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The Effectiveness of Interactive Video on Digital Literacy of Students with Hearing Impairments

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Abstract

Students with hearing impairments have limited vocabulary which affects communication and reading comprehension. Visual media greatly helps students with hearing impairments in the process of understanding text. Interactive video is a moving visual media accompanied by text, links, questions, and discussions. This study aims to determine the effectiveness of interactive videos on digital literacy of students with hearing impairments. This study is pre-experimental study in one group, due to the limited research subjects, namely students with hearing impairments. The research design used one group pre-test posttest with 13 students with hearing impairments in special high schools as participants. The research subjects were given treatment in the form of the use of interactive videos for three weeks, before the treatment their digital literacy was measured and the following week it was measured again using a digital literacy questionnaire on a likert scale. The data analysis technique used in this study was to compare the pretest and posttest scores with N-Gain. The results of data analysis obtained a mean of .7231 which can be concluded that interactive videos are very effective for student with hearing impairment towards digital literacy. Interactive videos can facilitate the reading ability of student with hearing impairment through the various facilities provided, such as tests, content and links

Keywords: Interactive Video, Digital Literacy, Students, Hearing Impairments

1. Introduction

Hearing loss is related to the loss of part or all of the ability to hear, which can be classified into four, namely: mild (<40 db), moderate (40–70 db), severe (71–90 db), and very severe (> 91 db) (Cano, Peñeñor, Collazos, & Albiol-Pérez, 2020). The lack of auditory response to sound can cause student with hearing impairments to experience deficiencies in language and speech development (Ahmad et al., 2021; Asogwa et al., 2020). Student with hearing impairment have a very small vocabulary compared to hearing students, which is due to a lack of access to language early in their development. This limited vocabulary affects reading comprehension (Mann, O'Neill, Watkins, & Thompson, 2023). There is a significant impact between basic knowledge and reading comprehension in student with hearing impairment (Coppens et al., 2011; Solís-Campos et al., 2023; Zhao et al.,

2021). Vocabulary knowledge has been shown to be a consistent predictor of reading comprehension achievement in student with hearing impairment. Vocabulary knowledge has a significant direct impact on the reading comprehension of student with hearing impairment, indicating that the better a student with hearing impairment's vocabulary knowledge, the better their ability to comprehension reading (Zhao et al., 2021). Student with hearing impairment are individuals who experience limited hearing which makes it impossible to hear conversations through the ear, but have the ability to use information and communication technology in learning activities and social interactions (Kaba & Ellala, Digital information resources: use and perceptions of deaf and hearing students, 2019). (Alieksieieva, 2023) states that student with hearing impairment are ready for learning that uses information and communication technology or computers.

According to the findings of research conducted by (Ahmad et al., 2021), the use of mobile phones by student with hearing impairment in everyday life makes them understand and learn new words faster because they are more likely to use these words in text messages or browsing social media. They also feel that the use of mobile technology in academics will make language learning easier (Nasir et al., 2021).

Su, Guthridge, He, Howard, & Leach (2020) explains that students with hearing loss experience obstacles in learning outcomes and literacy. According to Gorski & Clark (2002) in Lowenthal et al. (2020), for students with special needs, there is a gap in digital skills sometimes referred to as the digital divide, which refers to the difference in access to computers and the internet between students with special needs and normal student.

In today's digital era, digital literacy skills are very important to develop for students with special needs (Tohara, Shuhidan, Bahry, & Nordin, 2021). Digital literacy is critical for student with disabilities because it enable them to participate effectively in education, prepare them for the workforce, and function as global citizens. By mastering digital literacy, student with disabilities can access information, communicate better, and develop the skills necessary to succeed in an increasingly technology-dependent environment. (Cihak et al., 2015). In addition, digital literacy helps increase their confidence in using technological tools, which is essential for active participation in learning and everyday life. Without these skills, student with disabilities may face greater difficulties in achieving their educational and career goals (Kim & Doh, 2006).

