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Implementing the Smart Sajadah to Enhance Worship Independence among Students with Visual Impairments in Islamic Religious Education

Implementasi Smart Sajadah dalam Meningkatkan Kemandirian Ibadah Siswa Disabilitas Netra pada Pembelajaran Pendidikan Agama Islam

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Abstract

Limited access to visual information during practical *ṣalāh* instruction causes students with visual impairments to depend heavily on teacher assistance, highlighting the need for assistive learning media that foster greater independence in worship. This study aims to examine the implementation of the *Smart Sajadah* in Islamic Religious Education and to identify its contribution to enhancing the independence of students with visual impairments in performing *ṣalāh* at a special school (*Sekolah Luar Biasa/SLB*) in Wonosobo Regency, Indonesia. A qualitative case study design was employed using non-participant observation and semi-structured interviews involving one Islamic Religious Education teacher and two students with visual impairments selected through *purposive sampling*. The findings indicate that the implementation of the *Smart Sajadah* transformed teacher-centered instruction into a more student-centered learning process through audio feedback that improved the accuracy of prayer movements, strengthened students' confidence, and reduced their dependence on continuous teacher guidance. These findings demonstrate that the *Smart Sajadah* serves as an effective assistive learning medium that supports inclusive Islamic education while promoting the spiritual independence of students with disabilities.

Keywords: Smart Sajadah; Visual Impairment; Assistive Technology; Worship Independence; Inclusive Islamic Education

Abstrak

Keterbatasan akses visual dalam pembelajaran praktik salat menyebabkan siswa disabilitas netra masih bergantung pada pendampingan guru sehingga diperlukan media pembelajaran yang mampu mendukung kemandirian ibadah melalui pemanfaatan teknologi asistif. Penelitian ini bertujuan menganalisis implementasi *Smart Sajadah* dalam pembelajaran Pendidikan Agama Islam serta mengidentifikasi kontribusinya terhadap peningkatan kemandirian ibadah siswa disabilitas netra di salah satu Sekolah Luar Biasa (SLB) di Kabupaten Wonosobo. Penelitian menggunakan pendekatan kualitatif dengan desain studi kasus melalui observasi nonpartisipan dan wawancara semi-terstruktur terhadap satu guru Pendidikan Agama Islam dan dua siswa disabilitas netra yang dipilih secara *purposive*. Hasil penelitian menunjukkan bahwa implementasi *Smart Sajadah* mengubah pembelajaran yang semula berpusat pada guru menjadi lebih berorientasi pada kemandirian siswa melalui umpan balik audio yang membantu ketepatan gerakan salat, meningkatkan kepercayaan diri, serta mengurangi ketergantungan terhadap pendampingan guru. Temuan ini menegaskan bahwa *Smart Sajadah* berkontribusi sebagai media pembelajaran asistif yang mendukung pengembangan pendidikan Islam inklusif sekaligus memperkuat kemandirian spiritual peserta didik penyandang disabilitas.

Kata Kunci: Sajadah Cerdas; Gangguan Penglihatan; Teknologi Bantu; Kemandirian dalam Beribadah; Pendidikan Islam Inklusif

INTRODUCTION

Worship constitutes a fundamental component of Islamic education because it aims not only to develop religious knowledge but also to cultivate students' practical skills and independence in performing religious obligations.[1] For students with visual impairments, learning worship practices, particularly *ṣalāh*, presents greater challenges than for their sighted peers. Limited access to visual information makes it difficult for these students to recognize the sequence of prayer movements, maintain proper body positions, and ensure that each stage of the prayer is performed correctly.[2] Consequently, worship instruction often depends heavily on intensive teacher guidance throughout the learning process. This situation restricts students' opportunities to develop independence in worship, as nearly every stage of the prayer still requires continuous verbal instruction and direct correction from the teacher.

The persistent reliance on teacher assistance indicates that worship learning for students with visual impairments requires innovative instructional media capable of overcoming information accessibility barriers without diminishing the essence of Islamic learning.[3] Recent advances in assistive technology have created opportunities to develop learning media that are more responsive to the needs of students with disabilities. One emerging innovation is the *Smart Sajadah*, a sensor- and audio-based learning medium designed to provide immediate feedback during *ṣalāh* practice.[4] Through this technological integration, students receive guidance on each stage of the prayer movements independently without continuously relying on verbal instructions from the teacher. Accordingly, technology functions not merely as a mechanical aid but also as an instructional medium that supports a more inclusive, participatory, and student-centered learning environment.

