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Development of HICAH Learning Media (Count Fractions) for Blind Students in Makassar

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Abstract: This study aims to determine the feasibility of the media, student responses, and teacher responses to Hicah learning media (count fractions) for blind students in Makassar. This research is development research using the ADDIE model (Analysis, Design, Development, Implementation, dan Evaluation). The analysis stage is used to find out about the problems and needs of students, the design stage makes media prototypes according to student needs, then the development is carried out media validation, implementation as a media trial, and evaluation by revising to adjust the results of field trials. The results of this study are: (1) The results of the validation of the Hicah learning media developed are feasible to use and feasible to be tested on students and teachers with a media feasibility weight of 90%. (2) The responses of the blind students of SLB Negeri 1 Makassar, SLB-A YAPTI Makassar, and SLB Yukartuni to the Hicah learning media developed received a positive response. Student responses strongly agree by 83%. (3) The responses of mathematics teachers and class teachers at SLB Negeri 1 Makassar, SLB-A YAPTI Makassar, and SLB Yukartuni to the Hicah learning media developed were given a very good response. The positive response of the teacher can be seen from the percentage of 100% positive response.

Keywords: learning media development, blind students, math count fractions

INTRODUCTION

Children with special needs experience intellectual, sensory, physical, emotional, or behavioral disorders, and have special talents (Hajar & Mulyani, 2017). Children with sensory disturbances are called blind children (Noviatun et al., 2022). Blind children are children who experience visual disturbances (Pahlawaty & Aprilia, 2022; Setiarani & Suchyadi, 2018). The learning system for blind children is more likely to be done using verbal language because blind children use their senses of touch and hearing more in receiving information. (Praptaningrum, 2020) suggests that the learning experience of blind children must be obtained by using the senses of touch and hearing. Visual learning has a significant impact on blind children so their limitations make some subjects difficult to understand, especially mathematics. Mathematics lessons are related to abstract concepts that are often associated with everyday life to be able to develop mathematical abilities based on the experience of students (Dinni, 2018; Mad Amin et al., 2020). Understanding mathematics requires good concentration and a long time so that students can understand mathematics, especially blind students. This is following the explanation of (Rumantinigsih et al., 2019) who stated that mathematics requires understanding and reasoning so learning media are needed to visualize mathematical material.

Blind students find it difficult to understand mathematics because they have limitations in perceiving something. One of the mathematics lessons that are difficult for blind students to perceive is fractional material. Teaching mathematics to blind children cannot be separated from learning media. Learning media serves to make it easier for students to understand learning (Haifa et al., 2022; Rezkiani & Aprilia, 2023). Fractional learning media has been studied several years before. (Indriani, 2018) has designed a media of fractional blocks made with

colorful paper or cardboard and in the form of a circle, then divided by value. The media developed by Indriani is only limited to introducing the form of fractions, for example in introducing 1/2, the block media used will try to represent the fractional number. The shortcoming of this study is that it only provides an understanding of the form of fractions, but it is still difficult to operate fractions.

Previous research has developed domino cards using simple materials in the form of picture cards. How to apply this media by matching the fractions according to the image on the card. The advantages of domino card media are flexible, easy to use, and easy to remember, while the disadvantages are that the topics studied are limited and take a long time (Putri et al., 2021). (Indrawati & Cahyanti, 2018) developed a fractions shading board media made of flannel and used in a shaded manner. However, the media created has not been able to make blind students understand how to operate a fraction.

Based on the problems faced by the blind, the researcher assessed that blind students needed better learning media in learning fractions. The designed media is named Hicah (counting fractions). Hicah is a fraction calculator for blind students which is designed to be rectangular in shape, made of plastic, and has a size of 30 cm x 6 cm x 4 cm. Media Hicah contains numbers in braille to make it easier for students to recognize numbers. Calculation of fractions in vertical form is implemented in Hicah media.

METHOD

This type of research is a research and development conducted on blind students using the ADDIE model. The ADDIE model is a development research model that has 5 stages, namely: (1) Analysis, (2) Design, (3) Development, (4) Implementation, and (5) Evaluation. Cahyadi (2019) stated that ADDIE is a development model that is often used to develop teaching materials. The samples in this study were SLB-A YAPTI Makassari and SLB Yukartani (Indonesian Blind Business Foundation) Antang Makassar, and SLB Negeri 1 Makassar.

