Original Research Article

DEVELOPMENT OF DIGITAL-BASED VISUAL LEARNING MEDIA FOR PHYSICAL EDUCATION, SPORTS, AND HEALTH FOR STUDENTS WITH HEARING IMPAIRMENTS

ABSTRACT:

This research focuses on the development of digital-based learning media for individuals with hearing impairments. The aim of this study is to address the challenges faced by deaf learners in accessing and engaging with educational content effectively. The research question guiding this study is: "How can digital learning media be developed to cater to the specific needs and learning preferences of individuals with hearing impairments? “To investigate this question, a mixed-methods approach was employed, combining qualitative interviews and surveys with deaf learners and quantitative data analysis. The research team developed a prototype of a digital learning platform tailored to the unique requirements of deaf learners, incorporating visual and interactive elements to enhance their comprehension and engagement. This research includes Research and Development (R&D) research used to produce certain products and test the effectiveness of these products. The findings of the study reveal the significance of designing inclusive digital learning media that consider the sensory and communication needs of individuals with hearing impairments. The interviews and surveys highlighted the positive impact of the developed digital learning platform on the learning experiences of deaf learners, as it facilitated better understanding, increased motivation, and encouraged active participation. This research contributes to the field of inclusive education by providing insights into the design and implementation of digital learning media for individuals with hearing impairments. The developed platform offers a valuable resource for educators and instructional designers to create accessible and engaging learning experiences for deaf learners.

Keywords: *digital learning, media development, inclusive education, hearing impairments, deaf learners*

INTRODUCTION

Efforts to improve the quality of educational processes and outcomes are constantly sought, researched, and pursued through the study of various components of education [1]. Improving the process and learning outcomes of students as one indicator of the quality of education, improvement and refinement of the teaching system is a direct and most real effort.

These efforts are directed towards the quality of teaching as a process that is expected to be carried out to improve the quality of teaching by starting from the view that education and teaching are a system.

Similarly, teaching technology and the use of learning media such as audio-visual learning media can provide alternatives to the design of teaching programs and implementation strategies that are indicated to stimulate the interest of learner motivation and be able to increase their understanding in the current 4.0 era.

The object of study in this research is the development of digital-based learning media for individuals with hearing impairments. The aim of this study is to address the challenges faced by deaf learners in accessing and engaging with educational content effectively. Where Physical Education, Sports and Health is an integral part of education which in its learning process prioritises physical activity in order to encourage healthy living habits towards harmonious, balanced physical, mental, social, and economic growth and development [2].

The success or failure of the teaching and learning process at school, especially sports and health physical education in accordance with the expected goals, is determined by many internal and external factors.

Internal factors that come from within students such as psychological, physiological conditions, intelligence, and maturity, while external factors that come from outside students are the natural environment, the social environment, which includes family, community and school and the learning media used.

This research is motivated by concerns about education for people with disabilities who seem marginalised, the education gap is still experienced by people with disabilities. Where in official

government data it is said that most people with disabilities dominate at the low education level, namely 25.83% of elementary / equivalent, 30.54% did not graduate from elementary school, and there were even those who did not / have never been to school as much as 21.22%. Meanwhile, only 2.8% of them completed their education up to university level. This figure is far compared to the non-disabled who reached 9.48% in completing higher education. Meanwhile, only 3.38% have never been to school [3].

From the data source obtained from the Central Bureau of Statistics (BPS), it confirms that the world of education, especially for people with disabilities, is still a polemic that we cannot ignore.

The potential of the object of this research in general is very large in number on a national scale, where in the data from the Ministry of Social Affairs 157,477 Deaf students are recorded who are currently pursuing primary to upper secondary education [4]. However, there is not much information that displays specific data related to the empowerment of deaf people in the context of physical education learning, in the archipelago.

In fact, in the extreme, no data has been found that shows that the teaching staff of physical education sports health Physical Education, Sports and Health in Special Education School are teachers with deaf disabilities, for example. This statement reinforces the researcher's plan to show and support the potential of disability so that it can be directly useful to the community more specifically in the world of education as.

Because from the aspect of learning potential, deaf people have good potential if the process of basic, secondary, and higher education is well facilitated and follows the times where the current era is closely related to the digitalisation system.

