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Implementation of Smart Iron as Supporting Technology for Blind Junior High School Students in Ironing Activities at SLBN A Citeureup

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ABSTRACT

Purpose: This study aims to examine the implementation of a smart iron as assistive technology to support visually impaired junior high school students in ironing activities at SLBN A Citeureup, particularly in improving independence, orientation and mobility, and daily living skills. **Methods**: This research employed a qualitative descriptive approach involving visually impaired junior high school students, skills teachers, and school staff at SLBN A Citeureup. Data were collected through observation, interviews, and documentation. The observations focused on students' orientation and mobility development, social development, and independence during ironing activities using the smart iron. Data were analyzed through data reduction, data presentation, and conclusion drawing, while source and method triangulation were used to ensure data validity. **Findings**: The findings revealed that the implementation of the smart iron positively influenced students' independence, confidence, and practical life skills. Students were able to recognize the parts and functions of the smart iron, follow audio instructions, distinguish temperatures through sound or vibration features, and iron clothes safely with minimal teacher assistance. In addition, the use of the smart iron improved students' motor coordination, tactile abilities, social responsibility, and confidence in performing household activities independently. Teachers also confirmed that the voice guidance and automatic temperature features enhanced safety and reduced students' dependence on assistance. **Research Implications**: The findings imply that assistive technology can play an important role in supporting inclusive education and daily living skills development for visually impaired students. The smart iron can be utilized as an adaptive learning medium to improve accessibility, safety, and independence in vocational and household activities. **Originality**: This study offers originality by specifically developing and implementing a smart iron with voice and sensor features as assistive technology for visually impaired students in ironing activities, an area that has received limited attention in previous studies.

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INTRODUCTION

A blind person is an individual whose sense of sight does not function perfectly as a channel for receiving information in daily activities, as it does for a sighted person. The word "tunanetra" in the Great Dictionary of the Indonesian Language comes from the word "tuna," meaning damaged or defective, and the word "netra," meaning eye or visual organ (Rama & Trustisari, 2024). Therefore, the word "tunanetra" means impaired vision. Scholl, in Hidayat and Suwandi (2013), states that a person is legally blind if their central visual acuity is 20/200 feet or less with their best vision after correction with glasses, or if their central visual acuity is greater than 20/200 feet, but there is a visual field defect that forms an angle of no greater than 20 degrees in their best eye (Handoyo, 2022).

In special education, children with visual impairments are referred to as blind children, whether they are totally blind or have low vision. Visual impairment can be measured and viewed from both a medical and educational perspective. Medically, a person is considered blind if their visual acuity is 20/200 or their visual field is less than 20

degrees (Legiana & Yuliana, 2023). Educationally, a child is considered blind if the learning medium used is touch (totally blind) or if they can still read and write but with larger font size. A blind child is a child who experiences visual impairments, which can cause difficulties in mobility or activities. Mobility is the ability, readiness, and ease of movement and change places. Blind children often experience difficulties in their daily activities, so an accessible environment is needed to facilitate children's activities independently (Wau et al., 2024).

In essence, "Independence is a person's ability to do something without the help of others, to be responsible for their own decisions and efforts, to have confidence in making plans, to choose alternatives in solving problems, and to be able to compete with others." 'Hakam and Nurdin' (2016, p. 135). "Independence is a person's ability to be confident in carrying out their tasks." 'Ramtina M' (2015, p. 1), in addition "Independence is also a person's action in managing himself with a full sense of responsibility according to his capacity, while in 'Sari and Rasydah' (2019, p. 5) "Independence is an attitude of self-confidence in solving problems with his own ideas or thoughts". "A person is said to be independent if that person has self-confidence, does not depend on others in carrying out his daily life" (Pahlefi et al., 2024). By referring to these opinions, researchers can interpret that independence is a person's ability to have a self-confident attitude, have the freedom to act without influence and depend on others, can think positively, want to try and be responsible for all his decisions. Thus, independence is very important for everyone to have, without exception, both sighted children and blind children, because with the independence that blind children have, blind children will feel confident in carrying out Orientation and Mobility in various environments safely, securely, and independently (Ramadani & Mukhaiyar, 2022).