Data were collected through observation and questionnaires. (1) Observations are made to find out how blind students learn how to learn fractions and how teachers teach fractions to blind students. (2) Questionnaires are given to determine the functionality of the developed media to expert validators (easy access to learning access). The instruments used in this study were validation questionnaires given to validators, student and teacher response questionnaires, and interviews.

The data analysis technique used in this research is descriptive statistical analysis. Descriptive statistical analysis is a quantitative data analysis technique that is presented by describing the data that has been obtained so that it is easier to understand (Nasution, 2017). The technique used uses the following formula:

$$P = (Score \text{ of } Data\ Collection\ Results)/(Ideal\ Score) \times 100\% \qquad (1)$$

Description:
P = Percentage number
Ideal Score = Total highest score x Number of respondents

FINDING AND DISCUSSION

Finding(s)

Analysis Stage

The analysis carried out is an analysis of the needs of students to determine the learning media to be developed. This stage is carried out using observation and interviews with teachers and students. Based on the results of observations and interviews, teachers and blind students need effective media to increase students' understanding of the mathematics learning process, especially in fractional arithmetic operations. Thus, students are expected to understand fractional counting operations using fractional counting media (Hicah).

Design Stage

The media design stage is used to create accessible media and can facilitate the delivery of material to students. Researchers designed the media in the form of a rectangle, with a size of 30 cm x 6 cm x 4 cm which would be made using plastic as a base material. Hicah media also includes wheels that can be rotated 360º and have 10 sides. Each side of the wheel has a number written in Braille. The design of Hicah's learning media follows the concept of a series of numbers that correspond to fractions such as the following concepts: 1/2+1/3=3/6+2/6=(3+2)/6=5/6. Hicah's learning media design can be seen in the following picture 1 and 2.

Development Stage

At the development stage, the researcher validated the design to media experts using a questionnaire. The validation questionnaire is used as a validator reference to assess the feasibility of Hicah's learning media before it is implemented for students and teachers. The media feasibility instrument consists of 10 indicators with a Guttman scale rating. Validation was carried out with 2 media expert validators. The assessment result sheet is listed in the following Table 1. Based on the assessment that has been carried out by the media expert validator 1 with the assessment instrument totaling 10 indicators, 8 indicators are good and 2 are not good. Based on the assessment that has been carried out by the media expert validator 1 with the assessment instrument totaling 10 indicators, 10 indicators are of good value and no indicator is of bad value. The frequency distribution table 2 is the result of the assessment of media expert 1 validator and media expert validator 2.

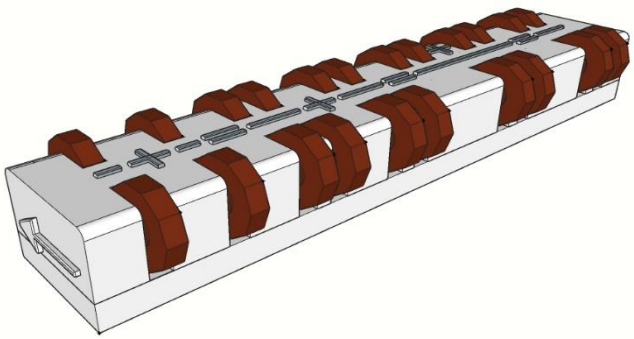

Figure 1. Sideways Hicah Design

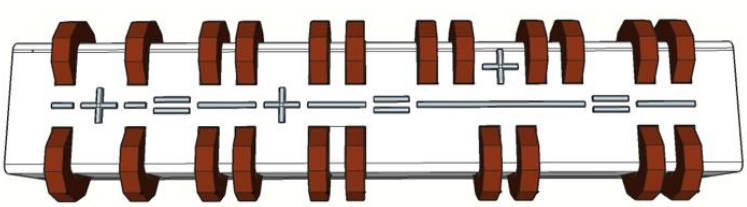

Figure 2. View from above

Table 1. Media Expert Validator 1 and 2

No	Question Items	V1	V2
Content Eligibility			
1	Hicah learning media (count fractions) following the material for counting fraction operations	1	1
2	Hicah learning media (count fractions) can increase the curiosity of students	1	1
Application			
3	Hicah learning media (count fractions) is easy to use	0	1
4	Hicah learning media (counting fractions) is interactive	1	1
Media display			
5	The display of hicah learning media (counting fractions) is interesting	1	1
6	Braille numbers on hicah learning media (count fractions) are clear	1	1
7	Placement of braille numbers on hicah learning media is appropriate	1	1
8	Braille numbers can be palpated well	1	1
Presentation			
9	Hicah learning media (count fractions) is not easily damaged	0	1
10	Hicah learning media (count fractions) is designed in a practical way	1	1
	Total	8	10

