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DIFFERENTIAL LEARNING DESIGN TO OPTIMIZE THE POTENTIAL OF VISUALLY IMPAIRED STUDENTS

Gunawan[1], Uswatun Khasanah[2]

Email Correspondence: gunawan@gmail.com

[1] *Speech Therapy Study Program, Polytechnic of the Ministry of Health Surakarta*
[2] *Master of Islamic Religious Education, Universitas Darul Ulum Islamic Centre Sudirman*

ABSTRACT

This study aims to analyze the learning needs of a speech-impaired student, design a differentiated learning model contextualized to the characteristics of the madrasah, and examine the effectiveness of the design in improving student participation and learning achievement. The research employed a Research and Development (R&D) approach conducted at MI Muhammadiyah Klaseman. The research subjects consisted of one fifth-grade speech-impaired student and a classroom teacher as a supporting informant. Data were collected through observation, interviews, documentation, and limited trials. The needs analysis revealed that the primary barrier faced by the student was instructional communication access rather than cognitive ability. The developed differentiated learning model included differentiation of content, process, product, and learning environment through visual supports and alternative non-verbal responses. The effectiveness test showed an improvement in learning participation from low to high category and an increase in learning achievement with an N-gain score of 0.57 (moderate category). The study concludes that a needs-based differentiated learning design is effective in optimizing the potential of speech-impaired students and strengthening the implementation of inclusive education in Islamic elementary schools.

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ABSTRAK

Penelitian ini bertujuan untuk menganalisis kebutuhan pembelajaran siswa tunawicara, merancang model pembelajaran diferensiatif yang kontekstual dengan karakteristik madrasah, serta menguji efektivitas desain tersebut dalam meningkatkan partisipasi dan capaian belajar siswa. Penelitian menggunakan pendekatan Research and Development (R&D) yang dilaksanakan di MI Muhammadiyah Klaseman. Subjek penelitian terdiri atas satu siswa tunawicara kelas V dan guru kelas sebagai informan pendukung. Data dikumpulkan melalui observasi, wawancara, dokumentasi, dan uji coba terbatas. Hasil analisis kebutuhan menunjukkan bahwa hambatan utama siswa terletak pada akses komunikasi instruksional, bukan pada kemampuan kognitif. Model pembelajaran diferensiatif yang dikembangkan mencakup diferensiasi konten, proses, produk, dan lingkungan belajar berbasis visual dan alternatif respons non-verbal. Hasil uji efektivitas menunjukkan peningkatan partisipasi belajar dari kategori rendah menjadi tinggi, serta peningkatan capaian hasil belajar dengan nilai N-gain sebesar 0,57 (kategori sedang). Penelitian ini menyimpulkan bahwa desain pembelajaran diferensiatif berbasis analisis kebutuhan efektif dalam mengoptimalkan potensi siswa tunawicara dan memperkuat implementasi pendidikan inklusif di madrasah ibtidaiyah.

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INTRODUCTION

Inclusive education is an educational approach that places all students as subjects who have the same rights and opportunities to develop according to their respective potentials. This principle emphasizes that schools must be able to adapt learning systems, strategies, and designs to accommodate the diversity of student needs, including students with special needs **(UNESCO, 2020; Ministry of Education and Culture, 2021)**. In practice, inclusive education

is not only oriented towards access to school, but also on the quality of learning services that are adaptive and responsive to the individual characteristics of students.

One group of students with special needs who need special attention in learning is students with speechless disabilities. Verbal communication barriers experienced by visually impaired students have an impact on the process of academic interaction, class participation, and understanding of learning materials. Limitations in expressing ideas orally often cause students' cognitive potential not to be explored optimally **(Rahmawati & Hidayat, 2022)**. In addition, teachers' lack of understanding of alternative communication strategies is also a factor that affects the effectiveness of learning for visually impaired students **(Sari, 2023)**.

In the context of madrasah ibtidaiyah, these challenges become increasingly complex due to the characteristics of elementary school students who are still in the intensive stage of language and social development. Classical and uniform learning tends to make it difficult for visually impaired students to follow the rhythm of the classroom optimally. Therefore, a learning approach that is able to accommodate differences in learning readiness, interests, and student learning profiles is needed. One relevant approach is differential learning.