The implementation of the *Smart Sajadah* is highly relevant because it aligns with the principles of inclusive education, which recognize every learner's right to receive educational services that accommodate their individual characteristics and learning needs.[5] Within the context of Islamic Religious Education (*Pendidikan Agama Islam/PAI*), assistive technology provides teachers with opportunities to develop more effective instructional strategies while maintaining meaningful educational interactions with students.[6] Teachers no longer function solely as providers of technical instructions but increasingly assume the role of facilitators who guide students toward a deeper understanding of the values and meanings of worship. Simultaneously, students are encouraged to practice independently through the immediate feedback generated by the device,

1 Ma'muroh Ma'muroh, Abqorina Abqorina, and Amrin Amrin, "The Concept of Tazkiyatun Nafs by Al-Ghazali and Its Implementation at Pesantren Darut Tasbih Tangerang," *Edu Cendikia: Jurnal Ilmiah Kependidikan* 4, no. 02 (November 2024): 833–44, https://doi.org/10.47709/educendikia.v4i02.4989.

2 Bayu Sudrajat et al., "Challenges and Opportunities for MSMEs in Implementing Sharia Principles in Indonesia," *PROCEEDING AL GHAZALI International Conference* 2 (January 15, 2025): 190–201, https://doi.org/10.52802/aicp.v1i1.1272.

3 Sugiarto Sugiarto, Hanifudin Aminullah , and Siti Rochanah , "Implementation Of The Al-Qur'an Literacy Education Program At The Darussalam Foundation, Cibubur Tourism City," in *International Conference on Digital Advance Tourism, Management and Technology*, vol. 1, 2023, 231–42, https://doi.org/10.56910/ictmt.v1i1.66.

4 Wiwik Kuspitasari, "Peningkatan Ketrampilan Sholat Melalui Metode Kinestetik dengan Media Sajadah Kontrol Bagi Siswa Kelas VI Tunanetra di SLB Negeri 1 Bantul," *Jurnal Exponential (Education For Exceptional Children)* 1, no. 2 (2020): 153–62.

5 Nana Sujana, Nur Azizah, and Kunto Ajibroto, "Implementasi Sensor Ultrasonik Untuk Menghitung Rakaat Shalat Berbasis Arduino Uno," *Formosa Journal of Multidisciplinary Research (FJMR)* 1, no. 2 (2022): 187–96.

6 Irfan Rizkiana Raja Nugraha, Agus Fakhruddin, and Cucu Surahman, "Integration of Dhikr and Sufistic Meditation in Islamic Religious Education: An Analysis of Al-Ghazali's Thought and Its Implications," *Jurnal Cendekia Media Komunikasi Penelitian Dan Pengembangan Pendidikan Islam* 17, no. 01 (March 11, 2025): 163–85, https://doi.org/10.37850/cendekia.v17i01.977.

allowing learning to occur progressively and continuously. Such an instructional approach is expected to enhance learning experiences while strengthening students' confidence in performing *ṣalāh* independently.

Research on assistive technology for students with disabilities has been widely conducted. *Previous studies* have demonstrated that audio-based learning media improve educational accessibility by delivering information in formats that are more easily understood by students with visual impairments; however, most of these studies have focused primarily on academic learning rather than worship instruction.[7] *Other studies* have found that sensor-based devices enhance the accuracy of motor activities through immediate feedback mechanisms, yet their implementation has largely been confined to rehabilitation and vocational training instead of Islamic education.[8] Research on *ṣalāh* instruction for students with disabilities has likewise emphasized the importance of teacher guidance in developing worship skills, but these studies have generally relied on conventional instructional methods, leaving the potential integration of assistive technology relatively unexplored.[9] These limitations indicate a significant research opportunity to investigate how assistive technology can be utilized as a worship learning medium that promotes students' spiritual independence.

