DEVELOPMENT OF BRAILLE NOTATION USING PLASTICINE TO IMPROVE THE READING COMPETENCY OF BLIND STUDENTS

Verdian Angga Saputra
{anggaverdian993@gmail.com}

Program Studi Pendidikan Seni, FKIP, Universitas Sebelas Maret, Jalan Ir Sutami No. 36, Kentingan, Jebres, Surakarta, Jawa Tengah 57126, Indonesia.

Abstract. The research aims to explain the innovation of braille musical notation made using plasticine for learning for blind students at SMK Negeri 8 Surakarta. This research was conducted using the research and development (R&D) research method with the Borg and Gall model. The research population was blind students majoring in music arts. The research stages carried out were (1) potential and problems; (2) data collection; (3) product design; (4) design validation; (5) design revision; (6) product testing; (7) making evaluation tools and products. The results of the expert assessment including design validation showed a score of 72.9% for the content feasibility aspect. The linguistic aspect score reached 68.75%, which is in the adequate category. the performance aspect reached 87.5% with a very decent category. Accumulative product trial results assessed from content quality aspects, appearance aspects and technical quality aspects reached a score of 91.6% in the very feasible category. Plasticine braille notation encourages students to more easily read, understand and make notations according to the desired musical creative power.

Keywords: notation, braille, and plasticine.

INTRODUCTION

Inclusive education has always been a challenge for the Indonesian people. These challenges still revolve around the areas of methods, media and learning systems used. Inclusive education always encourages teachers to be creative in creating new teaching methods and media, so that the teaching and learning process runs according to what is desired. As stated in the regulations made by the government, the philosophy of inclusive education is Pancasila and Bhinneka Tunggal Ika which leads to diversity in education. All groups, races, ethnicities, all forms of differences, both physical and non-physical, have the right to equal education.

The same thing is also stated in the 1945 Constitution article 31 paragraph 1 and Law Number 20 of 2003 concerning the National Education System indicating that the state provides full guarantees to all children, including children with special needs (ABK), in obtaining quality educational opportunities and services. As stated in Law Number 20 of 2003, chapter IV article 5 paragraph 1, that every citizen has the same right to obtain quality education. Furthermore, paragraph 2 states that citizens who have physical, emotional, mental, intellectual and social disabilities have the right to receive education. In national education regulation no. 70 of 2009, article 2, states that the government is implementing education that respects diversity and is non-discriminatory for all students.

SMK Negeri 8 Surakarta, is a vocational high school that accommodates inclusive education as an effort to participate in educating the nation's life through the arts, one of which is music. SMK Negeri 8 Surakarta has students with special needs, namely blind people who are majoring in music arts. Blind students in the arts and music department are something that is very unique and perhaps rare in other vocational schools. Learning music is synonymous with the musical talents and abilities possessed by students. One of them is the ability to read notation. Then it is necessary to pay attention to how blind students can follow the process of learning to read notation. In the world of music education, something

called braille notation has been developed, which is a conversion of number notation and block notation in the form of six domino dots.

Braille notation in the form of dots 1, 2, 4, 5 determines the name of the note being played, while dots 3 and 6 are the notation values which determine the length or shortness of the note being played. As we know, the solmization of music in sequence is do-re-mi-fa-sol-la-si-do. Standard solmization in music usually always starts in the key of C Major. The order of the C Major scale in writing Latin letters is: c - d - e - f - g - a – b. Meanwhile, when writing scales, they are written in letters starting with the letter d, namely: d - e - f - g - h - i – j. This scheme is a comparative illustration of musical notation in general, music notation, and the Latin braille alphabet. So the way to read the notation is c – d – e – f – g – a – b (because point 6 is filled, we sing the notes for 1 beat). In other words, when you find the arrangement of dots, the letter "d" in braille is read as "c", and so on. The creation of a code for braille music is of course an effort to improve the quality of music education for the blind.

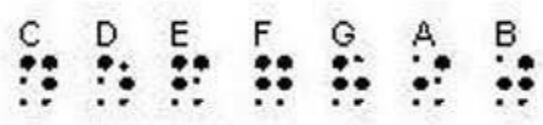

Fig. 1. Braille notation domino six-dot model

The Directorate of Special Education, Directorate General of Primary and Secondary Education, Department of National Education, through the Project Section for Improving Education for the Blind for Fiscal Year 2000, has held a "Seminar on Standardizing the Indonesian Braille Symbol System in the Field of Music and Development of Music Education for the Blind", so this has an important value. which is high for musical development. Basically, the musical potential of the blind is no different from people with a good visual system (sighted). However, the music education development system for them is less than optimal, their musical works have not yet found a place in society. In addition, the unavailability of source books and accompanying materials that can be accessed by the blind as a result of the very limited availability of 'Music Braille Symbols' in Indonesia is the main factor causing the failure of music education for the blind.