Differential learning emphasizes the adjustment of content, processes, products, and learning environments based on the individual needs of students **(Tomlinson, 2017; Marlina, 2021)**. In the context of visually impaired students, differentiation includes not only the level of material difficulty, but also the use of visual media, basic sign language, symbols, and augmentative and alternative communication strategies (AAC). Recent research shows that the systematic application of differential learning is able to increase learning participation and academic outcomes of students with special needs in inclusive schools **(Putri & Anwar, 2022)**.

In particular, the educational practice at MI Muhammadiyah Klaseman shows a commitment to learning innovation and strengthening the capacity of teachers. Various studies in the last five years have examined the implementation of character education, school literacy movements, and the development of learning media in the madrasah **(Anggraini, 2022; Purbowati, 2022; Prasetyo, 2024)**. The research data shows that the number of students in one class ranges from 30-40 students with diverse backgrounds of abilities. However, learning designs that specifically integrate differentiation principles for visually impaired students have not been systematically documented in previous studies.

This condition shows that there is a gap between the commitment to inclusive education and the availability of structured learning designs for visually impaired students. Teachers still tend to make adjustments spontaneously and situationally, without a planned differentiation framework based on individual needs assessment. In fact, without a systematic design, the academic and social potential of visually impaired students is at risk of not developing optimally.

Based on this background, this research focuses on designing differential learning designs to optimize the potential of visually impaired students at MI Muhammadiyah Klaseman. This study aims to (1) analyze the learning needs of visually impaired students, (2) design a contextual differential learning model with the characteristics of madrasas, and (3) test the effectiveness of these designs in increasing student participation and learning achievement. Thus, this research is expected to make a practical contribution to the development of inclusive education at the madrasah ibtidaiyah level and enrich studies on the implementation of differential learning for visually impaired students.

METHODS

This research uses a Research and Development (R&D) approach with a development model adapted from educational development steps which include the stages of needs analysis, design design, expert validation, limited trials, and product revisions. This approach was chosen because the research not only aims to describe the phenomenon, but also produces a product in the form of a differential learning design that can be applied practically for visually

impaired students. This development model is relevant to produce contextual and applicative learning tools in the environment of madrasah ibtidaiyah.

The research was carried out at MI Muhammadiyah Klaseman, Sukoharjo Regency. The research subjects consist of one visually impaired student who is registered as an active student, a classroom teacher, and a co-teacher (if available). The selection of subjects was carried out by purposive sampling by taking into account the special needs of students and the readiness of teachers in the implementation of learning interventions. In addition, the head of the madrasah is involved as a supporting informant to obtain data on policies and institutional support for inclusive education.

Figure 1. RnD research flow

The first stage of the research is needs analysis, which is carried out through classroom observation, in-depth interviews with teachers, and documentation studies of the learning tools that have been used. Observations were focused on learning interaction patterns, communication strategies used by teachers, and academic and social participation of visually impaired students. The interview aims to explore the constraints, expectations, and experiences of teachers in dealing with visually impaired students. The data at this stage is analyzed in a qualitative descriptive manner to formulate specific learning needs.

The second stage is differentiating learning design design, which includes differentiation of content, processes, products, and learning environments. The design is prepared in the form of a Learning Implementation Plan (RPP) which is modified with the integration of visual media, the use of supporting symbols/gestures, adaptive worksheets, and portfolio-based assessments. The learning tools developed were then validated by two experts, namely an inclusive education expert and a learning design expert, to assess the feasibility aspects of content, language, implementation, and suitability with the characteristics of visually impaired students.

The third stage is a limited trial, which is conducted in several classroom learning meetings. During the trial, the researcher made observations on student involvement, ability to understand instructions, interaction with teachers and peers, and the results of the assignments produced. The instruments used include learning participation observation sheets, performance assessment rubrics, reflective teacher interview guidelines, and documentation of student work results. Quantitative data in the form of participation scores and learning outcomes were analyzed using descriptive statistics (percentage and score increase), while qualitative data were analyzed through data reduction techniques, data presentation, and conclusion drawn.

