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INNOVATION OF "BRAILLE CORNER" DIGITAL LEARNING BASED ON LEARNING FOR THE STUDENTS WITH VISUAL IMPAIRMENT IN INCLUSION SETTINGS

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Abstract

This study aimed to develop a digital literacy-based learning innovation model "braille corner" for students with visual impairment in an inclusive education setting. This study used a design-based research approach. The model was formulated through a study of lectures attended by students with visual impairment in various study programs and innovation laboratories of the Ministry of Special Education through its braille Corner and the Indonesian Braille Literacy Center (BLBI) with its digital literacy resources for students with visual impairment. Content and empirical validation were carried out through the Delphi technique, to obtain the content formulation, efficiency, and implementation of the model that has the principle of feasibility. Empirical validation was carried out through Focus Group Discussions with practitioners to obtain input on the application of the model. The results of the study found a digital literacy-based learning innovation model "braille corner" for students with visual impairment that answered the importance of a support system for students with visual impairment through the realization of equality and accessibility for students with visual impairment through digital literacy braille Corner. With the hope of realizing an inclusive education setting in the learning process for students with visual impairment.

Keywords: Braille corner, Digital literacy, Innovation, Visually impaired.

1. Introduction

Learning innovation is a necessity [1], especially during this pandemic [2]. Pandemic brings something to teaching process to be more developed [3]. The development of digital literacy-based learning innovations must continue to be developed. This is an effort to meet the urgent demands of the pandemic, including the increasing number of students with special needs in higher education [4]. The existence of students with special needs is a challenge in the context of developing materials, methods, media, special aids (assistive technology), and modifying the right learning environment, especially for students with visual impairments (blind) [5-7]. The selection of methods, media, and materials according to the needs of students has a goal so that they can participate in learning optimally [8]. Learning innovations provide opportunities for students with visual impairment to construct knowledge and actively participate in the learning process [9]. Braille corner's digital literacy-based learning innovation is presented to change the way of thinking, behavior orientation, attitudes, and value systems that support the development of contextual and functional learning for students with visual impairment [10, 11]. Graduate competencies are expected to produce graduates who are highly competitive and efficient. This is done by increasing access and quality of education services [12].

Learning challenges and problems are quite complex problems, especially for students with visual impairment in higher education [13]. Students with visual impairment are students with special needs who need special education and services [14]. In addition to limited access to learning resources, not all lecturers understand the characteristics and needs of students with special needs [15]. This makes lecturers at universities able to get to know students with visual impairment and develop learning innovations, one of which is based on braille corner's digital literacy.

There are several barriers to accessing digital literacy [16], namely: (i) Situational barriers are barriers that arise as a consequence of someone's circumstances [17]. Examples of digital literacy skills are too expensive, not having enough time, too busy working, having no transportation, having no access to computers, having unsupportive family and friends, having special needs, and lack of appropriate tools and technology. Cost and time are the most common reasons not to pursue digital literacy learning. (ii) Institutional barriers are barriers that arise as a consequence of organizational policies and procedures [17]. Institutional barriers that are difficult for individuals to overcome, such as: not meeting entry requirements, inflexible course dates and times, not enough information, class sizes being too large, or courses are also held at inappropriate times, and inaccessible places. (iii) Dispositional Barriers are barriers that come from within the individual [17]. These include a lack of self-confidence and low self-esteem and feelings of inadequacy, especially when compared to other people. Examples of digital literacy skills are feeling too old to learn new skills, not doing well, and feeling not smart enough.

In today's world, people are using the immense power of digital media to explore, connect, create, and learn in ways never before imagined [18]. With this strength, students have the opportunity to develop their potential. However, they also face many consequences related to cyberbullying, digital cheating, desensitization, and a lack of understanding of immutability and replication. This safety and security issue is the background of the need to increase responsible

digital literacy competencies and better ways of using the internet, especially for students. Not all students have the same access for various reasons [19].

Currently, many studies discussed digital [18, 19], digital-based learning [20-22], the impact of using the digital internet [23, 24], the benefits of using digital internet [25, 26], and the function of digital tools [27-30]. However, until now there has been no research that discusses the "braille corner" digital literacy-based learning innovation for students with visual impairment in inclusive education settings.