Based on these research gaps, this study aims to examine the implementation of the *Smart Sajadah* in Islamic Religious Education and to identify its contribution to enhancing the independence of students with visual impairments in performing *ṣalāh* at a special school (*Sekolah Luar Biasa/SLB*) in Wonosobo Regency, Indonesia. The study is significant because it not only explains how assistive technology is integrated into practical worship instruction but also explores how the technology transforms teacher–student interactions while fostering students' confidence in practicing worship independently. The findings are expected to contribute conceptually to the advancement of inclusive Islamic education and to provide practical recommendations for teachers, schools, and educational technology developers in designing more adaptive assistive learning media that effectively address the needs of students with disabilities.

Method

This study employed a qualitative approach using a case study design to gain an in-depth understanding of the implementation of the *Smart Sajadah* in worship learning for students with visual impairments at a special school (*Sekolah Luar Biasa/SLB*) in Wonosobo Regency, Indonesia.[10] This approach was selected because it enables researchers to comprehensively examine the learning process, teacher–student interactions, and the impact of assistive technology on students' independence in performing *ṣalāh*. The identity of the school was anonymized to protect the privacy of both the institution and the participants. Informants were selected through *purposive sampling*, consisting of one Islamic Religious Education (*Pendidikan Agama Islam/PAI*) teacher as the primary informant and two students with visual impairments who were directly involved in worship learning using the *Smart Sajadah*.

7 Diana Akizhanova et al., "Improving Training Strategies for Audio Description Interpreters: Methods for Enhancing Information Accessibility for Visually Impaired Individuals," *International Journal of Inclusive Education*, May 15, 2026, 1–19, https://doi.org/10.1080/13603116.2026.2670737.

8 Anton Kos and Anton Umek, "Wearable Sensor Devices for Prevention and Rehabilitation in Healthcare: Swimming Exercise With Real-Time Therapist Feedback," *IEEE Internet of Things Journal* 6, no. 2 (April 2019): 1331–41, https://doi.org/10.1109/JIOT.2018.2850664.

9 Hafizhah Zulkifli et al., "Designing the Content of Religious Education Learning in Creating Sustainability among Children with Learning Disabilities: A Fuzzy Delphi Analysis," *Frontiers in Psychology* 13 (November 22, 2022), https://doi.org/10.3389/fpsyg.2022.1036806.

10 J Moleong Lexy, *Metode Penelitian Kualitatif*, *Bandung: Rosda Karya*, 2002.

Data were collected through non-participant observation and semi-structured interviews. Observation was conducted to examine the implementation of practical *ṣalāh* instruction, the interactions between the teacher and students, and the utilization of the *Smart Sajadah* throughout the learning process. Semi-structured interviews were subsequently carried out with the Islamic Religious Education teacher and the two students to explore their experiences, perceptions, and perceived changes following the implementation of the *Smart Sajadah*. To enhance the trustworthiness of the findings, observational data were compared with interview results through methodological triangulation, allowing evidence from different data collection techniques to corroborate one another.

The data were analyzed using the interactive analysis model, which consisted of three interconnected stages: data reduction, data display, and conclusion drawing.[11] During the data reduction stage, information relevant to the implementation of the *Smart Sajadah* and its contribution to students' independence in worship was identified and organized. The selected data were subsequently presented in a narrative form supported by observational findings and interview excerpts to provide a comprehensive description of the phenomenon under investigation. Finally, conclusions were drawn by interpreting the overall findings in relation to the objectives of the study and connecting them with the broader discourse on assistive technology and inclusive Islamic education.

RESULTS AND DISCUSSION

Implementation of Smart Sajadah in Worship Learning for Students with Visual Impairments

The implementation of the *Smart Sajadah* in Islamic Religious Education (*Pendidikan Agama Islam/PAI*) learning at a special school (*Sekolah Luar Biasa/SLB*) in Wonosobo Regency began with identifying students' need for a learning medium capable of reducing their dependence on teachers' verbal instructions during *ṣalāh* practice. Based on classroom observations, practical *ṣalāh* instruction prior to the use of the *Smart Sajadah* relied heavily on direct demonstrations provided by the teacher at every stage of the prayer movements. The teacher repeatedly corrected students' postures during *rukū'*, *sujūd*, sitting between the two prostrations, and the final *tashahhud* because students experienced difficulty recognizing the sequence of movements independently. Consequently, instructional time was extended, and the teacher's attention was devoted primarily to correcting technical movements rather than fostering students' understanding of the spiritual meaning of worship. In response to these challenges, the *Smart Sajadah* was introduced as an assistive learning medium capable of providing movement guidance through an integrated audio system, enabling students to receive instructional cues more independently throughout the learning process.