V1: First Validator; V2: Second Validator

Table 2. Frequency distribution of media expert validation

No	Criteria	Frequency	Score
1	Not good (0)	2	0
2	Good (1)	18	18
	Total		18

Based on the frequency distribution table for media expert validation, the feasibility presentation can be calculated using formula (1).

$P = (Data\ Collection\ Results\ Score)/(Ideal\ Score) \times 100\%$

$P = (18)/[(2)(10)]\ x\ 100\%$

$P = (18)/(20)\ x\ 100\%$

$P = 90\%$

Based on the table of the feasibility percentage scale with a scale of 1-2, the percentage of 90% is included in the feasible category. After that, the media design was revised according to input from media experts. Then it is printed using 3D printing which will then be implemented for blind students and teachers.

Implementation Stage

At the implementation stage, the researcher implemented the media for students and teachers. Then they were given a questionnaire to find out how the students and teachers responded to Hicah's media.

(1) *Student's Responses*

Student's responses to the learning media for fractional counting (Hicah) are shown in the Table 3.

Table 3. Analysis of Student's Responses

Score Interval	Categorization	Frequency of Students	
		Score	Percentage (%)
$X \leq 16$	Very deficient	1	8%
$16 < X \leq 20$	Deficient	1	8%
$20 < X \leq 24$	Good	6	50%
$X > 24$	Very good	4	33%

The number of student responses to Hicah's learning media is 8% disagree, 8% disagree, 50% agree, and strongly agree 33%. From these results, it was found that the students' good response to the learning media for fractional counting (Hicah) was 83%.

(2) *Teacher's Responses*

The teacher's responses to the learning media for fractional counting (Hicah) are shown in the table 4.

Table 4. Analysis of Teacher's Responses

Score Interval	Categorization	Frequency of Students	
		Score	Percentage (%)
$X \leq 16$	Very deficient	0	0%
$16 < X \leq 20$	Deficient	0	0%
$20 < X \leq 24$	Good	2	33%
$X > 24$	Very good	4	67%

The number of teacher responses to Hicah's learning media is 0% disagree, 0% disagree, 33% agree, and 67% strongly agree. From these results, it was obtained that the teacher's good response to the learning media for counting fractions (Hicah) was 100%.

Evaluation Stage

At the evaluation stage, the researcher made improvements that were adjusted to the suggestions given by the teacher and participants. The advice given regarding the improvement of the placement of braille punctuation is still using the warning sign (a punctuation mark in mathematics that is commonly used), it is recommended to use mathematical marks in braille so that students can better understand the location of mathematical punctuation marks. In addition, it is also recommended to put a number mark on each number on the wheel so that blind students can better understand where the numbers are placed. The results of the design revision can be seen in figures 3 and 4.

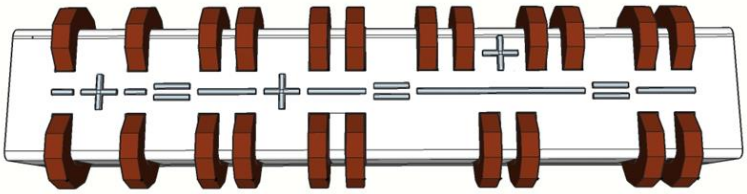

Figure 3. Media design before revision

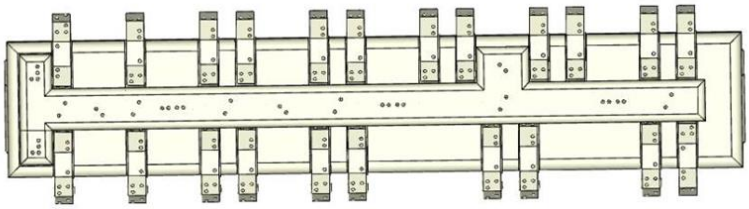

Figure 4. Media design after revision

Discussion(s)