However, the reality in the field, with the loss of sight, there are still many blind children whose independence has not developed, they have difficulty in orientation and mobility, have difficulty developing their potential, and have difficulty imitating movements made by others, while sighted children can easily do all these activities (Pamungkas & Kurniasari, 2022). According to 'E Octaviana' (2016, p. 230) in her research based on the results of interviews with Guidance and Counseling teachers at the Tuah Sakato Kalumbuk Social Home for the Blind in Padang City, stated "there are still blind people who have a lack of confidence in their abilities, due to their physical condition, therefore with their blindness, it affects the self-concept of the blind themselves, so that the potential of the blind children does not develop". The independence of blind children, as with children in general, is very important to develop. Although blind children may face additional challenges in terms of sensory perception, there are many ways to support them to be independent (N. Simanjuntak et al., 2025).

According to the KBBI (Big Indonesian Dictionary), an iron is a clothes smoother used to remove wrinkles from clothing. Freshly washed clothes usually need to be ironed to make them smooth again. This happens because when the polymer molecules in the clothing fibers are heated, the fibers are straightened due to the weight of the iron. After cooling, the clothes retain this straight shape. Some clothing materials need to be given water to loosen the bonds between the molecules. Currently, there are many clothing materials made from synthetic polymers that are promoted as materials that do not need to be ironed. Ironing is part of the Activity of Daily Living Personal Care Skill in managing a household. Ironing is an easy activity for people in general, but for individuals with visual impairments, this is quite difficult. Based on the results of interviews with blind people, especially Totally Blind at SLBN A. Citeureup, Cimahi City, individuals with visual impairments said that they experienced problems ironing clothes, namely often being exposed to the hot plate of the iron. This affects when blind people are ready to return to society because blind people are required to be able to carry out daily activities.

Research on the application of assistive technology for the visually impaired in daily living skills activities is still relatively limited, particularly on the use of smart irons as a supporting medium for ironing learning in junior high schools with special needs. Most previous studies have focused more on assistive technology in aspects of mobility, communication, or academic learning, while studies focusing on the development of vocational skills and household independence have not been formulated in depth. Furthermore, previous research generally only highlights the effectiveness of assistive devices in general without specifically examining how the application of smart irons can improve the safety, independence, and confidence of visually impaired students in ironing activities. This condition indicates a research gap that needs further examination to obtain a more comprehensive understanding of the use of assistive technology in practical skills activities for visually impaired students.

On the other hand, the formulation of the problem in research related to the application of smart irons has not been explicitly formulated in several previous studies, so the direction of the research is often less focused. The research objectives are usually only stated at the end without being preceded by a clear problem formulation regarding the needs of blind students, obstacles in ironing activities, or the role of assistive technology used. Therefore, the study entitled "The Application of Smart Irons as Supporting Technology for Blind Junior High School Students in Ironing Activities at SLBN A Citeureup" is present to fill this gap by formulating the problem more systematically and specifically

examining the application of smart irons as an effort to support the learning of safe, independent, and adaptive life skills for blind students.

Based on this, researchers created assistive technology that can help them carry out daily activities or ADL by modifying an iron to adjust to the obstacles they experience. Assistive technology is an effort that can help blind people to improve their mobility and help children to do activities independently. Assistive technology provides benefits to blind people and optimizes the function of the tools to be used. One example of assistive technology that can be given to blind children is a sensor iron. A sensor iron is a modified iron and is designed to help blind people tidy clothes independently. In addition, the sensor iron contributes to accessible services for the blind in general. The purpose of this research is to create and test a sensor iron for blind people that can help children to do activities well without any obstacles. This research will explain the definition of sensor iron assistive technology, the benefits of sensor irons and how to use a sensor iron. The results of this research are able to design a sensor iron for blind people that will provide accessible services for blind people.

METHOD

This study employed a qualitative method with a descriptive approach. This approach was chosen because the study aimed to deeply understand the process of implementing a smart iron as assistive technology in ironing activities for visually impaired students. Through qualitative methods, researchers were able to describe students' experiences, responses, and forms of interaction regarding the use of this technology in daily life skills activities in the school environment..

