is attached to the attachment page.

3.4. **Evaluation stage**

The evaluation phase is carried out by the steps:

3.4.1. **Validation and trials include:**

3.4.1.1. **Material expert validation**

The first validation is the assessment and assessment of the aspects of the appearance, content, and language of ICT-based learning media from academics with the results of expert assessment of the material can be summarised in the following diagram:

![Figure 1](image1.png)

**Figure 1.** Diagram of results of expert material evaluation on web quality

Based on Figure 1, it can be seen that the expert content assessment tends to be balanced on the material aspects with a percentage of 37.5% each. The Learning Strategy aspect gets a good rating with a percentage of 50%. Figure 1 Diagram of Teacher Material Assessment Results on Website Quality.

3.4.1.2. **The validity of instructional media experts**

Media expert lecturers who assess with the results of the assessment of media experts can be summarised in the following diagram:

![Figure 2](image2.png)

**Figure 2.** Diagram of results of media expert rating on website quality

Based on Fig. 2, it can be seen that the assessment of media experts tends to be useful in the communication aspect with a percentage of 60%, the technical design aspect gets a very good rating with a percentage of 50%.
with a percentage of 50%, while the display format aspect gets a good rating with a percentage of 66.70%.

3.4.2. Field trials

This field test is a trial of website-based learning media with a total of 20 students aiming to find out how difficult they are to understand the material and how to access website-based learning media. Field trial results are as follows:

![Figure 3. Diagram of the results of a learning media trial on website quality](image)

Based on Fig. 3, it can be seen that the blog-based learning media testing of students tends to be good in the aspect of understanding decline with a percentage of 50%, the display aspect gets a good rating with a percentage of 62.50%, while the aspect of learning independence is 53.70%.

- In the revision stage, there are two kinds, namely: (a) changes to the learning material in the presentation of instructional media. (b) The final product will obtain the results of the revision based on input from the trial.
- Dissemination Stage
  At this disseminate stage, the dissemination of learning media that has been produced is carried out.

4. Conclusions

ICT-based learning media for students can further enhance the learning process and learning independence. Material expert assessment got a good rating with a percentage of 37.5%, 50% on the Learning Strategy Aspects. The results of ICT-based learning media trials on students tend to be good on the aspect of ease of understanding with a percentage of 50%, the display aspect gets a good rating with a percentage of 62.50%, while the aspects of interest and attractiveness of the media get a good rating with a percentage of 53.70%.

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