Classroom observations further indicated that the implementation of the *Smart Sajadah* significantly transformed classroom dynamics. The teacher began each session by introducing the functions of the device and demonstrating its operation before allowing students to practice individually. During practice, the device generated audio feedback corresponding to each stage of the *ṣalāh* movements, enabling students to confirm whether they were performing the correct posture. Rather than providing continuous verbal instructions, the teacher primarily monitored students' progress and intervened only when errors could not be corrected through the device's feedback system. This instructional approach created a more active learning environment because students were encouraged to complete each sequence of prayer movements

11 Matthew B Miles and A Michael Huberman, *Qualitative Data Analysis: An Expanded Sourcebook*, 2nd ed. (Sage Publications, 1994).

independently without constantly waiting for teacher guidance, as had been the case during previous instructional sessions.

These observational findings were reinforced by interviews with the Islamic Religious Education teacher (G1). The teacher explained that before implementing the *Smart Sajadah*, a considerable portion of instructional time was spent providing one-on-one assistance during prayer practice, resulting in a relatively inefficient learning process. According to G1, *"Previously, I had to accompany students during almost every transition between prayer movements. After introducing the Smart Sajadah, students gradually began following the audio guidance independently, allowing me to focus more on explaining the recitations, the meaning of ṣalāh, and monitoring each student's progress.*"[12] This statement suggests that assistive technology does not diminish the teacher's role; rather, it transforms the teacher into a facilitator who prioritizes strengthening students' understanding of worship instead of merely correcting their physical movements.

Similar experiences were reported by both student participants. S1 stated, *"Previously, I was often confused about what movement came after rukūʿ, so I always asked my teacher. Now I simply follow the audio instructions from the Smart Sajadah, and I feel more confident practicing independently*".[13] Likewise, S2 explained, *"I feel more confident because whenever my movement is not quite correct, the device immediately provides guidance to help me improve it. I am no longer as afraid of making mistakes during prayer practice"*.[14] These interview findings demonstrate that the *Smart Sajadah* not only assists students in recognizing the sequence of *ṣalāh* movements but also enhances their sense of security and confidence throughout practical worship learning.

Table 1. Changes in the Learning Process Before and After the Implementation of the *Smart Sajadah*

Aspect	Before Implementation	After Implementation
Teacher's Role	Directly provides instructions and movement corrections	Functions as a facilitator and learning supporter
Student Activity	Waits for teacher instructions	Actively follows guidance from the *Smart Sajadah*
Accuracy of Prayer Movements	Frequent errors and repeated corrections	Movements become more systematic
Learning Independence	Low	Gradually improves
Learning Interaction	Teacher-centered	More student-centered

Source: Observation and interview data (2026)

As presented in Table 1, the most noticeable transformation occurred in the instructional interaction, which shifted from a teacher-centered approach to a more student-centered learning environment. Teachers no longer dominated every stage of instruction, while students were provided with greater opportunities to explore each *ṣalāh* movement independently through the audio feedback generated by the *Smart Sajadah*. These findings indicate that assistive technology supports a more participatory learning environment while simultaneously reducing students' dependence on direct teacher assistance. Previous research has similarly demonstrated that technology-based assistive learning media improve educational accessibility for students with

12 Interview with G1 (Islamic Religious Education Teacher), June 18, 2026.

13 Interview with S1 (Student with Visual Impairment), June 18, 2026.

14 Interview with S2 (Student with Visual Impairment), June 18, 2026.

disabilities by delivering information in ways that correspond to their specific learning needs.[15] *Other studies* have also reported that audio- and sensor-based systems provide immediate feedback, enabling learners to correct their movements independently without relying continuously on teacher intervention throughout the instructional process.[16]