The research subjects consisted of visually impaired junior high school students at SLBN A Citeureup, skills teachers, and school officials involved in the ironing learning process. Data collection techniques were conducted through observation, interviews, and documentation. Observations were used to directly observe students' activities when using the smart iron, interviews were conducted to obtain information about the benefits, obstacles, and effectiveness of using the device, while documentation was used to supplement the data in the form of activity photos, learning notes, and other supporting documents..

The data analysis technique was conducted descriptively and qualitatively through the stages of data reduction, data presentation, and conclusion drawing. Data obtained from observations, interviews, and documentation were then analyzed to find patterns, meanings, and relationships related to the implementation of smart irons for blind students. To maintain data validity, the study used source triangulation and method triangulation techniques by comparing the results of interviews, observations, and documentation to ensure the data obtained was more valid and accountable.

Table 1. Orientation and Mobility Development Instrument

Nu.	Competence	Indicator
1.	**Body Image**	
	Explaining the names of body parts	a. Name the parts of the body from head to toe b. Name the front and back parts of the body. c. Name the parts of the sides of the body
	Shows the location of body parts	a. Identify each body part b. Identify the body parts on the head c. Identify the body parts on the trunk d. Identify the body parts on the feet
	Explaining the functions and parts of the body	a. Explain the function of each body part from hair to toe b. Perform activities by using certain body parts
2.	**Motor skills, spatial and environmental awareness.**	
	Do sitting movements	a. Sitting on the floor b. Sitting on a chair c. Sitting in a cross-legged position d. Sitting with your legs straight out in front of you (stretched)
	Do standing movements	a. Perform a perfect standing position b. Perform a standing position on one leg c. Perform a standing position with the legs and arms raised (airplane position)
	Doing tactile exercises	a. Distinguishing different surfaces, namely rough, smooth, soft, hot, and cold.

Nu.	Competence	Indicator
		b. Distinguishing various materials, namely silk, cotton, and wool.
		c. Distinguishing walking on various surfaces, such as grass, asphalt, soil, and gravel.
		d. Distinguishing sizes, namely long and short.
		e. Distinguishing shapes, namely circles, triangles, rectangles, etc.
		f. Distinguishing the relationship between two or more objects.
	Do listening exercises	a. Name the type of sound
		b. Name the location of the sound
		c. Differentiate sounds
		d. Respond to sounds
	Doing Smell Exercises	a. Differentiating and indicating
		b. Identifying types of odors
		c. Differentiating types of odors
		d. Identifying locations of odors
		e. Responding to odors
	Perform movements by exploring the environment	a. Move around the room
		b. Search for objects in the room or environment
		c. Follow the sound source
		d. Pick up objects
3.	**Principles and components of orientation skills**	
	Establish your position using the senses that are still functioning	a. Determine where you are
		b. Determine where you are going or where you are going.
		c. Determine how you will get there.

Table 2. Social Development Instruments for the Blind

Nu.	Competence	Competence
1.	**Personal Health**	
	Maintaining personal health	a. Bathing Yourself
		b. Washing and Drying Your Hands
		c. Washing and Drying Your Feet
		d. Brushing Your Teeth
		e. Using the Bathroom (Toilet)
		f. Using Deodorant
		g. Putting on Shoes and Sandals
		h. Trimming Your Nails
		i. Washing and Combing Your Hair
		j. Applying Makeup
	Caring for and maintaining clothing.	a. Washing by hand
		b. Washing using a washing machine
		c. Folding clothes
		d. Ironing clothes
		e. Storing clothes
		f. Choosing the right clothes
		g. Labeling clothes

RESULTS

Orientation and Mobility Development

The orientation and mobility development aspects of this study focus on the ability of blind students to recognize, understand, and use the environment and tools independently during ironing activities. The implementation of the smart iron is expected to help blind junior high school students at SLBN A Citeureup improve their motor skills, tactile abilities, motor coordination, and a sense of security and confidence when ironing as part of developing daily independence. This is supported by the following observations made by the researcher:

Table 3. Observations of Development and Mobility

Nu	Observed Aspects	Statement	1	2	3	4	5
1	Introduction to smart ironing tools	Students are able to recognize the parts of a smart iron.	-	-	-	√	-
2	Introduction to smart ironing tools	Students are able to state the function of the buttons on the smart iron.	-	-	-	√	-
3	Security awareness	Students are able to check the condition of cables and tools before use.	-	-	-	√	-
4	Security awareness	Students are able to use tools carefully and safely.	-	-	-	√	-
5	Tactile skills	Students are able to differentiate the temperature of the iron using the sound/vibration feature.	-	-	-	√	-
6	Hearing skills	Students are able to understand audio instructions on the smart iron	-	-	-	√	-
7	Motor skills	Students are able to hold the iron in the correct position.	-	-	-	√	-
8	Motor skills	Students are able to move the iron regularly on clothes.	-	-	-	√	-
9	Movement coordination	Students are able to iron clothes without much help from the teacher.	-	-	-	√	-
10	Independence	Students are able to prepare clothes to be ironed	-	-	√		-
11	Independence	Students are able to operate the smart iron independently	-	-		√	-
12	Independence	Students are able to turn off the iron after use.	-	-	-	√	-
13	Understanding of tool use	Students are able to follow the steps for using a smart iron correctly.	-	-	-	-	-
14	Accuracy of use	Students are able to choose the temperature level according to the type of fabric.	-	-	√	-	-
15	Accuracy	Students are able to iron clothes neatly	-	-	-	-	-
16	Effectiveness of tool use	Students are able to complete ironing activities on time	-	-	-	√	-
17	Response to technology	Students demonstrate confidence when using the smart iron			√		-
18	Response to technology	Students show interest in using smart iron technology	-	-	-	√	-
19	Learning interactions	Students are able to follow the teacher's directions during ironing practice.	-	-	-	√	-
20	Evaluation of results	Students are able to identify neat clothes by touch.	-	-	-	√	-

Based on observations of orientation and mobility development, the implementation of a smart iron for visually impaired junior high school students at SLBN A Citeureup showed positive results in supporting independent ironing activities. Students were able to recognize the parts of the smart iron, understand the button functions, and use the tool safely and carefully. In addition, students were also able to understand audio instructions, distinguish temperatures through sound or vibration features, and move the iron in the correct position. In terms of independence, students were able to prepare clothes, operate the smart iron, and turn off the device after use with minimal teacher assistance. The use of the smart iron also increased students' self-confidence, interest in technology, and ability to complete ironing activities more effectively and in a focused manner. The results of these observations were reinforced by the results of teacher interviews obtained by the researcher. The results of the teacher interviews showed that:

> *The use of a smart iron significantly helps visually impaired students develop orientation and mobility by making it easier for them to recognize the position of tools, clothing, and work areas through the sound feature and special markings on the iron. Furthermore, students gain more confidence in moving and ironing independently because the tool is designed to be safer and easier to use. With repeated practice, students' motor coordination, sense of touch, and sense of direction also improve.*

Based on observations and interviews, it can be concluded that the implementation of a smart iron as a supporting technology for visually impaired junior high school students at SLBN A Citeureup has a positive impact on the development of students' orientation and mobility in ironing activities. Students demonstrated good abilities in recognizing the tool's parts, understanding button functions, following audio instructions, and using the iron safely and independently. In addition, the use of a smart iron helped improve motor coordination, tactile ability, sense of direction, and students' confidence in carrying out daily activities. The results of teacher interviews also confirmed that the sound

feature and safe design of the tool made it easier for students to recognize the position of the tool and work area so that ironing activities could be carried out more effectively, directed, and independently through repeated practice.