Braille corner digital literacy offers a comprehensive and balanced approach to addressing safety, security, ethical, Behavioral, and digital literacy issues for students with visual impairments. The ability to maintain and create personal and community connections are key to preventing isolation and promoting social independence and inclusion. Through the braille corner's digital literacy program, digital braille literacy skills can develop optimally. Conventional computers allow students with visual impairments to operate them. Voice is used to improve communication. Zoom serves to improve visual accessibility on conventional computers. The braille terminal translates digital text to a braille output display. Screen readers are supported to access the internet, email, communicate with friends, join social clubs, shop online, access information (locally, nationally, and globally), and increase student digital interest. The e-braille application is an application created to unite braille and digital literacy. Through an application using an iPad and an updateable braille display, students practice and hone their braille literacy skills anywhere, anytime [31].

The purpose of this study is to develop a digital literacy-based learning innovation model "braille corner" for students with visual impairment in inclusive settings. This study uses a design-based research approach. In this study, we examine the stages of lectures followed by students with visual impairment in various study programs to formulate an innovation model. Content and empirical validation are carried out through focus group discussion activities. The results of the study found a "braille corner" digital literacy-based learning innovation model for students with visual impairment. This answers the importance of a support system for students with visual impairment to realize equality and accessibility for students with visual impairment with the hope of realizing an inclusive education setting in the learning process for students with visual impairment. The novelty of this research is digital literacy "braille corner", students with visual impairment subjects, literacy learning innovations, and inclusion settings.

2.Method

2.1. Research procedure

This research uses design-based research. The research procedure was carried out in three stages. First, in the preliminary stage, we examine the digital and empirical literacy literature to formulate a braille corner digital literacy-based learning innovation model as a hypothetical model. The second stage is a model validation stage to revise and develop a hypothetical model through theoretical conceptual validation and practical-empirical contextual validation. At this stage, it involves experts and practitioners so that the model becomes an operational model. The third stage is the model testing stage. At this stage, the operational model is tested for its applicability and effectiveness. The results of this test are used as the basis for

further improvements. Thus, braille corner's digital literacy-based learning innovation model for students with visual impairment can be disseminated.

2.2. Location and subject's research

This research was carried out in faculties and in study programs that have students with special needs at the Universitas Pendidikan Indonesian (UPI). The research subjects are students with special needs, especially the students with visual impairment at the Universitas Pendidikan Indonesian. Table 1 describes the number of students with visual impairment subjects in the Universitas Pendidikan Indonesian. The students come from the Faculty of Education (FIP), the Faculty of Art and Design Education (FPSD), the Faculty of Language and Literature Education (FPBS), and the Faculty of Social Sciences Education (FPIPS).

Qualitative data collection was carried out according to the source and type of research data needed for answering the problem. The main instrument of qualitative research is the researcher himself. A qualitative approach, including naturalistic inquiry, requires humans as the instrument, so the instrument is a guide. Data was collected through interviews, observations, and documentation studies. In this study, a field note format was also developed.

Table 1. List of Students with visual impairment in Universitas Pendidikan Indonesia.

No.	Name	Program Study	Faculty	Year
1	ZK	Special needs education	Education	2021
2	AAS	Special needs education	Education	2020
3	II	Special needs education	Education	2020
4	NSA	Special needs education	Education	2020
5	RA	Special needs education	Education	2020
6	SRI	Special needs education	Education	2020
7	PKP	Special needs education	Education	2019
8	BF	Music art education	Art	2021
9	A	Music art education	Art	2021
10	C	Music art education	Art	2020
11	SFM	Music art education	Art	2019
12	J	Music art education	Art	2017
13	MSR	German language education	Language	2019
14	SPS	Indonesian literature	Language	2019
15	F	History	Social science	2021
16	SA	Social science education	Social science	2021
17	MPD	Social science education	Social science	2019
18	DW	History	Social science	2018

3. Results and Discussion

3.1. Students' demography

This study involved 18 students with visual impairment as subjects. Students with visual impairment are children with special needs. They need special services and education [32]. Students with visual impairment have problems in the aspect of vision. Thus, they are auditory learners. They maximize the function of the five senses

of hearing and tactile in understanding information. Media and learning methods must be adapted to their needs [14, 33]. Methods and media according to needs make it easier for students with visual impairments to understand information [2, 8].

