



Development of Ceker Media and Space Building for Light Mild Mental Retardation Students of SMPLB Pekanbaru

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ARTICLE INFO

Article history:

Received: 28 Nov 2020

Revised: 09 April 2021

Accepted: 18 April 2021

Published online: 24 April 2021

Keywords:

Learning Media

Ceker

Space Building

Mild Mental Retardation Student

ABSTRACT

In conveying the concept of mathematics in a concrete manner so that it is easily accepted by participants in the mentally retarded education, tools/media are needed. One of the media developed in this study for mentally retarded students is Ceker media and space building media. This study aims to produce Ceker learning media on number material and spatial shapes on blocks and cubes for mild mental retardation students at SMPLB Pekanbaru that meet valid and practical criteria. The research method used is the Borg and Gall development model. Collecting validation data for the addition and subtraction of integer operation materials was carried out by providing validation sheets to three experts. Practical data collection was carried out by distributing questionnaires to SMPLB mental retardation students using a Likert scale. The learning media of Ceker and building spaces that have been validated by 3 validators are very valid with a percentage of 93,3. The development of learning media for Ceker cards and building space for mild mentally retarded students has met the very practical criteria with a percentage of 100%. Based on the results of the research and discussion, it was concluded that the learning media of Ceker and building spaces (blocks and cubes) for mild mental retardation students at SMPLB have met the criteria of being very valid and very practical.

1. Introduction

SLB is a school that is devoted to children with special needs. One that includes the classification of children with special needs is mentally retarded children. Impairment is a certain condition with a decrease in intelligence and adaptive function (Delphie, Bondan 2012). According to Mumpuniarti (2003) mental retardation is a child who has mental barriers. The academic ability of mentally retarded children is below average so that their development is delayed compared to normal children. Therefore it is necessary to pay special

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Doi: <https://doi.org/10.31258/jes.5.2.p.383-392>

attention to mentally retarded children from the teacher or supervisor so that the development of mentally retarded children can be achieved according to their abilities .

Mentally retarded students are children who have an intellectual level below average (Febrisma, 2013). According to the American Association on Mental Retardation (AAMR) in (Sundari Tjutju, 2006) the classification of mentally retarded children is divided into 4 levels, namely children who have an IQ of 55-70 are said to be mildly mentally retarded, IQ 40-54 is said to have moderate mental retardation, IQ 25-39 is said to have severe mental retardation, and $IQ \leq 24$ mental retardation is very severe. According to Amin in Usti (2013), mild mentally retarded children have a slow mindset, but can still understand academic lessons. According to Sunaryo and Sunardi (2007) mild mentally retarded children can still learn to read, write and simple counting. Cockcroft (in Abdurrahman, 2003) argues that the need for students to learn mathematics because; (1) always used in all aspects of life; (2) all fields of study require appropriate mathematical skills; (3) is a strong, concise and clear means of communication; (4) can be used to present information in a variety of ways; (5) improve logical thinking skills, accuracy, and spatial awareness; and (6) provide satisfaction with the effort to solve challenging problems. Learning for mentally retarded students must be accommodative in terms of materials, methods, and learning media, so that it can facilitate the differences that exist between regular students and mentally retarded students (Delphie, 2006). Marti (in Sundayana, 2013) argues that mathematical objects that are abstract are the difficulties faced by students in learning mathematics. Not only students but also teachers has experience problems in teaching mathematics due to its abstract nature.

In the implementation of learning for mentally retarded students, a teacher must have the competence in educating and providing subject matter to children with special needs. The teacher must be able to design the material as flexible as possible so that it is easily conveyed to students. Mathematical concepts can be understood easily if they are concrete. Afwan (2013) said that to optimize the potential that exists in children with mild mental retardation, especially in mathematics lessons, it should be adjusted to the child's mental development.

In according to Murdiyanto, et al (2014) media is one solution to easily embed mathematical concepts, especially for students with special needs, namely mental retardation. Furthermore, Nandi (2006) states that the teacher will produce good output if the learning process in the classroom is supported by educational tools/media as a result of the development of appropriate science and technology. Joni Purwono, et al (2014) stated that learning media is very important to support the quality of a teaching and learning process This is in line with the opinion of Tejo Nurseto (2011) that the use of instructional media can facilitate the learning process. Setiawan, et al (2014) explained that the presence of the media has a significant meaning in the teaching and learning process, namely as an intermediary who can help clarify the material. A teacher can use various alternative learning media that are thought to help students learn. Through the media, the visual aspect is more able to provide clear information than just words.