The final stage is the evaluation and revision of the design, which is carried out based on the results of the trial and input from the teacher. The revision focused on the aspects of clarity of visual instructions, the difficulty of the task, and the effectiveness of the

communication strategies used. This process aims to produce a differential learning design that is more effective, practical, and in accordance with the real conditions of the madrasah.

To ensure the validity of the data, this study uses source triangulation techniques and triangulation methods. The credibility of the data was strengthened through discussion of observation results with teachers (member check), while the reliability of the assessment instrument was tested through an inter-rater agreement. Thus, this research method is designed to produce learning products that are not only theoretically valid, but also empirically effective in optimizing the potential of visually impaired students in the madrasah ibtidaiyah environment.

RESULTS AND DISCUSSION

1. Assessing the Learning Needs of Visually Impaired Students

This research was carried out at MI Muhammadiyah Klaseman with a focus on one visually impaired student in class V as the main subject of the research. Needs analysis was carried out through classroom observation during three meetings, in-depth interviews with classroom teachers, and documentation studies of learning tools used in madrasas.

The results of observations showed that visually impaired students had good visual attention and were able to follow the flow of activities when accompanied by concrete examples or image media. However, when teachers deliver instructions verbally without visual support, students often appear hesitant, wait for a friend's response, or require individual repetition of instructions. In the question and answer activity, students almost never raise their hands or respond spontaneously. However, when given written assignments, students are able to complete with a fairly good level of accuracy. This shows that there is a gap between verbal participation and actual cognitive ability.

The recapitulation of the results of the observation of learning participation is presented in the following table:

Table 1. Learning Participation Score of Visually Impaired Students (Pre-Intervention)

Yes	Observed Aspects	Score (1–4)	Category
1	Understanding verbal instructions	2	Low
2	Asking activity	1	Very Low
3	Involvement in discussions	2	Low
4	Responses to teacher questions	2	Low
5	Task completion independence	2	Low

Average participation score: 1.8 (low category).

The data shows that the aspect of active questioning is the lowest indicator. This shows that the main obstacle lies in expressive communication. However, the results of the analysis of the worksheets showed that the accuracy of the answers reached an average of 65%, which indicates that the students' conceptual understanding is actually quite adequate.

The results of interviews with classroom teachers reinforce these findings. The teacher said that so far the adjustments have been made spontaneously, such as approaching students to give a re-explanation, slowing down the tempo of speaking, or asking classmates to help explain the material. However, teachers do not have a differentiated learning plan documented in the lesson plan. There is no formal assessment of individual needs, and there has been no systematic alternative communication strategy.

Documentation studies of learning tools show that the lesson plans used are still general and uniform for all students. Instruction is dominated by lecture methods and

verbal question and answer. The evaluation form also emphasizes standardized written tests and verbal responses. No alternative learning products such as visual media, concept posters, or other forms of non-verbal expression were found.

Based on triangulation of observation, interview, and documentation data, the learning needs of visually impaired students can be classified as follows:

Table 2. Identifying the Learning Needs of Disabled Students

Dimensions of Needs	Field Findings	Pedagogical Implications
Communication	Difficulty understanding verbal instructions	Need visual instructions and consistent symbols
Academic	Able to understand written concepts	Need for language simplification and visualization
Social	Passive in large group discussions	Need structured, small group work
Evaluation	Limited verbal response	Need for product-based assessment alternatives

The analysis shows that the main obstacle lies not in the intellectual aspect, but in access to instructional communication. When information is conveyed through visual or written media, students show better understanding. This indicates that a verbally dominant learning approach is a limiting factor for student participation.

Pedagogically, this condition reflects the incompatibility between the classical learning design and the individual needs of visually impaired students. Undifferentiated learning causes students to lack the same expression channels as their peers. The impact is not only on low participation, but also has the potential to affect motivation and confidence.