Developing literacy skills is one of the main challenges that student with hearing impairment have to face, because it is not only a way to communicate with hearing people, but also to gain access to information and create new knowledge (Flórez-Aristizábal et al., 2019). Digital literacy skills of student with hearing impairment refer to their ability to access, understand, and use information obtained from digital media. This includes skills in using technological devices, understanding digital texts, interacting with digital content, and using digital tools for communication, learning, and task completion purposes (Flórez-Aristizábal et al., 2019; Ibraimkulov et al., 2022). Further explained by Lowenthal et al. (2020), digital literacy encompasses more than just the ability to use digital devices; it also involves a range of complex cognitive, motor, sociological and emotional skills that are required to function effectively in a digital environment. These skills are especially important in today's digital age, where much information and knowledge is presented through digital media.

Digital literacy for the hearing impaired will provide learning opportunities that suit their needs. Digital literacy provides broad learning opportunities that suit the way of learning for students with hearing impairments, where they are actively involved in content and receive information (Alsalem, 2016). Digital literacy in special education is directed at the ability to read, select, interpret and evaluate information (Tohara, Shuhidan, Bahry, & Nordin, 2021).

Chambers (1997) suggests using interactive videos in special education, because it makes students with special needs have self-esteem, increases hope and motivation, and supports collaborative learning. The use of technology in the classroom can have a big impact if it is designed to be easily accessible to children with disabilities, so that it can support the teaching and learning process which is usually adapted to the special needs of these children (Flórez-Aristizábal et al., 2019).

In his research, Samčović (2022) shows that digital television provides benefits in improving communication skills and providing access to programs and helping with visual readability. Furthermore, it was explained that deaf students prefer shows that have credit titles, and they spend an average of 3-4 hours watching television. Interactive videos have an interactive aspect where students can explore, answer questions, answer questions, and several other interactive options (Afify, 2020). Alias, Harun, & Kamaruddin (2023) said that interactive media for the deaf must involve a combination of visuals, user experience and how information is presented. Interactive videos are able to combine these three elements, where there are various visual combinations in the form of text or images that facilitate their needs, such as sign language, captions, and other visual aids. Student with hearing impairment can control and be involved in the process of understanding content through information displays.

Interactive videos can connect online information searches via the links provided. Research from Kaba & Ellala (2019) regarding the perceptions of students with hearing impairments regarding the use of digital information resources shows that internet use is able to activate intellectuals, make it easier to find information, and make it easier to explore digital sources. Student with hearing impairment by using interactive videos provide a better learning experience, and increase independence, as well as supporting social relationships with fellow friends, teachers and parents (Cano, Peñeñory, Collazos, & Albiol-Pérez, 2020).

One of the important components in interactive videos is written text that contains clarity of meaning, there are visual elements that clarify concepts (Khasawneh, 2023). Research has shown that it is more effective to present content and information to deaf students using images and videos with subtitles combined with sign language than word-based information. (Alsadoon & Turkestani, 2020). The text component will assist deaf students in clarity and understanding of meaning. Interactive learning experiences are created by manipulating and editing videos in moments where students pause to engage in focused learning activities. The interactive learning moment is guided by conceptual understanding, encouragement for discussion, providing feedback, and through questions (Gedera & Zalipour, 2018).

Digital literacy is a combination of technical procedures, cognitive and social emotional skills in its use (Aviram and Eshet-Alkalai, 2006; Nawaz & Kundi, 2010). Martin dan Madigan (2006) in Iordache, Mariën, & Baelden (2017) emphasized that digital literacy is awareness, attitudes and abilities in using digital tools and facilities appropriately for identifying, accessing, managing, integrating, evaluating, analyzing and synthesizing to build new knowledge. Furthermore, Aviram and Eshet-Alkalai (2006) explained that digital literacy is an integration of five literacy skills, namely photo-visual literacy (understanding of visual representations); reproductive literacy (creative reuse of existing materials); information literacy (understood as relating to the evaluation of information); branching literacy (basically the ability to read and understand hypermedia); and social-emotional literacy (behaving correctly and wisely in cyberspace) (Bawden, 2008) (Covello, 2010). Digital literacy requires website reading skills, namely coding skills, semantic skills, pragmatic skills, and critical skills (Walsh, Asha, & Spranger, 2007). Coding skills are skills in searching, scrolling, finding and determining keywords, as well as understanding navigation functions. Semantic skills, involvement in the use of keywords. Search for information, identify main ideas, obtain facts accompanied by interpretation and conclusions. Pragmatic skills, ability to use search engines, navigation between sites, and skills in their use. Critical skills are the ability to analyze and evaluate online information, understand the purpose of text. Koltay (2011) complements the digital literacy competencies of Bawden (2004), namely (1) searching for information followed by critical thinking; (2) accessing information as well as conveying and communicating; (3) awareness in using traditional tools related to media and social networks; (4) the ability to assemble knowledge from various trusted sources.