Nowadays, especially in the world of lectures, the use of digital access is a demand in the learning process or lectures. Most students have problems operating their computers or laptops. They need innovation in the development of learning methods and media. Media and methods must be adapted to their needs [8, 15, 33]. The development of a digital literacy-based learning innovation model "braille corner" for students with visual impairment in inclusion settings is one solution to minimizing problems in the lecture process.

3.2. Data analysis research procedures

This research went through several stages according to the development of design-based research procedures, namely (i) Preliminary study, (ii) Hypothetical model development and validation, and (iii) Applicability and model effectiveness trials [34].

From the preliminary study, three main data were obtained, namely: digital braille literacy, the philosophy and concept of innovation, and data for students with special needs. Based on the synthesis of the preliminary study, we formulated a hypothetical model framework for learning innovation based on braille corneR'S digital literacy for students with visual impairment.

Based on the results of conceptual-theoretical rational validation and practical-empirical contextualization, important data were obtained to provide confidence that the braille corner digital literacy-based learning innovation model is appropriate for students with special needs who have visual impairments (applicable). The structure and component content of the model are two dimensions that are considered from the validation results based on experts with doctoral qualifications [35]. These components are considered adequate and operational to be tested on a limited basis. Figure 1 shows the operational model based on contextual-practical-empirical tests conducted by weighing practitioners.

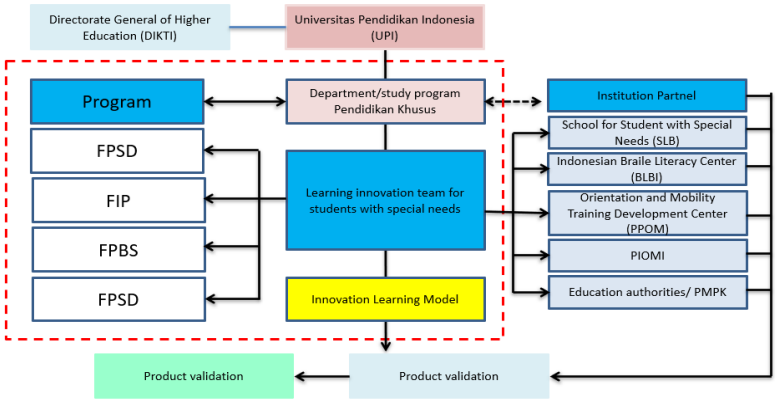

Fig. 1. A hypothetical model of learning innovation based on digital literacy braille corner.

The development of a digital literacy-based learning innovation model "braille Corner" for students with visual impairment in inclusive settings has a vision and mission. Its vision is to build a quality and equitable campus climate for the success of all students, through a network of partnerships with various relevant groups. Its mission is to facilitate all students in mastering competencies in the academic, personal, social, and career fields based on normative ethical living arrangements.

In the aspect of beliefs and goal parameters, the innovation of learning based on digital literacy in braille corners is built on the foundation of the belief that students with special needs (blindness) can participate in this program. This program is designed to ensure all students benefit. Consistently promotes effective learning, through school, home, and community partnerships that take place in an inclusive culture. An inclusive culture is manifested in the preparation of experiences for all students by diversifying programs. Meanwhile, in the aspect of indicators of quality, the national standard provides a structure for establishing an inclusive campus with objectives related to the competence of undergraduate graduates. The goal is an extension of the vision and mission, focusing on the results to be achieved by graduates.

To get the vision and mission objectives, various activities must be carried out:

(i) Planning stage. Activities include program planning, building foundations, designing delivery systems, implementing programs, and improving programs based on evaluation results. Students and parents must believe in the continuity of the program. Students with visual impairments are expected to benefit greatly from this braille corner's digital literacy-based learning innovation model. The key is to ensure the most appropriate placement. Students with special needs can pass through parts of the curriculum at a different level than other students. They do this individually or in small groups. Students with special needs through the outcome-based curriculum [36].