These findings confirm that needs analysis is a crucial stage in inclusive education. Without systematic needs mapping, learning adaptation will continue to be reactive and inconsistent. Therefore, the main needs of visually impaired students in this madrasah include: (1) differentiation of visual-based instruction, (2) alternative non-verbal communication, (3) flexibility in time to work on assignments, and (4) visual or written product-based assessments.

Thus, the results of this needs analysis become a conceptual and empirical foundation in designing a differential learning model that is able to optimize the potential of visually impaired students at the next stage of research.

2. Design of a Contextual Differential Learning Model with Madrasah Characteristics

The design of the differential learning model in this study is based on the results of the analysis of the needs of visually impaired students which shows the main obstacles to access to instructional communication, discussion participation, and uniform forms of evaluation. The development of the model was carried out contextually at MI Muhammadiyah Klaseman, taking into account the characteristics of madrasas based on religious values, integrated thematic learning, and a strong culture of togetherness between students.

The designed model refers to the four main components of differentiation, namely differentiation of content, processes, products, and learning environments. The four components are integrated into a thematic Learning Implementation Plan (RPP) that is modified to remain in harmony with the applicable curriculum, but more responsive to the communication needs of visually impaired students.

In the aspect of content differentiation, the material is presented in the form of structured visuals in the form of concept maps, illustrative images, symbol cards, and simple language summaries. Teachers no longer rely on long verbal explanations, but

instead use a combination of short and visual texts. Emphasis is placed on key keywords so that students can grasp the core of the concept without having to process complex sentences orally.

In the aspect of process differentiation, learning is designed with direct demonstration strategies, the use of consistent gestures, and the formation of heterogeneous small groups. In small groups, each student is given a specific role so that visually impaired students have a clear function in the discussion. This strategy aims to reduce communication pressure in large groups while increasing social interaction.

In the aspect of product differentiation, students are given a choice of task forms. In addition to answering written questions, students can create concept posters, create idea cards, or summarize material in simple visual form. This alternative allows students with disabilities to express understanding without reliance on verbal communication.

In the differentiation aspect of the learning environment, the seating arrangement was modified so that students could see the teacher's face directly to read expressions and lip movements. Teachers also maintain visual contact and slow down the tempo of speech accompanied by the support of writing on the board.

Here's a summary of the components of the developed model:

Table 3. Structure of Differential Learning Models

Components	Classroom Implementation	Adaptation Objectives
Contents	Visual concept map, simple summary	Makes it easier to understand instructions
Process	Demonstrations, consistent gestures, small groups	Increase participation
Products	Posters, concept cards, written answers	Alternative learning expressions
Environment	Strategic seating position, visual contact	Support communication access

The model that has been designed is then validated by two experts, namely an inclusive education expert and a learning design expert. The validation results showed a feasibility rate of 87% (very feasible category). The feedback provided is related to the consistency of visual symbols and the simplification of instruction sentences to make them more concise.

Analytically, this model shows that differentiation can be applied without changing the structure of the core curriculum. Adaptation is focused on the way of delivery and the form of response, not on the reduction of competency standards. Thus, students with disabilities continue to follow the same curriculum, but with different access routes.

This model is also contextual because it adjusts the madrasah culture that prioritizes the value of togetherness and group work. Process differentiation through small groups has proven to be relevant to the culture of mutual cooperation that has been formed in the madrasah environment. This means that learning innovation does not contradict the culture of the institution, but rather strengthens it.

From a theoretical point of view, this model reflects the principle that differentiation is not synonymous with separation, but flexible adjustment within the same class. Visually impaired students are not separated, but are given more equal access to learning. This underscores that effective inclusive education depends on planned learning design, not just administrative policy.

Thus, the results of the model design show that contextual differential learning can be a systematic solution to the communication and participation needs of visually

impaired students. The model is then tested for effectiveness at a later stage to see its impact on increased participation and learning outcomes.