LITERATURE REVIEW

The word media is the plural form of the word medium. Medium can be defined as an intermediary or an introduction to communication between the sender and the recipient [5].

Media is one of the components of communication, namely as a messenger from the communicator to the communicant [6]. From these definitions it can be said that the media is something that is convincing of messages and can stimulate the thoughts, feelings, and desires of the audience (students) so that it can encourage the learning process to occur on him.

Meanwhile, learning or the better-known expression "teaching" is an effort to teach students. Oemar Hamalik said that learning is a combination of human elements, materials, facilities, equipment and procedures that influence each other to achieve learning goals.

Meanwhile, according to the Big Indonesian Dictionary, learning is a process, method, action that makes people or living things learn. If taken from the above opinions, learning media is a tool or method and technique used as a communication medium between a teacher and students in order to further streamline communication and interaction between teachers and students in the teaching education process at school.

To facilitate further description, it is also necessary to provide an understanding of physical education, which in [7] outlines the meaning of physical education from several sources: physical education is an integral part of overall education through various physical activities aimed at developing individuals organically, neuromuscularly, intellectually, and emotionally.

Children with disabilities or exceptional children or children with special needs, in an educational environment can mean someone who has characteristics of mental, physical, emotional, or behavioural deviations that require modification and special services in order to develop optimally with all the potential they have. This includes children with physical disabilities, eye defects, including blindness or semi-blindness, bone defects, including paralysis due to brain disorders, deafness, including total and partial deafness, speech defects, epilepsy, emotional disorders, and congenital defects.

The ability to learn and interact with deaf children is closely related to the degree of deafness experienced by an individual where the degree of deafness can be grouped into moderate, severe, and very severe degrees of deafness. Therefore, it is necessary to assess deafness in the deaf class. The severity of deafness is measured by a hearing measuring instrument (audiometer) with the unit of measure decibel (db) the severity of a person's deafness can be seen in the following table:

Table 1. The severity of deafness is measured by a hearing measuring instrument (audiometer)

Average loss of hearing (db)	Degree of Deafness	Ability to understand conversations.

20 – 40	Mild	- Can react to stimuli (greetings) - can speak despite difficulties
40 – 65	Moderate	- Can have a conversation if you look at the other person's face
65 – 95	Severe	- Very difficult to pick up long-distance sounds
95	profound	- It is impossible to catch everyday conversations - everyday activities depend heavily on the sense of sight.

Based on literature review and relevant research, the conceptual framework which is the formulation of the basics in research can be described as below:

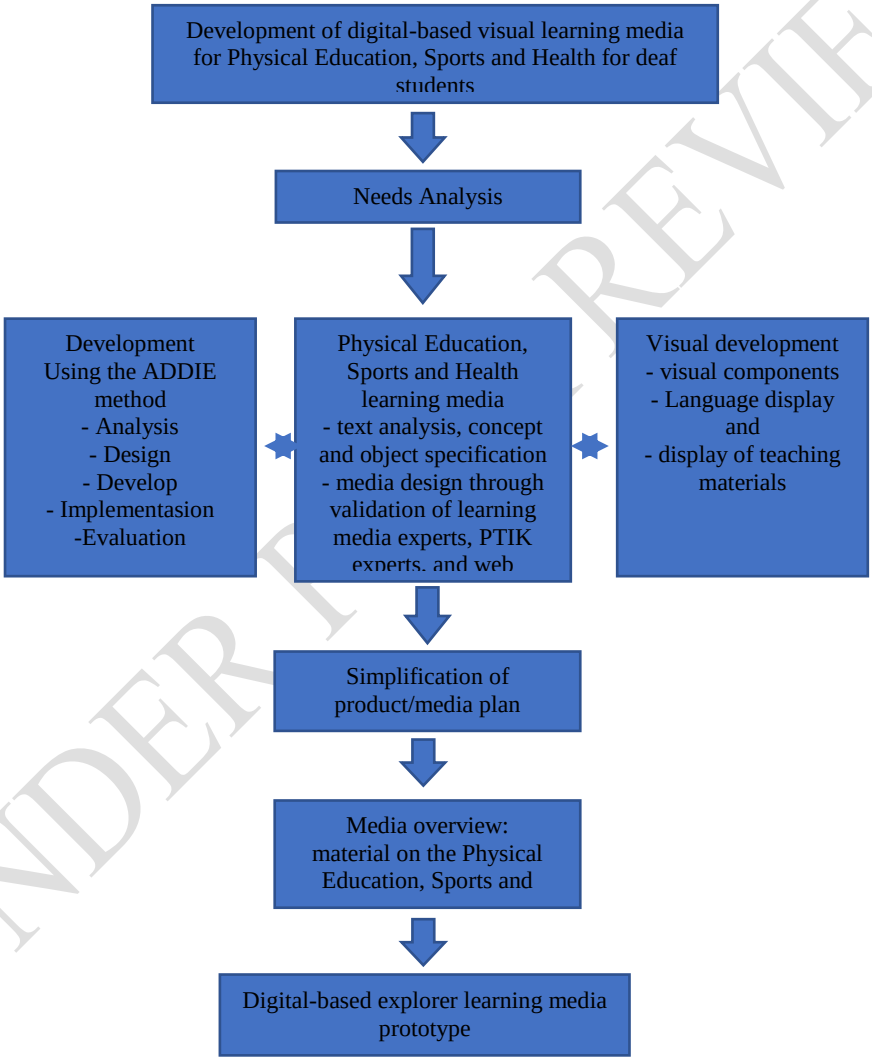


Figure 1. Thinking Framework Diagram

The development of digital-based visual learning media can improve understanding of health and sports education subjects for deaf people and has a strong foundation in the aspect of philosophical studies, using the Addie hypothetical model framework, namely Analysis, Design, Develop, and Implementation, evaluation.

Figure 2. Addie hypothetical model framework

METHODOLOGY

This research includes Research and Development (R&D) research. According to [8], Research and Development (R&D) is a research method used to produce certain products and test the effectiveness of these products.

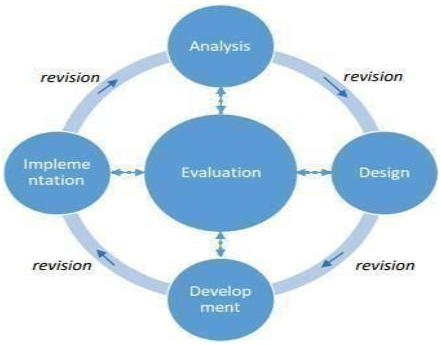


Figure 3. ADDIE development model

Media eligibility criteria

Table 2. Criteria for Eligibility Level

Feasibility Percentage	Interpretation
1-100%	Very Worth it
61-80%	Well Worth it
41-40%	Decent Enough
21-40%	Not Worth It
<21%	Not Feasible

Matrix data collection and analysis techniques according to the formulation of the problem, this matrix aims to describe the technical steps in this study to find answers to the formulation of the problem The inter-achievement conversion of media feasibility is:

Table 3. The inter-achievement conversion of media feasibility

Interpretation	Definition of value
Very Worth it	Very good without improvement, fulfils prerequisites for development
Well Worth it	Good with minor improvements, fulfils prerequisites for development
Decent Enough	Good enough with major improvements, fulfils the development category
Not Worth It	Does not fulfil development criteria
Not Feasible	Far from the expected application and benefits of development

The stage of the application made is a learning media application for Physical Education, Sports and Health in the form of PE and sports learning service media for deaf people in .app format with the name "TOTURU" or Teman Olahraga Tunarungu containing features and content that will facilitate deaf students and teachers when teaching physical education, sports and health online.
The initial product design of the initial TOTURU application includes: (1) loading page, (2) home page, (3) facility page, (4) material menu page, (5) sub material page.

Loading Page

When opening the TOTURU application, a loading page will appear, which is a page to wait while the application prepares data. You can see the logo in the form of text and the logo "TOTURU and Insan Indonesia Institute".

Figure 4. Display of TOTURU application loading page

Home Page

This page displays all the units in the TOTURU app (Athletics, Badminton, Swimming, Gymnastics, Drug Danger, Healthy Lifestyle).

