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A Digital Accessibility and Inclusive Design-Based E-Module in Higher Education: Does it Work in A Classroom with A Deaf Student?

Siti Musayaroh[1,], Neti Asmiati[1], Yuni Tanjung Utami[1], Dedi Mulia[1], Sistriadini Alamsyah Sidik[1], Reza Febri Abadi[1], Toni Yudha Pratama[1], Sayidatul Maslahah[1], Anggoro Suryo Pramudyo[2]*

[1] Pendidikan Khusus, Fakultas Keguruan dan Ilmu Pendidikan, Universitas Sultan Ageng Tirtayasa, Indonesia
[2] Teknik Elektro, Fakultas Teknik, Universitas Sultan Ageng Tirtayasa, Indonesia
Correspondence: E-mail: sitimusayaroh17@untirta.ac.id

ABSTRACT

The electronic module allows learning in class to be personalized according to student needs. This study aims to analyze the effect of the e-module education management course based on digital accessibility and inclusive design on the learning outcomes of the education management course in classes with a deaf student. This research is quasi-experimental with a quantitative approach and One Group Pre-Test – Post Test Design. Data were analyzed using paired sample t-test. The results show that the significance value (2-tailed) is .000. There is a significant difference in the use of e-module education management courses based on Digital Accessibility and Inclusive Design on the learning outcomes of the Education Management course in the effective leadership chapter. Dominant visual information and paying attention to the accommodation needs of all students, including deaf students, can help students understand the material being studied.

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1. INTRODUCTION

Each student has his uniqueness and characteristics. It is based on the statement that each individual has unique character traits. These characteristics are reflected in the form of potential, ability, strengths, and weaknesses possessed. Some students may be able to catch enough learning with lectures from the teacher, and may some others need visual information. Some students may be able to stay seated for hours to complete assignments, and others need a few minutes to rest and resume their activities.

The conditions of students who differ from one another demand personalization in the learning process. Personalization aims to make students understand the concept of the material being studied easily so that the learning objectives can be achieved for these students. This personalization is also one of the challenges faced in the e-learning process because different people learn differently. Creating and adapting content to learner preferences is important to maximize and speed up the learning process (Moubayed *et al*., 2021). It must adapt to the learner's attributes and suggest appropriate learning resources to assist the learning process and improve outcomes learned (Raj & Renumol, 2022).

One student who needs personalized learning resources is a deaf student in college. The term deaf is often used to measure objective hearing loss in both clinical settings and research studies (Kamil *et al*., 2015). As a result of the disturbance experienced, the deaf has limitations in processing information that impacts learning outcomes even though they have adequate abilities (Morere & Dean, 2009). For this reason, it is necessary to use other senses that still function as substitutes for senses that do not work or work but are very limited. The main substitute sense for the deaf is the sense of sight because the world of deaf children is not hearing but seeing.

The sense of sight is the most dominant sense utilized by students with hearing impairments. On this basis, student learning resources can be visual information such as text and images. Concluded by Eric Jensen stated on (Hasan & Yarmi, 2018) explains that 80-90% of all information absorbed by the brain is a visual form. Furthermore, after the Covid-19 pandemic, several lectures were conducted online. When attending online lectures, deaf students experience difficulties in understanding the information conveyed through online meeting applications such as Google Meet. Technical constraints are one of the most reported obstacles when online lectures occur (Larasati, 2022). One of the technical problems that often occurs is an unstable signal (Apriyanti, 2020). Some students choose not to turn on the camera when experiencing signal problems, so it impacts the understanding of deaf students because they cannot read the lips of students who are making presentations.

The use of Digital Accessibility and Inclusive Design-Based Education Management e-module is one of the learning resources that researchers have developed to accommodate the learning needs of all students in the class, including students who are deaf. Two design approaches can solve the deaf problem, namely accessible design, and inclusive design. The accessible design has guidelines to help deaf people, and inclusive design looks at the diversity of experiences that can exclude someone from using the interface effectively. In the case of audio content, it can be subtitles or transcripts of audio content. Digital accessibility is the extent to which a product, service, or digital device can be used by as many people as possible, including persons with disabilities. Digital inclusion is also a related concept that refers to the portion of target users who have access to digital products and services, taking into account disability, accessibility, social factors, and connectivity.