Hicah Learning Media Design

The design of Hicah learning media is carried out in stages starting from recognizing the learning problems of blind students, making media designs, to validating Hicah learning media. After validating the media expert and being declared eligible, it was immediately followed up with the implementation of the media for students and teachers. After implementation, it was concluded that the Hicah learning media was suitable for students to use as an alternative learning media that was used independently and teachers could use Hicah media as teaching aids in providing understanding to students about fractional operations.

Eligibility of Learning Media

Based on the assessment carried out by the media expert validator 1 and media expert validator 2, the feasibility of learning media includes four aspects of the assessment, namely aspects of the feasibility of content, use, media display, and presentation. The content feasibility aspect obtained an average score of 1 with good criteria, the usage aspect obtained an average score of 0.75 with good criteria, the display aspect obtained an average score of 1 with good criteria, and the presentation aspect obtained an average score of 0.75. With good criteria. The results of all these aspects obtained a score of 18 with an average of 0.9 with good criteria. Based on the calculation results, the learning media is included in the category that is suitable for use. Comments given by media experts are that this media can be used practically and is not easily damaged and media expert validators provide suggestions to add a little color to the media because low vision blind people still have vision left to see. The results of the assessment obtained show that this media (Yanto, 2019) has the potential to develop students' knowledge. this is also related to the media that has been carried out by and argues that the use of media can provide convenience in conducting learning in the classroom. In addition, it can also increase student activity in learning (Dewi et al., 2019; Maula & Sidiq, 2022). So that this media needs to be followed up because it has the potential to benefit students directly.

Student's Responses

Student responses are student responses and reactions seen from the results of questionnaires given to blind students at SLB Negeri 1 Makassar, SLB-A YAPTI Makassar, and SLB Yukartuni to Hicah's learning media on fractional material. After conducting product trials on 12 blind students, students were given response questionnaires and were accompanied directly

by researchers to fill out questionnaires and provide responses on how students responded to hicah learning media. The results of student responses related to Hicah learning media have been designed as well as possible and are well supported by students, which is 83%.

Teacher's Responses

The teacher's response to Hicah's learning media was measured by giving a questionnaire to the teacher after implementing the media. The teacher's response to Hicah's learning media is very good seen from the support or good response given, 33% of teachers respond to agree with Hicah's learning media and 67% of teachers respond strongly agree. This shows that Hicah's learning media can be used. The good response given by the teacher gave suggestions for holding Hicah learning media in every special school or this media was submitted to educational institutions so that they could hold this media in schools.

CONCLUSION

The stages of research carried out are adjusted to the development model used, namely the ADDIE development model (analysis, design, development, implementation, evaluation). The results of the needs analysis showed that blind teachers and students need effective media to improve students' understanding of the mathematics learning process, especially in fractional arithmetic operations. So the researchers designed a learning media called Hicah (count fractions). The prototype of Hicah's learning media is rectangular, with a size of 30 cm x 6 cm x 4 cm which is made using plastic base materials. Hicah media also includes wheels that can be rotated 360º and consist of 10 sides. Each side of the wheel has a number written in Braille.

The results of expert validation of the developed Hicah learning media are feasible to use and feasible to be tested on students and teachers with a media feasibility weight of 90%. The responses of the blind students of SLB Negeri 1 Makassar, SLB-A YAPTI Makassar, and SLB Yukartuni to the Hicah learning media developed received a positive response. Student responses strongly agree by 83%. Judging from the responses of the mathematics teachers and the class teachers of SLB Negeri 1 Makassar, SLB-A YAPTI Makassar, and SLB Yukartuni to the Hicah learning media that was developed, they were also given a very good response. The positive response of the teacher can be seen from the percentage of 100% positive response.

REFERENCES

Dewi, A. S., Isnani, I., & Ahmadi, A. (2019). Keefektifan Model Pembelajaran Stad Berbantuan Media Pembelajaran Terhadap Sikap Dan Kemampuan Pemecahan Masalah Matematika. *JIPMat*, *4*(1), 7–11. https://doi.org/10.26877/jipmat.v4i1.3509

Dinni, H. N. (2018). HOTS (High Order Thinking Skills) dan Kaitannya dengan Kemampuan Literasi Matematika. *Prisma*, *1*, 170–176.