(ii) Implementation Stages. Activities include improving the quality of implementing development staff or lecturers who support courses and training for students with special needs who experience visual impairments. The training includes strategy development and curriculum modification intended to benefit all students in the class. Differentiated curriculum bridge the achievement of the national curriculum with the needs of students [14-15, 33]. Topics of innovation development include: first, program development is carried out by carrying out needs analysis, writing philosophy, designing identification processes, selecting service options, and making action plans. Both identification characteristics and needs were carried out to determine the characteristics of students with visual impairment, the emotional and social needs of students with visual impairment. The three stages of instructional strategies include content, process, product. The data was obtained from various meetings and discussions with experts. Support and technical assistance are provided to provide curricular experiences for students with visual impairment with the continuity of the program. The strategy is a curriculum measuring tool. However, it is structured to provide a context for visually impaired students to discuss their emotions and thoughts.

(iii) The evaluation stage produces a written document that can be accessed by lecturers, administrators, parents, and anyone interested in this program. The necessary changes must be made and evaluated in the next cycle. Program

audits provide evidence of program alignment. The main purpose of collecting information is to serve as a guide for program follow-up and to develop expected outcomes for students with visual impairments in the future. Evaluation is needed as material for program improvement [14-15, 33].

3.3. Data analysis

Braille is a form of reading and writing for students with visual impairment that was developed in 1824 by Louis Braille [37, 38]. Visually, students with visual impairment rely on their sense of hearing and sense of touch to read and write. In accessing information, they do everything with the click of a button. Students with visual impairment people face many challenges and problems in accessing digital. The invention of smartphones and internet devices changed the way we communicate with each other. The internet makes many aspects of life easier [39]. However, this digitization has become a real problem for students with visual impairment. One of them is the accessibility of specific devices and resources. Students with special needs require accessible digital use according to their needs [38]. Currently, the company focuses only on the most active users who typically have stronger purchasing power and higher levels of digital literacy. Users with disabilities are often overlooked in this market and technology-oriented approach [40].

Students with visual impairments have difficulty finding good reading material in accessible formats [14]. Whereas the internet is the largest repository of information and reading material. However, most of them are not accessible to students with visual impairment. Today, screen reading software has revolutionized for the visually impaired to acquire computer skills. Software such as JAWS allows the visually impaired to read the text of content displayed on a computer screen using a braille display or listening software.

Screen readers help in increasing computer literacy and allow greater access to resources available on the internet [19]. However, this software is very expensive due to the high cost of each JAWS license. Some of the students with visual impairment come from rural areas and have never accessed this technology. Therefore, a digital braille system is needed so that it can help the visually impaired to read digital content easily and affordably.

Braille corner digital literacy is tailored to the individual needs of students with visual impairment in various study program settings. Essential skills training is held in addition to digital literacy classes. This helps to develop access to computer facilities in the local library. Not all students feel confident enough to use their equipment. They need the help of others. However, not all librarians have time to sit down with students with visual impairment [40].

To help minimize barriers to digital literacy, training providers should consider the following in their implementation, the provision of 'taster' courses, more entry-level classes, allowing students to progress at their own pace, and being allowed to re-take the same training. Braille corner innovation laboratory of the Department of Special Education in the Faculty of Education (FIP) at Universitas Pendidikan Indonesian (UPI) started with basic-level computer training for students with visual impairment. That's because the program is made to be based on the needs of students [14-15, 39, 41-44]. Course dates and times are flexible according to student availability. We also provide time every Saturday for braille corner discussion forums and workshops/training.