Levie (in Arsyad, 2013) states that learning through visual stimuli produces better learning outcomes for tasks such as remembering, recognizing, and connecting facts and concepts. The development of learning media should comply with the VISUALS principles (Visible, Interesting, Simple, Useful, Accurate, Legitimate, Structured) in systematic planning for media use (Tejo Nurseto, 2011). Levie & Lentz (1982) in Kustandi & Sutjipto (2011) suggest four functions of learning media, especially visual media, namely attention function, affective function, cognitive function and compensatory function. The attention function is the core, which is to attract and direct students' attention to concentrate on the content of the lesson. Affective function can be seen from the level of enjoyment of students when learning to use media. Cognitive functions can be seen from student's understanding to remember information through the visual stage. The compensatory function is to accommodate students who are weak and slow to accept and understand the content of the lessons presented in text or verbally. Furthermore, Montessori (2002) states that there are 4 characteristics of learning media, namely:

a. Auto-education

Learning media are made with attention to independence so that they are independent in using these tools. Learning media is adapted to the child's level of development so that children do not have difficulty how to use it

b. Auto-correction

Montessori learning media is made by paying attention to error controllers so that students know the mistakes that have been made in using learning media without any direction from the teacher.

c. Interesting

Montessori learning media is made by paying attention to the beauty in it, so that students are interested in learning.

d. Graded

Montessori learning media are made by paying attention to gradations. There are two types of gradations, namely age gradations and gradations of rational stimuli. The age gradation can be seen from the use of media for the previous grade level and the next grade level. The gradation of rational stimuli can be seen in the use of media that involves several senses.

According to Nandi (2006) learning media must increase learner's motivation. The use of media has the aim of providing motivation to students, besides that the media must also stimulate students to remember what they have learned. Lillard (2005) states that the characteristics of learning media must also be contextually close to the student environment. Based on the four characteristics of learning media from Montessori and Lillard used in this study.

Hartariani, et al (2016) in class D2 SLB C Negeri Singaraja in their research found that the constraints in the learning process of mathematics for mentally retarded students are due to the limited availability of media so that students are less active in the learning process, low mastery of concepts and children's understanding. The development of 3-dimensional media can make students more interested because of the varied colors and shapes that are more concrete in

learning. Ni Wayan Sukerti (2016) conducted a research at SMPLB-C Harmoni Gedangan obtained results that students who have below average intelligence experience difficulty remembering, are difficult to think abstractly and have difficulty concentrating so some learning process must be related to concrete objects which is understood by mentally retarded students easily.

Based on the results of research by researchers on students with intellectual disabilities SLB Pelita Hati Pekanbaru in the odd semester of the 2019/2020 academic year on the material introduction to Numbers and Number operations, the results show that the teacher only uses fingers as a medium in teaching about operations on numbers. The teacher only introduces the addition and subtraction operations on positive integers whose operation results are also positive integers. The teacher does not introduce operations on two numbers that produce negative integers. The teacher does not introduce negative integers, positive and negative integer operations or operations on negative numbers with negatives. According to the teacher, negative integers are not taught because it is very difficult to explain to mentally retarded students. The researcher also asks whether in the syllabus there is no negative number material. The teacher gives answers for the mentally retarded junior and senior high school students should be given a book. The researcher also asked other than the fingers used, what media had been used by the teacher in teaching number operations material. The teacher replied that there was an abacus whose number was 100 that was not used. The researcher continues the question with the teacher. Abacus is also for positive numbers, right? The teacher gave the answer, yes, this is a thump, we feel that our media is very inadequate and we are also here that there are no teachers who have graduated from the mathematics department. Elementary, junior high and high school students with mental retardation in our schools join in one class. We are not here looking for materials that can be combined and accepted at the same time for elementary, middle and high school students. We ask for a book, because your mother is a Mathematics lecturer, if you want to make us a media that we can use to make it easier for our students to receive subject matter, especially mathematics. In addition to numbers, researchers also asked for information about geometric material, especially about flat and space shapes. Based on information from the SLB Pelita Hati Pekanbaru teacher, the teacher only introduced the building blocks of blocks and cubes, the Prisma room, pyramid and others were not introduced. The introduction made by the teacher only uses examples of boxes that resemble blocks and cubes. For example, toothpaste wrapping boxes, food boxes, and chalk boxes. The researcher also asked whether there were some introduced which angles, edges and sides. The teacher gave the answer only briefly, not in detail. The teacher uses a teaching aid in the form of a drinking straw which is cut into small pieces to make it easier to count. The straw media used by the teacher is only limited to operations on numbers that produce positive numbers. The weakness of the media used is not introducing negative numbers. Junior high school students should have introduced negative numbers and their operations. From the results of interviews with teachers of SMPLB Negeri Pembina Pekanbaru in teaching space building materials, the teacher used the cube framework provided by the school. The school beam frame does not have. The results of the researchers' interviews with several mentally retarded students