Therefore, braille music innovations are needed as an effort to increase the capacity and quality of braille music in Indonesia, so that it develops better than in previous years. This research attempts to make braille notation from plasticine, which is elastic wax commonly used for children's toys. Plasticine is a craft material similar to clay/wax that is easy to shape. The texture of plasticine is like clay, so it is often used as a variety of crafts that are popular among artists and sculptors. According to the Big Indonesian Dictionary (KBBI), plasticine is a wax material that has a soft and colorful texture. Plasticine can be shaped by hand or by mold. Plasticine is made from a soft substance such as clay which is made from synthetic materials, aka not natural clay. The definition of plasticine also includes a type of artificial clay that does not dry out, meaning that plasticine can be used repeatedly. The synthetic materials in making plasticine will provide a soft texture, which makes it easy to shape. However, plasticine materials can also vary depending on the maker. Plasticine was discovered by an English artist named William Harbutt. Harbutt discovered plasticine in the late 1800s.

This innovation in making braille notation in plasticine form is used to help learn music technology. However, this plasticine braille notation is not in the form of six domino numbers as explained above. What will be done in this development research is the transfer of block notation to embossed block notation or braille made from plasticine. So the notation will be exactly the same as the notation read by other students who are not blind.

It is hoped that this transfer of block notation vehicles to be made into braille on plasticine will be an effort to develop teaching media, especially in music technology subjects, especially for learning to read notation for students. This innovation was motivated by the fact that too much effort had been

used to solve students' problems in understanding block notation in music technology subjects at SMK Negeri 8 Surakarta.

RESEARCH METHOD

The research carried out is a type of research and development Research and Development (R&D) using the Borg and Gall development model. Research and development consists of ten stages. The research stages were then adapted into seven stages, these were adapted to research needs. The seven stages are as follows, (1) potential and problems; (2) data collection; (3) product design; (4) design validation; (5) design revision; (6) product testing; (7) making evaluation tools and products. This research was carried out in seven research stages. The seven stages are listed in Figure 1 as follows.

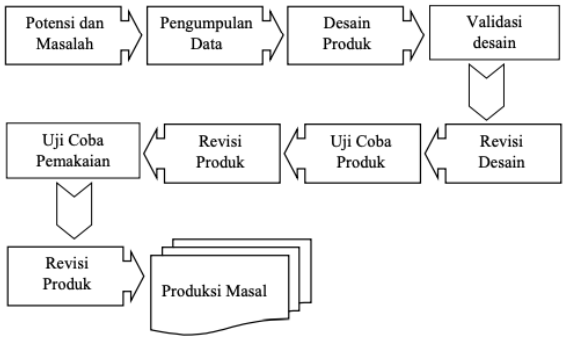

Fig. 2. Research design

Data analysis from the results of expert validation questionnaires is used to determine the feasibility of the media being developed. The results of the questionnaire were analyzed using steps modified from Riduwan (2013) in Table 1.

Table 1. Skala Likert

Kriteria	Skor
Sangat Baik (SB)	4
Baik (B)	3
Kurang Baik (KB)	2
Tidak Baik (TB)	1

Next, calculate the percentage of feasibility of the data obtained using a Likert scale with the following formula:

$$x = \frac{\sum M}{M_m} x\ 100\ \%$$

Fig. 3 Calculate Formula

Information :

Mmax = Maximum score for each aspect of the assessment

$\sum$ M = The total score for each aspect of the assessment

χ = The percentage of scores for each aspect of the expected assessment

The scores are then converted into qualitative data in the assessment criteria table as in table 2 as follows :

Table 2. Eligible Category

No	Interval	Kriteria
1	X ≤ 52%	Tidak Layak
2	52% < X ≤ 68%	Kurang Layak
3	68% < X ≤ 84%	Layak
4	X > 84%	Sangat Layak

RESULT AND ANALYSIS

In this section, the research results are presented consisting of (1) potential and problems; (2) data collection; (3) product design; (4) design validation; (5) design revision; (6) product testing; (7) making evaluation tools and products. This research and development produced learning media using plasticine as a suitable medium for visualizing musical notes as a medium for increasing the competency of blind students majoring in music at SMK Negeri 8 Surakarta. The development procedure used is the Borg and Gall model which was adapted into 7 stages, namely:

1.1 Potential and problems

From the results of the preliminary study, it turns out that blind students at SMK Negeri 8 Surakarta have musicality in terms of recognizing notes in melodies and chords that is superior to regular students. However, these students lack sensitivity to the value of notes in rhythmic melodies and chords. On the other hand, teachers do not yet understand the concept of learning for students with special needs who are blind. Class teachers only carry out and carry out learning according to the learning plan in the Teacher's Book without understanding the concept of learning for students with special needs who are blind due to the lack of training or training for the learning process. So there needs to be steps and innovations in learning to be used as provisions for teachers in carrying out learning in the classroom.

1.2 Data collection

Data collection was carried out to overcome the potential and problems of the development carried out by researchers. Collecting data by conducting needs analysis, material studies and studies of media creation tools.

1.2.1 Needs Analysis

Carry out needs analysis using interviews that have been conducted. Information was obtained that the Sibelius software which is used as a learning medium for musical note writing does not accommodate talkback which can be used as a translator for the blind, so that students with special needs who are blind in the music department have difficulties in learning music technology, so that students' enthusiasm is reduced in participating in learning music technology. In response to this situation, it was deemed necessary to develop learning media to help students with special needs who are blind in understanding block notation in music technology subjects. The media developed is a tool made of plasticine to imitate musical notes in 3 dimensions so that they can be felt by blind students.

1.2.2 Material Assessment

Based on the analysis, it is known that the benefits of using media in the learning process create enthusiasm for learning, more direct interaction between students and learning resources, thereby raising students' curiosity and increasing students' motivation to learn and improving learning achievement.

In addition, at the material review stage, the material that will be presented to students, media devices and their use are determined. The material chosen in this research is class XI music material on technology for inputting and editing notation.

1.3 Product Design

After collecting data, the next step is to create learning media that will be used by blind students to learn musical notes. How to make and design results of learning media from plasticine are presented in the following picture, prepared materials

1) Plastisin;
2) Clipboard;
3) Buah lidi;
4) solasi.

1.3.1 How to create learning media

1) Ready clipboard
2) Cut 5 sticks according to the length of the clipboard
3) Arrange the cut sticks to form a staff (staves).
4) Untuk menempelkan lidi pada clipdoard bias menggunakan perekat (isolasi) supaya lidi dapat menempel pada clipboard dengan kuat.
5) Once everything has been created, the media is ready to be used. To form clefs, notation, time lines and so on, use plasticine as the medium.

1.4 Learning media design results

Fig. 4. Results of learning media design

1.5 Design Validation

In the next development stage, learning media validation is carried out by material experts. The following is an explanation of expert validation as follows:

1) Material validation

The purpose of material validation is to see the suitability of the material in music notation learning media using plasticine. Aspects and criteria for material experts can be seen in table 3:

Table 3. Aspects and Criteria for Material Experts

No	Aspects	Criterion
1	Eligibility of content	1. Conformity to Competency Standards and Basic competencies 2. Provide new knowledge 3. Material accuracy 4. Encourage curiosity

2	Discuss	5. Presentation technique 6. Ease of understanding the material 7. Presentation of learning 8. Coherence and flow continuity
3	*Performance*	9. Attractiveness of presentation 10. Can be used individually or in groups

source: processed by researchers

Table 4. Material Expert Validation Results on Content Feasibility Aspects

Assessment Aspects	No	X1	X2	X3	Σ Per No	Σ Per aspek	Max Score	Score (%)	Category
Eligibility of content	1	3	3	2	8	35	4 8	72,9	Proper
	2	3	3	3	9				
	3	4	3	3	10				
	4	4	2	2	8				

source: processed by researchers

The results of the assessment of the feasibility of music notation learning media using plasticine in linguistic aspects by material experts can be seen in table 5 below:

Table 5. Material Expert Validation Results on Linguistic Aspects

Assessment Aspects	No	X1	X2	X3	Σ Per No	Σ Per aspect	Max Score	Score (%)	Category
Discuss	5	3	2	3	8	33	48	68,75	Proper
	6	3	3	3	9				
	7	3	2	2	7				
	8	4	2	3	9				

source: processed by researchers

The results of the assessment of the feasibility of music notation learning media using plasticine in the performance aspect by material experts can be seen in table 6 below:

Table 6. Material Expert Validation Results on Performance Aspects

Assessment Aspects	No	X1	X2	X3	Σ PerNo	Σ peraspek	Skor Maksimal	Score (%)	Category
Performance	9	4	3	3	10	2 1	2 4	87,5	Very Worth It
	10	4	3	4	11				

source: processed by researchers

From the results of the design validation, several changes and revisions were made based on input from experts. The actions taken on media design are as follows:

Fig. 5. View before media expert revision

Fig. 6. View after media expert revision

The results of the validation carried out by 3 media experts show that learning media is included in the category worthy of being tried out. Apart from providing assessments, media experts also provide suggestions. The advice given by experts is as follows:

1. The distance between the time lines is too narrow so that blind students may have difficulty placing the plasticine according to the required note
2. The size of the musical notes is adjusted to the distance or spacing of the time lines.

Based on the results of the expert assessment, the final percentage of the assessment reached 90% with very feasible criteria. So that learning media using plasticine can be tested.

1.6 Design Revision

At the design revision stage, improvements were made to the design taken from comments and suggestions provided by validators, material experts and media experts as a reference for researchers regarding the shortcomings of musical note learning media using plasticine..

Table 7. Expert Suggestions and Improvements

No	Validator	Suggestion	Repair

1.	Materials Expert	The time line should stick well and be straight	The measure of the stick used is chosen to be straight so that it can provide an even distance or spacing with the other measures
		Notation input must be adjusted to the SK and KD material	Notation input has been adjusted to SK and KD material.
		The notation material is not too long or adjusted to the capacity of the media	Material is limited to 4 bars.
		Minimize the use of alteration marks	The material uses the C major natural scale.
		Don't use too many guide lines	The material has been adjusted to the required tone range
2.	Media Expert	The spacing on the time lines is not wide enough, to make it easier for students to input notation	The time line spacing is widened to make it easier for students to input notation
		The notation made must be adjusted to the stave line	The font size has been corrected

1.7 Product Trial

Field trials responding to students' interest in musical note learning media using plasticine are presented in the form of the following table:

Fig. 7. Blind students majoring in music arts at SMK Negeri 8 Surakarta trying out learning media products. (source: researcher documentation)

Table 8. Blind Student Response Data

No	Responden	Rated aspect			Total
		Content Quality	Display Aspects	Technical Quality	
1	Student 1	38	17	36	91
2	Student 2	39	16	38	93

3	Student 3	37	18	35	90
4	Student 4	38	16	37	91
5	Student 5	39	15	39	93

Source: Processed by Researchers

Based on Table 11, data on the feasibility of learning media can be obtained from the student side. Data from students was obtained from questionnaires made by researchers and filled out by blind students majoring in music arts at SMK Negeri 8 Surakarta. The questionnaire contains 25 instrument items and uses a Likert scale with the highest score of 4 and the lowest 1 of each question. The questionnaire consists of 3 aspects with the composition of content quality aspects as many as 10 items, display aspects as many as 5 items and technical quality aspects as many as 10 items. After knowing the score interval of each, then the next is the calculation of scores based on each aspect which then the scores are converted to categories. The assessment score of each respondent can be seen in the following table:

Tabel 8. Response Data of Blind Students

No	Aspects	Average	Percentage	Category
1	Content quality	38,2	95,5%	Very Worth It
2	Display Aspect	16,4	82%	Proper
3	Technical quality	37	92,5%	Very Worth It
	Total	91,6	91,6%	Very Worth It

source: processed by researchers

All aspects have an average score of 91.6 with a percentage of 91.6% being in the very decent category. The positive response from many students was that the learning media for block notation using plasticine helped them understand the material. Blind students in class.

CONCLUSION

Based on the results of the research and discussion, it can be concluded that: 1) Plasticine braille notation is a product of the development of a long process of music technology subjects at SMK Negeri 8 Surakarta. 2) Plasticine braille notation is an alternative that allows it to become a new open media for inclusive students with special needs who are blind. 3) Plasticine braille notation can encourage blind students to develop their potential, especially in terms of reading, understanding and making notation so that they can work according to their creative abilities in the field of music.
Based on the research that has been carried out, several suggestions that can be given include:

1) Suggestions for learning music technology majoring in musical arts. Seeing the great interest of students, there should be more media and developed further so that it can be used longer and the media is unlimited.
2) Suggestions for further research. Media is made more interesting and easier for blind students to use so that it is more interesting and students are more enthusiastic about learning.