The e-module is developed by taking into accessibility and an inclusive design for all students (especially for deaf students in the class). The development includes the availability

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of; 1) navigation buttons, 2) clear text, 3) headings and sub-heading features, 4) videos equipped with Indonesian sign language, subtitles, and End-of-Movie Chapter Information Summary, 4) image, 5) interactive quizzes/platforms, and 6) a selection of contrasting text and background colors (see **Figure 1**). However, researchers have yet to learn the effect of using the e-module in the lecture process. For this reason, this article was written to analyze the effect of an e-module based on digital accessibility and inclusive design in education management courses for students in tertiary institutions. The alternative hypothesis in this research is that there is a significant influence on using an e-module based on digital accessibility and inclusive design in education management courses for college students.

Figure 1. Some features of digital accessibility and inclusive design-based e-module.

2. METHODS

This research is quasi-experimental, using a quantitative approach and One Group Pre-Test – Post Test Design. The e-module implemented in lectures is the e-module of education management courses. The material being evaluated is "Effective Leadership." The research was conducted in the Special Education study program at Sultan Ageng Tirtayasa University. As many as 27 regular students, one deaf student, and one physical impairment student (with no need for adjustment in a content course) participated in the research. The research subjects were selected by purposive sampling with the following criteria; 1) Students of the Untirta special education study program, both with disabilities and non-disabilities, 2) Students who contract education management courses, and 3) Students study in a class where there are students with hearing impairments. Data were analyzed using paired sample t-test analysis using SPSS.

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Pretest data was taken before students took part in the effective leadership chapter lectures and before accessing the chapter's e-module. In comparison, the post-test is done by students after attending lectures and accessing the e-module in education management courses based on Digital Accessibility and Inclusive Design. The total number of pretest and post-test questions is 5 case study items. A student's maximum total score if he answers all five questions correctly is 100.

3. RESULTS AND DISCUSSION

The results in **Table 1** showed that the average student pretest in the material "effective leadership" was 48.28 out of a maximum score of 100. The scores obtained by students in this pretest ranged from 0 to 100. Before the treatment, a deaf student on this test received a score of 60, while a physical impairment student got a score of 40.

The pre-test is carried out at the beginning before the lecture and before students access the module in the "Effective Leadership" chapter. After the lectures are carried out, and students access the e-module, students are asked to do a post-test. The post-test results showed an increase in the average from the previous 48.28 to 71.03 (see **Table 1**). Deaf students on this test scored 80, while a physical impairment student got a 40. The range of scores obtained in the post-test was 20 to 100.

Furthermore, a significance value (2-tailed) of .000 has been obtained (see **Table 2**). If the significance value (2-tailed) is less than 0.05, it indicates a significant difference between the initial and final variables. It means that there is a significant effect of using the e-module based on digital accessibility and inclusive design in education management courses for students in high education.

Based on the results of the research that has been done, the significance value (2-tailed) results are .000. Where the significance value (2-tailed) is less than 0.05 indicating the alternative hypothesis is accepted. It can be concluded that there is a significant influence on using the e-module based on digital accessibility and inclusive design in education management courses for college students. It is because the material in the e-module is designed according to the learning needs of students in class without prejudice to the conditions of students with special needs, namely deaf students.

Table 1. Paired sample statistics.

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pretest	48.28	29	22.372	4.154
	Posttest	71.03	29	15.663	2.908

Table 2. Paired samples test.

		Mean	St. Dev	Std. Error Mean	95% Confidence Interval of the Difference	Upper	t	df	Sig. (2-tailed)
Pair 1	Pretest - Posttest	-22.759	27.110	5.034	Lower	-12.446	-4.521	28	.000

The e-module used in lectures is developed based on digital accessibility and inclusive design. The e-module pays attention to the things that hinder deaf students in processing learning material by developing the e-module as follows: the text is written clearly (headings and sub-headings), the video embedded in the e-module has been subtitled Sign Language

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Interpreter (JBI), and end-of movie chapter summary information, and finally there is an interactive quiz to check students' understanding each time they complete lecture material in that chapter.

Furthermore, the visual information in the e-module design dominates enough to make it easy for deaf and non-disabled students to use. The dominance of visual information in this e-module helps deaf students understand effective leadership material well. Deaf individuals need to optimize their visual abilities because they rely heavily on visual media to understand languages, such as signs, text, images, videos, and animations (Muljono *et al*., 2019).

4. CONCLUSION

The average pre-test and post-test scores on effective leadership material changed after receiving treatment using the e-module based on digital accessibility and inclusive design in education management courses. The average score obtained by students increased from 48.28 to 71.03. An increase also followed the increase in the average pre-test and post-test scores in the scores obtained by deaf students, namely 60 for the pre-test to 80 for the post-test. Through analysis of paired sample t-test using SPSS, a significance value (2-tailed) of .000 was obtained. So, there was a significant difference in using the e-module based on digital accessibility and inclusive design in educational management courses for students in tertiary institutions.

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6. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

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