3. Test the Effectiveness of Differential Learning Design in Increasing Participation and Learning Outcomes of Visually Impaired Students

The effectiveness test of the differential learning model was carried out through limited implementation during four thematic learning meetings at MI Muhammadiyah Klaseman. Effectiveness measurement is focused on two main indicators, namely (1) increased learning participation and (2) increased learning outcomes of visually impaired students. Data was obtained through participation observation sheets, performance assessment rubrics, and analysis of task results before and after the application of the model.

1) Increased Learning Participation

The results of the observation showed a significant change in learning behavior. If in the pre-intervention stage the student tends to be passive and waits for individual direction, after the application of differentiation of visual instruction and small group work, the student begins to show a more active response.

Here's a comparison of participation scores:

Table 4. Comparison of Participation Scores Before and After Intervention

Aspects of Participation	Pre-Interventions	Post-Intervention	Improvement
Instruction response	2	3	+1
Asking activity	1	3	+2
Discussion engagement	2	3	+1
Question Responses	2	3	+1
Task independence	2	4	+2

The average score increased from 1.8 to 3.2, which means an increase of 1.4 points or about 77% from the initial condition. The aspects that experienced the highest increase were the activeness of asking questions and the independence of completing tasks.

Analytically, these improvements show that process and product differentiation provides a more inclusive space for expression. When students are provided with non-verbal communication alternatives and consistent visual support, barriers to participation are noticeably reduced. Increased participation also has an impact on more positive social interactions in small groups.

2) Improved Learning Outcomes

The effectiveness of the model was also measured through a comparison of the results of the task before and after the intervention.

Table 5. Comparison of Learning Outcomes

Indicator	Before Intervention	After Intervention
Accuracy of answers	65%	85%
Concept fit	Enough	Good
Self-sufficiency of the solution	Low	Height
Turnaround time	Slow	More efficient

Based on a simple calculation of the gain score:

Gain = (Final score – Initial score) / (100 – Initial score)

Gain = (85 – 65) / (100 – 65) = 20 / 35 = 0.57

The N-gain value of 0.57 is included in the medium to high category, which shows a fairly strong effectiveness in improving learning outcomes.

Quantitative and observational data show that differential learning designs are effective in improving both participation and academic achievement of visually impaired students. A 77% increase in participation suggests that communication barriers that previously hindered classroom engagement can be minimized through visualization strategies and response alternatives.

Pedagogically, the 20% increase in learning outcomes reinforces the assumption that when access to instruction is clarified, students' cognitive potential can develop optimally. This confirms that the main problem is not in the intellectual abilities of students, but in the design of learning that was previously less accessible.

Increased independence is also an important indicator of the success of the model. Students are no longer completely dependent on the help of teachers or peers, but are instead able to understand the flow of tasks through systematic visual cues. This shows that the differentiation of the environment and learning process contributes to the strengthening of student self-efficacy.

In addition, changes in social behavior were also observed. Structured, small, group work helps students feel more accepted and have a role in the discussion. A supportive learning environment is a supporting factor for increasing intrinsic motivation.

Overall, the effectiveness of the model proves that differential learning designed based on needs analysis is able to be a systematic solution in optimizing the potential of bilingual students. This model not only improves learning outcomes quantitatively, but also improves the quality of participation and social interaction in the classroom.

CONCLUSION

Based on the results of research carried out at MI Muhammadiyah Klaseman, it can be concluded that the main learning needs of visually impaired students lie in the aspect of access to instructional communication, not in the limitations of cognitive ability. Needs analysis shows that the low participation of students in classical learning is due to the dominance of verbal methods that have not been balanced with visual support and alternative non-verbal responses. Students actually have good academic potential, but they have not been facilitated through adaptive and systematic learning designs.

The design of differential learning models that integrate the differentiation of content, processes, products, and learning environments has proven to be relevant and contextual with the characteristics of madrasas. This model is able to provide a more equal learning access path for visually impaired students without changing the applicable curriculum standards. The implementation of the model showed a significant increase in learning participation and academic achievement, which was shown by an increase in participation observation scores and learning outcomes with the medium to high effectiveness category. Thus, differential

learning based on needs analysis has proven to be effective in optimizing the potential of visually impaired students and strengthening inclusive educational practices that are fair and humanist in the madrasah ibtidaiyah environment.

