

Determinant factors in multimedia-based e-learning design

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Abstract. E-learning as a learning media should be designed innovatively and interactively. E-learning will be effective if it carries learning materials comprehensively, with the ability to combine text, images, audios, music, animations, or videos in a unity that completes each other in order to achieve the learning objectives. This article aims at discussing determinant factors in the design of e-learning using multimedia in its learning process. The results show that the determinant factors in the design of multimedia-based e-learning include: display, good setting menu, completeness of information, clarity of media, interrelation of material, language usage, and levels of difficulty. Relating to e-learning flexibility, this study recommends that e-learning design should be able to be operated on both desktop device and smart phone.

1. Introduction

Learning is an effort to create conditions evoking student's initiative and role in learning. To achieve learning objectives, it is necessary to develop active, creative, and fun learning models in order to foster positive, disciplined, objective and persistent attitudes in learning process[1]. One of important learning components is proper selection of educational media. Learning media is anything that can be used to deliver messages from sender to recipient so as to stimulate learners' thoughts, feelings, attention, and interests and willingness in such a way that the learning process takes place in order to achieve the learning objectives effectively[2].

Currently, the development of science and technology is growing rapidly and brings ease in various fields[3]. Technology exists to improve the quality of human life [4]. Innovation in the development of learning media has encouraged the presence of ICT-based learning concept and mechanism. The concept now known as e-learning has changed the traditional learning through face-to-face in the classroom into the online-based one. The implementation of e-learning is flexible, can be tailored to the needs, as: supplements, complement, and/ or substitution of learning activities in the classroom [5]. In its application, e-learning generally provides a variety of learning media in the form of multimedia [6]. This study aims to discuss and analyze the determinant factors in the design of e-learning using multimedia.

2. Methodology

The methodology used as an analytical tool in this study is qualitative analysis, examining the causal relationships of factors influencing the design of multimedia-based e-learning. The main data source used in this study is literature review, which is then evaluated by educational and informatics experts. Based on the general classification, learning multimedia is categorized into two main groups, namely:



linear and interactive multimedia. The scope of this study discussion is limited to the development design of interactive multimedia.

3. Result and discussion

Effective learning is usually characterized and measured by the achievement level of the targets set in the plan according to the goals, by most students. Each level of achievement can indicate that a number of internal learning experiences are acceptable to students[7]. Furthermore, to improve learning effectiveness, it requires to optimize the use of learning media, one of which is the use of e-learning.

E-learning-based will have advantages that can provide flexibility, interactivity, speed, and visualization in the learning process. A learning involving many senses will make learning meaningful since students interact better with learning resources and media[8].

E-learning is expected to overcome the weakness or negative impact of the conventional learning pattern, namely: (1) the learning process is considered monotonous, (2) students tend to be passive due to only receiving given material, (3) the students tend to be more focused on making notes, and (4) students tend to forget the learning materials faster because the learning process feel less meaningful. The creativity of teachers in determining the appropriate method and learning model is strongly matter to realize an effective learning [9]. E-learning can be considered an innovative approach to serve a good, user-centered, interactive, delivery media design and an open, flexible, and distributive learning environment [5].

The design of e-learning generally uses research and development method. Research and development method is a research used to produce certain product and examine its effectiveness. [10]. As for the development stages, it can use Borg and Gall model consisting of research and information collecting, planning, develop preliminary form of product, preliminary field testing, main product revision, operational field testing, final product revision, and final product revision[11].

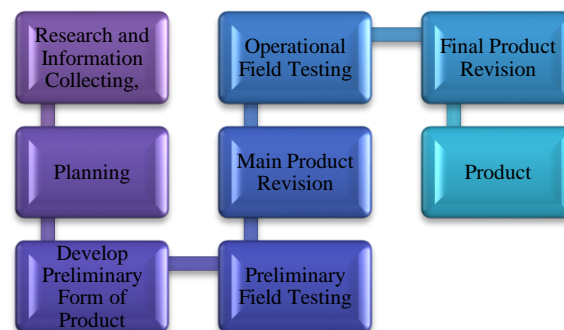


Figure 1. Research and development [11].

The design of e-learning at least consists of important criteria including management, pedagogic, interface design, technology, and resources. Meanwhile, examining the quality of e-learning is done based on dimensions including system quality, information quality, service quality, system use, user satisfaction, organization on structure, and net benefit [12].