Social Development for the Blind

The social development aspect for the blind in this study focuses on students' ability to iron independently, safely, and in a directed manner through the use of a smart iron. This social development includes clothing care skills, the use of assistive technology, the ability to follow instructions, and increasing the self-confidence of blind students in carrying out daily life activities in the school environment. With the implementation of the smart iron, it is hoped that students will be able to improve their independence and functional social skills in ironing clothes at SLBN A Citeureup. This is supported by the results of observations conducted by the researcher as follows :

Table 4. Observation of social development for the blind

Nu	Observed aspects	Statement	1	2	3	4	5
1	Caring for and maintaining clothing	Students are able to prepare clothes to be ironed independently	-	-	√	-	-
2	Caring for and maintaining clothing	Students are able to recognize parts of clothing through touch.	-	-	-	√	-
3	Caring for and maintaining clothing	Students are able to use the smart iron according to the instructions for use.	-	-	-	√	-
4	Caring for and maintaining clothing	Students are able to turn on the smart iron independently	-	-	-	√	-
5	Caring for and maintaining clothing	Students are able to choose the temperature according to the type of fabric with the help of the smart iron feature.	-	-	√	-	-
6	Caring for and maintaining clothing	Students are able to iron clothes with the right movements	-	-	√	-	-
7	Caring for and maintaining clothing	Students are able to straighten the position of clothes before ironing.	-	-	√	-	-
8	Caring for and maintaining clothing	Students are able to identify parts of clothing that are still wrinkled by touch.	-	-	√	-	-
9	Caring for and maintaining clothing	Students are able to understand voice instructions on the smart iron	-	-	-	√	-
10	Caring for and maintaining clothing	Students are able to use the smart iron carefully and safely.	-	-	-	√	-
11	Caring for and maintaining clothing	Students are able to avoid mistakes during the ironing process.	-	-	-	√	-
12	Caring for and maintaining clothing	Students are able to fold clothes after ironing them.	-	-	√	-	-
13	Caring for and maintaining clothing	Students are able to store ironed clothes in their place.	-	-	√	-	-
14	Caring for and maintaining clothing	Students are able to turn off the smart iron after use.	-	-	-	√	-
15	Caring for and maintaining clothing	Students are able to store the smart iron properly after use.	-	-	-	√	-
16	Student independence	Students are able to carry out ironing activities independently	-	-	-	√	-
17	Student independence	Students are able to follow the teacher's directions during ironing practice.	-	-	-	√	-
18	Student independence	Students demonstrate confidence when using the smart iron	-	-	-	√	-
19	Student independence	Students demonstrate precision in the process of ironing clothes	-	-	-	√	-
20	Student independence	Students are able to complete the ironing activity until it is finished.	-	-	-	√	-

Based on the results of observations on the social development aspect for the blind, it can be concluded that the implementation of a smart iron as a supporting technology for junior high school students with visual impairments at SLBN A Citeureup has a positive impact on students' independence and social skills in ironing activities. This is

evident in the students' ability to prepare clothes, identify clothing parts by touch, use the smart iron according to instructions, and complete the ironing process independently with safety and confidence. In addition, students are also able to understand voice instructions, follow teacher directions, demonstrate accuracy, and be responsible for storing clothes and the iron after use. Thus, the use of a smart iron has been proven to help increase the independence, self-confidence, and adaptability of blind students in carrying out daily activities more effectively and safely. The results of these observations were reinforced by the results of teacher interviews obtained by the researcher. The results of the teacher interviews showed that:

> *I believe that using a smart iron significantly contributes to the social development and independence of blind students, as they become more confident in ironing without relying too much on teacher assistance. The voice prompts and automatic temperature control feature make it easier for students to understand the steps for using the iron safely. Furthermore, students appear more active in following directions, are able to work more independently, and demonstrate responsibility in tidying up and storing equipment after use.*

Based on observations and teacher interviews, it can be concluded that the implementation of a smart iron as a supporting technology for visually impaired junior high school students at SLBN A Citeureup has a positive influence on the social development and independence of students in ironing activities. From the observations, it was seen that students were able to carry out various stages of ironing independently, starting from preparing clothes, identifying clothing parts by touch, using the smart iron according to the instructions, and completing the ironing process safely, carefully, and confidently. Students were also able to understand voice instructions, follow teacher directions, and demonstrate responsibility in storing clothes and equipment after use. These results were reinforced by teacher interviews which stated that the use of a smart iron helped students become more confident and less dependent on teacher assistance. In addition, the voice feature and automatic temperature settings made it easier for students to understand the steps for using the iron safely, so that students were more active, independent, and responsible in carrying out ironing activities. Thus, the smart iron has proven effective in supporting the social development, life skills, and independence of visually impaired students in daily activities.