Visually impaired students and parents must believe that there will be continuity in the program. Students with special needs who experience visual impairments can benefit greatly from this innovation of learning based on digital literacy in braille corners. The key is to ensure that the three basic components for the delivery of a learning management system, learning services, and curriculum modification exist (UNESCO, 2016)

Parents and the community are valuable resources in the context of the success of students with visual impairment in pursuing higher education. They can establish contact and share with the parents of other students, especially in the FIP at UPI. There is provided a place for parents called the FIP Student Parents Association (IOM FIP). The parent and alumni community are used to find and determine mentors for students with visual impairment in Braille Corner digital literacy. Visually impaired students sometimes need someone who is watching them do their lectures. As alert parents, parents can assist in contributing to the success of their child's studies. The involvement of parents in the education of students with visual impairment can be a significant positive force. The participation of parents is very influential on the potential development of their children [14-15, 439, 41-44].

As a service unit for students with visual impairment, the Braile Corner of the Innovation Laboratory of the Department of Special Education FIP UPI develops an effective service model through the synergy of relevant sources. Digital sources need to be developed and become the agenda for further studies, especially concerning applications that can connect to WiFi and braille displays. Braille corner Department of Special Education FIP UPI also builds synergy with CBT FIP and BLBI Abiyoso of the Ministry of Social Affairs including with the UPI Library Data Service Center so that this is projected for the "Digital literacy network for all" project. The utilization of digital literacy access is very important [20, 23, 25].

Digital literacy can ensure new opportunities for students with visual impairments from previous generations. Diversity creates new opportunities for students with visual impairment in pursuing their studies at universities. Apart from braille, modern times establish digital literacy as a fundamental prerequisite for the independence of students with visual impairment and their inclusion in the life of the wider community. Digital Literacy for students with visual impairment is directed to empower uniqueness into strength. Every child has a different potential [45-47].

Braille corner digital literacy is expected to achieve the conversion of electronic documents and other digital content into braille. The goal is to help the visually impaired to read and access them easily. The digital function is for digital literacy and is accessible to students with visual impairment. Braille on digital is designed and implemented using an Arduino board and push-pull solenoids. The final prototype fulfils all major designs. The specification uses less force, it takes into account the comfort of tactile reading. The microcontroller-based platform is programmable and is a standalone system that allows for portability. So, the system implemented with this component can read the text. The text that is read is then moved in braille. All media are adapted to the needs of the visually impaired. Media that suits students' needs makes it easier for them to access and understand information[48, 49]. Braille can be read from a braille cell by simply placing a finger because the pattern moves rather than sliding the finger in the already formed braille pattern. The digital braille system was developed to enable the visually impaired to easily access electronic devices and read on the go. This innovation

shows that there is a great opportunity to make digital braille modules at affordable prices and improve the daily lives of the visually impaired. The digital braille system helps students with visual impairment to acquire computer literacy. The benefits obtained will change reading for students with visual impairment and encourage digital consumption among the younger generation, especially for the visually impaired.

The rapid transformation of digital technology forces everyone to be ready to transform digitally. However, not everyone has the same access and ability to switch to digitization, especially students with visual impairments. This Braille Corner digital literacy-based learning innovation is important to develop to provide digital literacy for students with visual impairment and provide the ability to participate in the transition process towards digitization and provide equal opportunities to students with visual impairment in higher education. This is expected to be useful for universities in Indonesia to find effective strategies to provide equal opportunities to students with visual impairment in this era of digital transformation. This is an effort to provide accessibility for students with visual impairment and to eliminate discrimination. Eliminating discrimination is an effort in realizing an inclusive education setting [14-15, 45]. Further development will be required to implement greater usability functions. The functionality of adjusting the reading speed will also be very important for the usability of a braille digital device. Digital braille systems may be modified to be implemented in conjunction with software. Using audio in conjunction with a braille system can be an effective learning tool.

4. Conclusion

This study develops a digital literacy-based learning innovation model "braille corner" for students with visual impairment in inclusive settings. A design-based research approach is used in this study. The stages of lectures followed by students with visual impairment in various study programs were studied to formulate an innovation model. Focus Group Discussion activities were carried out for content and empirical validation. The results of the study explain the discovery data of the "braille corner" digital literacy-based learning innovation model for students with visual impairment. This answers the importance of a support system for students with visual impairment to realize equality and accessibility for students with visual impairment in the hope of realizing an inclusive education setting. Digital literacy "braille corner", students with visual impairment subjects, literacy learning innovations, and inclusion settings are the novelties of discussion in this study.

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