The components that must be considered in digital literacy for individuals are firstly, information literacy refers to the individual's capacity to find and translate information; second, information and communication technology literacy is used to participate academically and actively in the learning process; third, media literacy refers to an individual's ability to read and think creatively in academic communication; fourth, the individual's ability to use technology for learning purposes; fifth, the use of technology for communication in learning networks (Arifuddin, Qamari, & Surwanti, 2022). Paying attention to these components, digital literacy is very supportive for students with disabilities, in this study, students with hearing impairments, because it has a positive impact on their development (Khanlou, Khan, Vazquez, & Zangeneh, 2021)

2. Method

This research used a pre-experimental design because there was no control group. And using a one group pre-test posttest design, which follows three steps, namely conducting a pre-test to measure the dependent variable, secondly carrying out experiments on research subjects (in this study using interactive videos), and thirdly conducting a post-test (Ary, Jacobs, & Sorensen, 2010).

The interactive videos used in this study utilize Edpuzzle, where the content is developed by researchers based on the learning theme of students with hearing impairments. The subjects of the study, students with hearing impairments, utilized interactive videos for three weeks using their respective smartphones. One week before, the subjects were given digital literacy instruments and one week after utilizing interactive videos, a posttest was given.

The subjects of this study were students with hearing impairments who attended SMPLB Kemala Bayangkari 2 Gresik. The number of subjects in this study was 13 students with hearing impairments.

The digital literacy instrument in this study was adapted to student with hearing impairment using the Likert scale (1-4) (Table 1). Digital learning instruments in this study were developed by researchers based on several theories listed in table 1, adjusted to the characteristics of students with hearing impairments. digital literacy instruments developed by researchers were validated by experts in the field of learning and language in special education experts. Research subjects filled out the instruments digitally.

Table 1: Literacy Digital Instrumens

Variable	Indicator
Pragmatic ability to use tools (Covello, 2010)	Have the ability to use various applications Able to find solutions when problems occur in the application used
Ability to access information (Bawden, 2008)	Can access information from various sources
Conveying information (Arifuddin, Qamari, & Surwanti, 2022) (Bawden, 2008)	Can convey the information obtained
Ability to read and think critically (Bawden, 2008)	Ability to sort information according to topic

This research activity was carried out for three weeks. Research subjects were given a pretest related to digital literacy, and then treated with interactive videos for three weeks. After that, a digital literacy instrument post-test was given. The analysis technique used in this research is comparing the pretest scores with the posttest using N-gain. N-Gain data analysis in this study aims to determine the effectiveness of interactive videos on digital literacy. The results of the calculations with N-Gain in this study were confirmed using the paired sample t-test to see the level of significance.

3. Results

Data obtained on digital literacy for students with hearing impairments for the pretest and posttest are in table 2. The data results in table 2 show the mean and standard deviation of the pretest and posttest. Indicators related to the ability of students with hearing impairments in using various applications show an increase, where they use interactive videos followed by exploring various applications or searching via the available links. Students with hearing loss during interactive video use are more skilled at solving problems when the application or link experiences problems. In using interactive videos, various applications are used, from various tests to searching for links related to the material. Obtaining information through interactive videos, students with hearing impairments experience increased literacy skills in conveying the information they read. Apart from that, there is an increase in the ability to sort various information related to the topic and the truth of the information.