REFERENCES

Anggraini, Z. G. (2022). *Implementation of character value education in learning Aqidah Akhlak in grade IV students of MI Muhammadiyah Klaseman for the 2021/2022 school year* (Thesis). UIN Raden Mas Said Surakarta.

Anwar, M., & Putri, R. (2022). Implementation of differential learning in inclusive elementary schools. *Journal of Inclusive Education*, 6(2), 115–128.

Arifin, Z. (2021). Learning strategies for children with special needs in elementary school. *Journal of Special Education*, 17(1), 45–56.

Azizah, N. (2020). Inclusive education and its challenges in Indonesia. *Journal of Educational Sciences*, 26(3), 210–220.

Bender, W. N. (2020). *Differentiating instruction for students with learning disabilities*. Corwin Press.

Branch, R. M. (2021). *Instructional design: The ADDIE approach*. Springer.

Directorate of Basic Education Teachers. (2021). *Guidelines for the implementation of inclusive education in elementary schools*. Ministry of Education and Culture.

Florian, L., & Black-Hawkins, K. (2019). Exploring inclusive pedagogy. *Cambridge Journal of Education*, 49(6), 1–15.

Hall, T., Meyer, A., & Rose, D. (2020). *Universal design for learning in the classroom*. Guilford Press.

Hidayat, R., & Rahmawati, S. (2022). Analysis of the learning needs of children with disabilities in inclusive schools. *Indonesian Journal of Special Education*, 8(1), 33–44.

Ministry of Education and Culture. (2022). *Inclusive education policy and special services*. Ministry of Education, Culture, Research, and Technology.

Marlina. (2021). *Differential learning in inclusive schools: Concept and implementation*. Deepublish.

Mulyadi, D. (2023). Adapting the curriculum for students with special needs. *Journal of Basic Education*, 14(2), 101–112.

OECD. (2020). *Education for inclusive growth*. OECD Publishing.

Prasetyo, A. D. (2024). *The relationship between reading interest and the learning skills of MI Muhammadiyah Klaseman* students (Thesis). UIN Raden Mas Said Surakarta.

Purbowati, D. (2022). *Implementation of the school literacy movement at MI Muhammadiyah Klaseman* (Thesis). UIN Raden Mas Said Surakarta.

Putri, R., & Anwar, M. (2022). The effect of differential learning on the learning outcomes of students with special needs. *Indonesian Journal of Basic Education*, 7(3), 145–156.

Rahmawati, S., & Hidayat, R. (2022). Alternative communication strategies for students with speech impairments. *Journal of Special Education*, 9(2), 89–100.

Rose, D. H., & Meyer, A. (2020). *Universal design for learning: Theory and practice*. CAST Professional Publishing.

Sari, N. P. (2023). Implementation of alternative assessments for students with special needs. *Journal of Educational Evaluation*, 11(1), 55–66.

Slavin, R. E. (2020). *Educational psychology: Theory and practice* (13th ed.). Pearson.

Smith, D. D., & Tyler, N. C. (2020). *Introduction to special education: Making a difference* (9th ed.). Pearson.

Sugiyono. (2022). *Educational research methods (Quantitative, qualitative, and R&D approaches).* Alphabet.

Sukmadinata, N. S. (2021). *Educational research methods*. Teenager Rosdakarya.

Tomlinson, C. A. (2017). *How to differentiate instruction in academically diverse classrooms* (3rd ed.). ASCD.

Tomlinson, C. A., & Moon, T. R. (2019). *Assessment and student success in a differentiated classroom*. ASCD.

UNESCO. (2020). *Global education monitoring report: Inclusion and education – All means all*. UNESCO Publishing.

Widodo, A. (2021). Visual learning model for students with special needs. *Journal of Educational Technology*, 23(2), 78–90.

Yusuf, M. (2020). Psychology of children with special needs. *Journal of Educational Psychology*, 5(1), 60–72.

Zakia, L. (2023). The effectiveness of visual-based learning on the participation of visually impaired students. *Indonesian Journal of Inclusive Education*, 10(1), 25–38.