Haifa, N., Respati, R., & Chairunnisaa, C. (2022). Word Cards Design as Learning Media for Dyslexia Students in Elementary School. *Journal of Education for Sustainability and Diversity*, *1*(1), 109–117. https://doi.org/10.57142/jesd.v1i1.11

Hajar, S., & Mulyani, S. R. (2017). Analisis Kajian Teoritis Perbedaan, Persamaan dan Inklusi Dalam Pelayanan Pendidikan Dasar Bagi Anak Berkebutuhan Khusus. *Jurnal Ilmiah Mitra Swara Ganesha*, *4*(2), 48.

Indrawati, D., & Cahyanti, D. N. (2018). Alternatif Pembelajaran Matematika Menggunakan Jurnal Inventa. *Jurnal Inventa*, *II*(2).

Indriani, A. (2018). Penggunaan Blok Pecahan Pada Materi Pecahan Sekolah Dasar. *JIPMat*, *3*(1), 11–16. https://doi.org/10.26877/jipmat.v3i1.2418

Mad Amin, A., Tahar, M., & Zakaria, A. (2020). Mathematical Learning Approach for Special Education Pupils: The Effectiveness of Mauselis Board in Improving Adding Skills. *Journal of ICSAR*, *4*(2), 1–6.

Maula, N., & Sidiq, Z. (2022). Traditional Kucing-Kucingan Game, in Improving Ground Motor Skills to Blind Children in SLB Negeri A Citeureup Cimahi. *INCLUSIVE EDUCATION*, *1*(1), 110–118. https://doi.org/10.57142/inclusion.v1i1.8

Nasution, L. (2017). Statistik Deskriptif. *Jurnal Hikmah*, *14*(1), 1829–8419. https://doi.org/10.1021/ja01626a006

Noviatun, A., Hermawan, H., & Supratiwi, M. (2022). The Relationship between Peer Social Support with The Resilience of Blind Adolescents in Surakarta. *Journal of ICSAR*, *6*(1), 78–82.

Pahlawaty, N., & Aprilia, I. D. (2022). MiBee Braille Application: An Alternative Accessibility Literacy for Totally Blind Students at Inclusive School. *Proceeding of International Conference on Special Education in South East Asia Region*, 1–12.

Praptaningrum, A. (2020). Penerapan Bahan Ajar Audio Untuk Anak Tunanetra Tingkat SMP di Indonesia. *Jurnal Teknologi Pendidikan*, *5*(1), 1–19.

Putri, F. Z., Putra, Z. H., & Munjiatun, M. (2021). Pengembangan media kartu domino materi pecahan untuk belajar mandiri siswa kelas IV di masa new normal. *Jurnal Ilmiah Aquinas*, *4*(1), 113–126.

Rezkiani, K., & Aprilia, I. D. (2023). Development of Alternative and Augmentative Communication Media System for Autism Spectrum Disorder with Complex Communication Needs. *Journal of Education for Sustainability and Diversity*, *1*(2), 118–129. https://doi.org/10.57142/jesd.v1i2.51

Rumantinigsih, D. K., Astuti, E. P., & Purwoko, R. Y. (2019). Mengatasi kesulitan belajar matematika pada siswa tunanetra melalui pengembangan media pandikar berkode braille. *Jurnal Pendidikan Matematika Dan Matematika*, *6*(2020), 105–114.

Setiarani, S., & Suchyadi, Y. (2018). Pola Asuh Orang Tua Terhadap Anak Tuna Netra Berprestasi Usia Sekolah Dasar. *JPPGuseda | Jurnal Pendidikan & Pengajaran Guru Sekolah Dasar*, *1*(01), 15–18. https://doi.org/10.33751/jppguseda.v1i01.866

Yanto, D. T. P. (2019). Praktikalitas Media Pembelajaran Interaktif pada Proses Pembelajaran Rangkaian Listrik. *INVOTEK: Jurnal Inovasi Vokasional Dan Teknologi*, *19*(1), 75–82. https://doi.org/10.24036/invotek.v19i1.409