DISCUSSION

Orientation and Mobility Development

The implementation of a smart iron as a supporting technology for visually impaired junior high school students at SLBN A Citeureup has shown positive results in improving their ironing skills. Students are able to recognize the parts of the smart iron, understand the button functions, and use the tool safely and carefully with the help of the sound feature and special signs on the tool. In addition, students are also able to understand audio instructions, distinguish temperatures through sound or vibration features, and move the iron in the correct position so that students' motor coordination and tactile abilities develop well. In terms of independence, students can prepare clothes, operate the smart iron, and turn off the tool after use with minimal teacher assistance. The results of teacher interviews also showed that the use of the smart iron helps students become more confident in moving and carrying out ironing activities independently because the tool is designed to be safer and easier to use. With repeated practice, the orientation, mobility, sense of direction, and motor skills of visually impaired students have improved so that ironing activities can be carried out independently.

This is in line with the opinion Simanjuntak et al. (2025) who said that training and sensitivity to the needs of blind children can guide and facilitate the development of optimal independence, particularly through mobility orientation (MO) methods, personal hygiene training, and involving children in social activities within the school environment. Teachers also have a responsibility to create a safe, challenging, and supportive learning environment, where children are given space to try, fail, and learn independently. With consistent guidance, teachers can help blind children recognize their potential and overcome fears in making decisions or exploring their surroundings.

Social Development for the Blind

The implementation of a smart iron as a supporting technology for visually impaired junior high school students at SLBN A Citeureup has had a positive impact on improving their social skills and independence in ironing activities. Observations show that students are able to carry out various stages of ironing independently, starting from preparing clothes, identifying clothing parts by touch, using the smart iron according to the instructions, selecting the temperature according to the type of fabric, and completing the ironing process safely and confidently. In addition, students are also able to understand voice instructions, follow teacher directions, demonstrate accuracy, and take responsibility for

folding and storing clothes and the iron after use. The results of teacher interviews also confirmed that the use of the smart iron helps students become more confident and less dependent on teacher assistance because the voice feature and automatic temperature settings make it easier for students to understand the steps for using the tool safely. Thus, the implementation of the smart iron has proven effective in supporting the social development, life skills, sense of responsibility, and adaptability of visually impaired students in carrying out daily activities more effectively, safely, and independently.

This is in line with the opinion Rachmadina et al. (2024) which reveals that in developing motor skills, physical activity plays a vital role for visually impaired children, improving their coordination, balance, and self-confidence. This approach not only supports physical health but also fosters their social skills through interactions with peers in an inclusive environment, a particular need in an inclusive education approach that focuses not only on academics but also on holistic development.

CONCLUSION

Based on the research results, the implementation of Smart Iron as a supporting technology for visually impaired junior high school students at SLBN A Citeureup showed positive results in improving orientation and mobility skills as well as students' social development in ironing activities. Through the sound feature, temperature sensor, and safer design, students were able to recognize the parts of the tool, understand the instructions, differentiate temperatures, and carry out the ironing process more independently and safely. In addition, the use of Smart Iron also helped increase students' self-confidence, motor coordination, tactile abilities, and responsibility in completing daily activities, especially in clothing care.

The research also confirms that the Smart Iron has great potential as an assistive technology that supports the independence of blind people in activities of daily living (ADL). The presence of audio features and supporting sensors provides a sense of security for students so they are no longer overly dependent on teacher assistance when ironing. With repeated practice and appropriate guidance, students are able to develop life skills, environmental orientation, and social abilities more optimally. Therefore, the Smart Iron can be an effective assistive technology innovation to support vocational skills learning and improve the quality of life for blind people.

However, this study still has several limitations, such as the limited number of research subjects and the study being conducted only in one school, so the results cannot be generalized widely. Furthermore, the development of the Smart Iron feature is still simple and does not include more modern technologies such as digital-based automatic sensors or supporting application connectivity. Therefore, further research is recommended to involve more subjects, expand the research location, and develop the Smart Iron feature to be more innovative, safe, and easy to use. Further research can also examine the effectiveness of using similar assistive technology in other life skills activities to support the independence of people with visual impairments more comprehensively.

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