Overall, the findings suggest that the implementation of the *Smart Sajadah* extends beyond technological innovation by transforming instructional strategies in Islamic Religious Education within special schools. Although teachers remain the primary facilitators of students' religious understanding, the *Smart Sajadah* functions as an assistive medium that promotes greater independence during practical worship activities. Several previous studies have emphasized that the effectiveness of assistive technology depends largely on teachers' ability to integrate technological tools into instructional practices rather than on the sophistication of the technology itself.[17] The present findings reinforce this perspective by demonstrating that the combination of teacher facilitation, repeated practice, and the use of the *Smart Sajadah* creates a more effective, inclusive, and meaningful learning experience while fostering greater independence among students with visual impairments in performing *ṣalāh*.

The Impact of Smart Sajadah Implementation on Students' Independence in Worship

The implementation of the *Smart Sajadah* not only transformed the learning process but also contributed significantly to the development of students' independence in performing *ṣalāh*. Based on classroom observations conducted during several learning sessions, students gradually demonstrated greater confidence in completing the sequence of prayer movements without relying continuously on verbal prompts from the teacher. Prior to the implementation of the *Smart Sajadah*, students frequently paused during transitions between movements while waiting for confirmation from the teacher regarding the correctness of their posture. Following repeated practice using the assistive device, however, students became increasingly capable of recognizing movement sequences through the integrated audio guidance. As a result, learning activities became more efficient because students required fewer direct corrections, allowing the instructional process to focus more extensively on developing religious understanding and spiritual awareness rather than merely correcting technical aspects of prayer performance.

These observational findings were corroborated by the interview with the Islamic Religious Education teacher (G1), who reported noticeable improvements in students' learning independence after several weeks of using the *Smart Sajadah*. According to G1, *"The most visible change is not only that students know the sequence of movements better, but they also become more confident when performing prayers. Previously, they constantly waited for my instructions, whereas now they usually complete the movements independently before asking for confirmation. This gives me more opportunities to explain the meaning of worship instead of repeatedly correcting body positions"*.[18] The teacher further explained that students

15 Aida Layachi and Nicola J. Pitchford, "Formative Evaluation of an Interactive Personalised Learning Technology to Inform Equitable Access and Inclusive Education for Children with Special Educational Needs and Disabilities," *Technology, Knowledge and Learning* 30, no. 3 (September 3, 2025): 1395–1419, https://doi.org/10.1007/s10758-024-09739-0.

16 Madhuka Thisuri De Silva et al., "In Sync: Exploration of a Multi-Sensory Artefact for Dance Accessibility with People Who Are Blind or Have Low Vision and Dance Teachers," in *Proceedings of the 27th International ACM SIGACCESS Conference on Computers and Accessibility* (New York, NY, USA: ACM, 2025), 1–21, https://doi.org/10.1145/3663547.3746367.

17 Esraa Hussein, Menatalla Hussein, and Maha Al-Hendawi, "Investigation into the Applications of Artificial Intelligence (AI) in Special Education: A Literature Review," *Social Sciences* 14, no. 5 (May 8, 2025): 288, https://doi.org/10.3390/socsci14050288.

18 Interview with G1 (Islamic Religious Education Teacher), June 18, 2026.

gradually developed a stronger sense of responsibility for monitoring their own learning process because the device immediately provided feedback whenever a movement was performed incorrectly. Consequently, the classroom atmosphere shifted from teacher dependency toward greater student participation and autonomy.

The students likewise expressed positive experiences regarding the use of the *Smart Sajadah*. S1 explained, *"Now I am more confident praying because I know the device will guide me if I forget the next movement. I am no longer afraid of making mistakes all the time"*.[19] Similarly, S2 remarked, *"Before using the Smart Sajadah, I often hesitated and waited for the teacher to tell me what to do next. After practicing several times, I memorized the sequence better and became more comfortable praying independently"*.[20] These testimonies demonstrate that the assistive technology contributes not only to improving technical accuracy but also to strengthening students' confidence, emotional security, and willingness to engage independently in religious practice.