Table 2: Pretest – Posttest Literacy Digital

Indicator	Pretest		Post-test	
	Mean	SD	Mean	SD
Ability to use various applications	2.5385	.77625	3.6154	.50637
Ability to find solutions when problems occur in the application used	2.3846	.65044	3.3846	.65044
Can access information from various sources	2.3846	.65044	3.6154	.50637
Can convey the information obtained	2.2308	.59914	3.4615	.51887
Ability to sort information according to topic	2.6923	.75107	3.7692	.43853

Table 3: Descriptive Statistics for N-Gain literacy digital

	N-Gain_Score	N-Gain_Percentage	Valid N (listwise)
N	13	13	13
Minimum	.50	50.00	
Maximum	1.00	100.00	
Mean	.7231	72.3138	
Std. Deviation	.12796	12.79611	

Table 4: Paired Samples Test Literacy Digital

Paired Differences	Mean	-5.462	
	Std. Deviation	1.330	
	Std. Error Mean	.369	
	95% Confidence Interval of the Difference	Lower	-6.265
		Upper	-4.658
t		-14.805	
df		12	
Sig. (2-tailed)		.000	

Calculation of the N-gain score shows a mean value of .7231, the acquisition of N-gain data was confirmed using the paired sample test to obtain a sig level. ,000 (table 4). Based on these results, it can be concluded that interactive videos are very effective in increasing the digital literacy of students with hearing impairments (table 3). DeForte (2020) in his research shows that students with hearing impairments find it easier to understand reading through video playback. The use of technology for student with hearing impairment helps reading skills and develops digital literacy (Hlatywayo & Muranda, 2015). Videos with the addition of hyperlinks can increase web browsing efficiency for student with hearing impairment (Fajardo, Parra, & Can˜as, 2010). Student with hearing impairment understand multimedia reading better than printed books, regardless of their language skills and strongly support literacy skills (Yaman, Dönmez, Avcı, & Yurdakul, 2016).

4. Discussion

Interactive videos contain signals in text or symbols that highlight important information (Brame & Perez, 2017). Color changes or symbols that highlight important information can be helpful in directing the attention of students with hearing loss, and continue processing the information in their working memory. Segmentation in interactive videos helps students with hearing loss in the acquisition of new information and their engagement with learning through the various information provided. Students with hearing impairments are able to utilize learning resources from the internet to access information, and have the ability to receive messages, send and access various graphic, audio, video information and interact collegiately (Udofia, Aloysius, & Jimmy, 2017). In their research, Kaba & Ellala (2019) shows that student with hearing impairment have very good ability to search for information via the

internet, and most have positive perceptions of digital resources. Videos that present information visually can help deaf students better understand text and context (Khasawneh, 2023).

Interactive videos can provide a clearer and more engaging visualization experience and allow students with hearing impairment to interact directly with the learning content. The features contained in interactive videos such as text, images, and animations can help for the hearing limitations experienced by students with hearing impairment and allow them to understand the material more easily (Khasawneh, 2023). The use of interactive videos for students with hearing impairments is very helpful in personalization because they can learn independently, at their own pace. And turning deaf students into active learners supported by interactivity, where they can navigate freely with the help of indexes, external links, and clues that help find meaning and connect with previously held information (Palaigeorgiou, Papadopoulou, & Kazanidis, 2018). Interactive videos based on several studies can increase student involvement in fulfilling their learning (Desai & D.C.Kulkarni, 2022). Active engagement due to interactive videos facilitates a learning environment that provides opportunities to explore interactivity capabilities. Educational intervention with video is an effective intervention to increase school engagement in adolescent students with hearing impairments (Asogwa et al., 2020).

Integrating applications into interactive videos helps students with hearing impairments have a better understanding of digital literacy (Abdullina & Zolotovitskaya, 2023). The use of various applications in interactive videos makes students with hearing impairments more active in reading and developing search skills in information and communication technology. Students with hearing impairments gain a variety of information from reading which can develop their cognitive skills. In addition, students with hearing impairments by utilizing interactive videos can develop communication skills related to the results of reading comprehension. The use of interactive videos for students with hearing impairment is generally able to improve academic abilities because it is supported by hand-eye coordination, imitation, and language development (Baglama, Haksiz, & Uzunboylu, 2018). The use of interactive videos is considered as one of the methods used to stimulate students with hearing impairments' cognitive growth by creating an active learning environment (Albalhareth & Saleem, 2024).

5. Conclusion

The use of interactive videos for students with hearing impairments is very effective in improving digital literacy skills. Interactive videos provide various learning activities, such as monitoring understanding, deepening understanding through various sources linked in the video, and searching for information related to the material. Students with hearing impairments can develop cognitive abilities from the various information they read at their own pace. Providing various content in interactive videos has an effect on the active involvement of students with hearing impairments

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