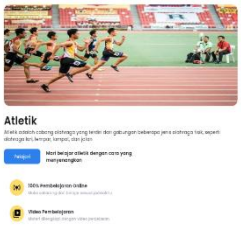
Figure 5. Home page view of TOTURU App

Material Facility Page

This page is intended for visitors who do not yet have an account on the application, personal data is filled in according to the fields provided.

Figure 6. Material facility page display

Material Menu Page



This page displays the menu in the teaching material selected by the TOTURU application user.

Figure 7. App log in page view

Sub-Material Page

This page displays all available units (health services, therapy, rehabiitation, and fitness centre). Users can select features according to their service purpose.

Figure 8. Display of TOTURU application sub-material page

Material Page

This page displays the teaching materials selected by the TOTURU application user in the Physical Education, Sports, and Health learning activity.

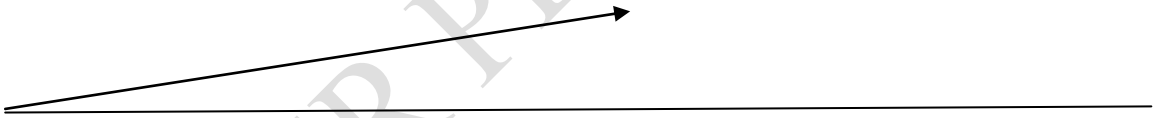
Figure 9. Application sub menu page display

RESULT

Table 4. small-scale trials on the application of deaf PE learning media (TOTURU)

No	Interval	Category	Percentage
1.	81% - 100%	Strongly Agree	90%
2.	61% - 80%	Agree	10%
3.	41% - 60%	Moderately Agree	0%
4.	21% - 40%	Disagree	0%
5.	0% -. 20%	Strongly disagree	0%
	TOTAL		100%

Based on the results of small-scale trials on the application of deaf PE learning media (TOTURU) conducted by respondents stated that 90% strongly agreed and 10% agreed. So, TOTURU application is feasible to be developed to support the service of physical education, sports, and health teaching process in special education school.
for the sake of hypothesis testing, an analysis of users (students and teachers of deaf special education school) against digital learning media physical education, sports, and health and as for the rating scale in accordance with this study is the Gutman rating scale as follows:



0 -less- 50 -good- 100

Discussion and conclusion

The results of data analysis and hypothesis testing that have been stated show that the hypothesis proposed in this study is accepted.
When observing the level of motivation of deaf students of special education school, it can be said that after the introduction of the physical education, sports, and health learning application for the deaf there is a good response so that the digital deaf physical education, sports, and health learning media can be categorised in the good category and feasible to use. This is reinforced by the results of data analysis where 58.1% of pre-test and post-test use interest in the learning application physical education, sports, and health deaf students' special education school. if this is connected to the theory and framework that has been previously stated, it basically supports the results of this study.
The product resulting from this research is a learning application called TOTURU (Teman Olahraga Tunarung) which aims to be a new learning resource option for deaf students in the subject of physical education, sports, and health. This developed application has passed several stages of development including needs analysis, design, prototyping, material and media expert validation, trials, and validity, practical, and effectiveness tests.

1. The results of this study illustrate that deaf learners really need digital-based physical education, sports, and health learning media.

2. The design of digital-based physical education, sports and health learning media has been carried out by referring to the results of the needs analysis.
3. The results of the validation process provided by material experts to assess the content of digital-based learning media in terms of usability, information and display aspects are declared in the category worthy of use with improvements, while in the media expert validation process on the assessment of media information, appearance, usability the results are included in the category worthy of use with improvements. trials have been conducted on teachers and deaf students, resulting in a good category.
4. The results of the practical test process given by material experts to assess the content of digital-based learning media in terms of usability, information and display aspects are stated in the category of feasible / practical use with improvements, while in the media expert validation process on the assessment of media information, appearance, usability the results are included in the category of feasible / practical use with improvements. trials have been conducted on teachers and deaf students, resulting in a good category.
5. Based on the effectiveness test that has been tested based on the dimensions of service quality, namely tangibles, reliability, responsiveness, assurance, empathy at the time of the pretest get a rating scale result of 58% which means good.

Consent

As per international standard or university standard, Participants' written consent has been collected and preserved by the author(s).

Ethical Approval:

As per international standard or university standard guideline participant consent and ethical approval has been collected and preserved by the authors.

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