Table 2. Observed Impacts of *Smart Sajadah* on Students' Independence in Worship

Indicator	Observation Findings
Confidence	Students became more willing to perform *ṣalāh* independently.
Accuracy of Movements	Prayer movements became more systematic with fewer teacher corrections.
Dependence on Teacher	Direct dependence gradually decreased during practical sessions.
Learning Participation	Students showed greater initiative in practicing independently.
Learning Motivation	Students expressed higher enthusiasm during worship learning activities.

Source: Observation and interview data (2026)

As presented in Table 2, the implementation of the *Smart Sajadah* generated positive outcomes across several dimensions of students' worship independence. The most prominent improvement was observed in students' self-confidence during practical prayer activities. Increased confidence subsequently encouraged greater participation, enabling students to practice repeatedly without experiencing excessive anxiety regarding potential mistakes. Simultaneously, the reduction in teacher dependence allowed instructional interactions to become more balanced, as teachers increasingly assumed the role of facilitators rather than constant supervisors. Previous research has similarly demonstrated that assistive technologies equipped with immediate feedback mechanisms promote greater learner autonomy by enabling students to evaluate and correct their own performance.[21] Other studies have also reported that technology-assisted learning environments contribute to improved self-efficacy because learners experience repeated opportunities to achieve success through independent practice.[22]

The findings further suggest that the educational value of the *Smart Sajadah* extends beyond facilitating technical aspects of prayer performance. Rather than functioning merely as a technological device, the *Smart Sajadah* creates a learning environment that encourages students

19 Interview with S1 (Student with Visual Impairment), June 18, 2026.

20 Interview with S2 (Student with Visual Impairment), June 18, 2026.

21 Ahmadreza Mohebbi, "Enabling Learner Independence and Self-Regulation in Language Education Using AI Tools: A Systematic Review," *Cogent Education* 12, no. 1 (December 31, 2025), https://doi.org/10.1080/2331186X.2024.2433814.

22 Su Cai et al., "Effects of Learning Physics Using Augmented Reality on Students' Self-efficacy and Conceptions of Learning," *British Journal of Educational Technology* 52, no. 1 (January 20, 2021): 235–51, https://doi.org/10.1111/bjet.13020.

to develop responsibility for their own worship practices while simultaneously strengthening their confidence in performing religious obligations independently. *Several previous studies* have argued that inclusive education should prioritize educational environments that empower students with disabilities to participate actively according to their individual capabilities instead of positioning them as passive recipients of assistance.[23] The present findings reinforce this perspective by demonstrating that assistive technology can become an effective pedagogical instrument when integrated with appropriate instructional strategies. Accordingly, the combination of teacher facilitation, repeated guided practice, and technology-based support contributes substantially to fostering greater independence, confidence, and meaningful participation among students with visual impairments during Islamic Religious Education learning.

CONCLUSION

The findings demonstrate that the implementation of the *Smart Sajadah* serves as an effective assistive learning medium for enhancing the independence of students with visual impairments during *ṣalāh* instruction in Islamic Religious Education. Rather than functioning merely as a technological innovation, the *Smart Sajadah* transformed the instructional process by shifting learning from teacher-dependent guidance toward greater student autonomy through integrated audio feedback. This transformation occurred because the device enabled students to recognize prayer movements independently while allowing teachers to focus on strengthening students' understanding of worship rather than repeatedly correcting technical movements. Consequently, the integration of assistive technology not only improved the accuracy of prayer performance but also fostered greater self-confidence, participation, and responsibility among students in carrying out religious practices independently.

This study contributes to the growing discourse on inclusive Islamic education by demonstrating how assistive technology can be pedagogically integrated to promote both accessibility and spiritual independence among students with disabilities. Nevertheless, the study is limited by its small number of participants and its focus on a single special school, which may restrict the broader applicability of the findings. Furthermore, the research examined only the implementation process and perceived impacts without evaluating long-term learning outcomes or comparing different forms of assistive technology. Future studies are therefore encouraged to involve more diverse educational settings and participant groups, employ longitudinal research designs, and explore the effectiveness of various technology-based learning media in supporting inclusive religious education and the sustainable development of independent worship practices among students with disabilities.

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