References

Aghni, Riski Ilyasa. (2018). Fungsi Dan Jenis Media Pembelajaran Dalam PembelajaranAkuntansi. Jurnal Pendidikan Akuntansi Indonesia. Vol. 14, No. 1.

Borg, & Gall. 1983. Educational research: An introduction. In: New York Longman.

Devinta, Maully Syifa. "Landasan Filosofi Teknologi Pembelajaran". Program Studi Pendidikan Guru MI FAI Universitas Muhamadiyah Sidoharjo

Direktorat PPK-LK Pendidkan Dasar Kementerian Pendidikan dan Kebudayaan Jakarta. 2011. Pedoman Umum Penyelenggaran Pendidikan Inklusif.

Hamdani Hamid. (2013). Pengembangan Sistem Pendidikan di Indonesia. Bandung: Pustaka Setia.

Hamdani. (2021). Strategi Belajar Mengajar. Bandung: CV Pustaka Setia.

Haq Chotib, Sjahidul. (2018). Prinsip Dasar Pertimbangan Pemilihan Media Pembelajaran. Jurnal PGMI. Vol. 1, No. 2.

Jabbar, Prima Nur. (2020). "Media Braille pada Pembelajaran Piano untuk Siswa Tunanetra di SMPLB-A (YPAB) Surabaya". Jurunal Pendidikan Sendratasik, 6(1), 1-12.

Kamil, Mustofa. (2019). Pendidikan Nonformal Pengembangan Melalui Pusat Kegiatan Belajar Mengajar (Pkbm) Di Indonesia (Sebuah Pembelajaran Dari Kominkan Jepang). Bandung : Alfabeta.

Majid, Abdul. (2019). Perencanaan Pembelajaran. Bandung: Remaja Rosdakarya.

Niatirama, Lidia. (2017). "Pembelajaran Notasi Braille Pada Siswa Tunanetra Elsavan Dalam Bidang Studi Vokal Di Sekolah Musik Yamuger Rawamangun Jakarta Timur". Program Studi Pendidikan Musik, Jurusan Sendratasik, Fakultas Bahasa dan Seni, Universitas Negeri Medan.

Nurokhmad, Siti. (2020). "Aplikasi Notasi Angka Timbul untuk Meningkatkan Penguasaan Lagu pada Siswa Tunanetra di SLBN-A Pajajaran Bandung". Departemen Pendidikan Seni Musik Fakultas Pendidikan Seni dan Desain Universitas Pendidikan Indonesia.

Martha, N. U., Wijayawati, D., Krisnawati, V., & Nugroho, B. A. P. (2022) Pengembangan Bahan Ajar Menulis Naskah Drama Bermuatan Kearifan Lokal dan Pendidikan Karakter. Jurnal Inovasi Pembelajaran, 8(1), 68-83.

Mudjillah, Hanna Sri. (2004). "Modul Teori Musik Dasar." Yogyakarta: FPBS IKIP Yogyakarta.

Sahab, Dahris. (2018). Analisis Kepuasan Pengguna Kompetensi Alumni Program diploma III Jurusan Komputerisasi Akuntansi Politeknik Negeri Madiun. Tesis Pascasarjana Universitas Sebelas Maret Surakarta. (Dipublikasikan).

Septian, E., Setyowati, D. L., & Atmaja, H. T. (2022) Pengembangan EduKependudukan digital di Sekolah Siaga Kependudukan Untuk Mewujudkan Sustainable Development goals (SDGs). Jurnal Inovasi Pembelajaran, 8(2), 156-170

Setiawan, Ezra Putranda. (2023). Literasi Baca Siswa Indonesia menurut Jenis Kelamin, Growth Mindset, dan Jenjang Pendidikan: Survei PISA. Jurnal Pendidikan dan Kebudayaan, Volume 8, No. 1-116

Sugiyono. (2016). Metode Penelitian Kuantitatif, Kualitatif dan R&D. Alfabeta. Bandung

Sofia. (2012). Peranan Media Pengejaran Dalam Pembelajaran Bahasa. Jurnal Al-Hikmah. Vol. XIII, No. 1.

Wijaya. Ardhi. (2016). Seluk Beluk Tunanetra dan Strategi Pembelajaran Anak Tuna Netra, Arruzz Media. Jakarta.

Yunus, Firdaus M. (2021). Kebebasan Dalam Filsafat Eksistensialisme Jean Paul Sartre. Jurnal AlUlmu, Volume 11, No. 267-282.