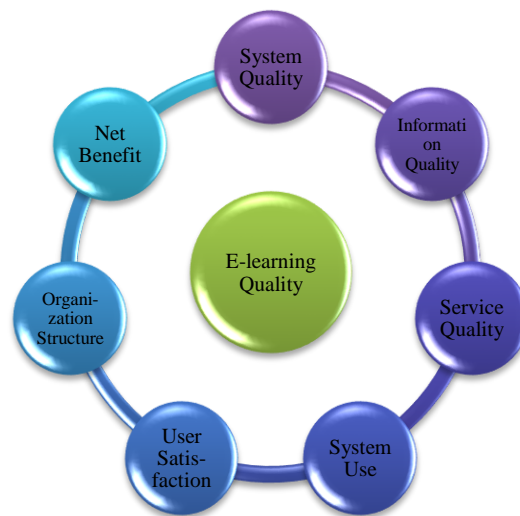


Figure 2. Criteria of E-learning Quality [12].

This study focusses on examining determinant factors in the utilization of multimedia in e-learning. Multimedia is a digital product that presents and combines text, images, sounds, audios, and videos, which is implemented through *tool* and *link*, so that users can navigate, interact, work and communicate [13]. In education, multimedia is used as learning media, which can be used by autodidact or students in the class [14]. Multimedia in the learning process has proven able to: create a fun learning atmosphere[15], enhance learning motivation [15], improve the effectiveness of learning [16], increase the understanding level [17], create student-centered learning [18], and enhance the investment efficiency of learning tools [19].



Figure 3. Multimedia content on e-learning system.

In principle, the design of e-learning must meet the needs of learners that can be measured based on indicators stating learning activities [20], as follows:

- Visual activities: reading, looking at pictures, observing experiments, performing demonstrations, making or visiting exhibitions, observing other people working, or playing.
- Oral activities: expressing a fact or principle, relating an event, asking questions, giving suggestions, giving opinions, interviewing, discussing
- Listening activities: listening to material presentations, conversations or group discussions, musical instruments, or radio.
- Writing activities: writing stories or reports, reviewing essays/articles, making sketches or summaries, doing a test, filling out a questionnaire.
- Drawing activities: drawing, creating graphs, diagrams, maps or patterns

- Metric activities: doing experiments, selecting tools, making exhibitions, making models, performing game simulations.
- Mental activities: contemplating, remembering, solving problems, analyzing factors, finding relationships, making decisions.
- Emotional activities: doing something relating to interests, differentiating something, being brave and calm and so on.

Based on the identification of multimedia usage needs as a learning process, the determinant factors to be considered in utilizing multimedia in e-learning include:

- **Display.** Display page is the main path to run the application program, therefore, it should use easy-to-read fonts, with attractive color combinations.
- **Good setting menu.** E-learning has facilities for administrator, material manager, instructor/teacher, and learner. The difference is in each user's permissions. Administrator has all of the permissions and can make any changes to all users' features. Administrator is responsible for registering and organizing e-learning participants as well as the permission of each user. Material manager can only add, subtract, and edit material. Instructor can only respond to the learning process, such as directing the discussion and responding to the discussion. Instructor is responsible for the content of the learning materials, including making quiz for each learning session. Participant of e-learning can only utilize the learning process, such as accessing and studying materials, discussions, and doing tasks[21]. Setting menu has to be designed as good as possible in order to maintain the authority of each domain user so that its function can be performed optimally.
- **Interactive features.** Multimedia embedded in e-learning should be interactive. Interactive multimedia is a multimedia device equipped with user-operated controller, so users can choose what they want to do next [22]. Learning media can be interactive if learners do not only see and hear, but also actually interact directly with it [23].
- **Communication Features.** In e-learning, it is essential to design message features, message notifications, and discussion features that facilitate the communication between students and students, students and teachers, and teachers and teachers, so that users can interact according to the topic of discussion.
- **Completeness of Information.** This aspect does not only concern on the volume but also the compliance with the users' expectation. Completeness of information for learning process should be arranged based on the need, such as through setting the presentation of summary or detailed information. The design of e-learning should provide links for related information sources to enrich the information provided.
- **Clarity of media.** In the use of learning media, it is essential to consider the selection of the size and the sharpness of the text, sound, picture, or video. A blurred image makes learners lose information that may be substantial in the discussion of certain material.
- **Interrelation of material.** This aspect relates to the interrelation between the information presented in the e-learning device and the needs of the learners. The use of material relevant to the topic will strengthen learners' understanding of a material while weak relevance between the media and the discussion topic will cause an understanding bias.
- **Language usage.** Standardized sentence structure will help user/ student in understanding the information provided. The use of unambiguous language is the main choice in explaining a particular topic in e-learning.
- **Representation of difficulty levels.** Media in e-learning should determine difficulty levels for each learning topic, in other words the learning media should be in accordance with the student profile. Accordingly, to provide learning objects according to the student profile, evaluation results and the information of other students are required.

4. Conclusion

The determinant factors in the design of e-learning multimedia include: display, good menu settings, interactive features, communication features, completeness of information, clarity of media, interrelation of material, language usage, and representation of difficulty levels. Relating to e-learning flexibility, this study recommends that e-learning design should be able to be operated on both desktop device and smart phone.

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