from SLB Pelita Hati and SLB Negeri Pembina Pekanbaru about their understanding of mathematics. In general, mentally retarded students from the two schools said that they had difficulty understanding mathematics and could only count 1 to 10. Students also had difficulty distinguishing angles, edges and planes in blocks and cubes. This was proven when the researcher asked the students to indicate which angles, edges and sides (planes) on the block and the cube they just pointed at.

Based on the results of these observations and interviews, the researcher views the need for assistive media in teaching mathematics to mentally retarded students, especially in the material of Numbers and Space Building. For this reason, researchers are interested in trying to research the development of learning media for Ceker and Build Space in the material of numbers and building blocks and cubes for mentally retarded students.

The formulation of the problem in this study is whether the Ceker learning media on Numbers and Space Building material on blocks and cubes material for mentally retarded students at SMPLB Pekanbaru meet the valid and practical criteria?

This study aims to produce Ceker learning media on Numbers and Space Building materials on blocks and cubes for mild mentally retarded students at SMPLB Pekanbaru that meet valid and practical criteria.

This research is expected to contribute to (1) Students: a. Learning using the learning media Checker and Build Space is expected to foster a learning atmosphere that is fun, effective and efficient, b. Encouraging students to be able to learn independently and to help improve students' understanding of mental retardation, especially in learning to count about number operations and to recognize cubes and cubes, (2) For teachers: a. Helping teachers in delivering subject matter more effectively and as input to broaden knowledge and insights for teachers about learning media, so that it can be an alternative learning media in an effort to improve the ability of mentally retarded students in number operations and to recognize spatial structures, especially blocks and cubes. , b. Helping teachers to overcome barriers to learning activities in the form of lack of materials or teaching aids as teaching equipment, (3) For schools: Can improve educational services and can create an accommodating learning environment for students with special needs, especially mental retardation, (4) For Researchers (Lecturers) : a. Adding insights and knowledge about education that is right for children with special needs, especially mental retardation and becomes a study material to provide assistance to special school teachers in developing learning strategies and learning media that can foster active participation of mentally retarded students in learning mathematics in subsequent research, b. Can develop the ability of lecturers in preparing teaching materials for students with special needs, c. Can develop lecturers' insights in implementing and developing one of the Three Pillars of Higher Education, namely writing scientific papers.

2. Methodology

This development research refers to the Borg & Gall development model. The stage carried out in this research is only up to the product trial stage. The first stage is the stage of potential and problems in developing learning media carried out by conducting observations and interviews at Pelita Hati Pekanbaru and the Pembina Pekanbaru Special School. The second stage is the information gathering stage, which is used as a prototype design material, so that it is expected to be able to overcome the problems that exist in mentally retarded students in learning mathematics. The third stage is product design, which is to assess the learning media so that its strengths and weaknesses are known. In the fourth stage, the designed validation stage, is the process of assessing the product design rationally. Design validation was carried out by two expert lecturers and one mentally retarded teacher. The fifth stage of Design Revision, the results of the validation are then analyzed and revised according to the validator's suggestions. The sixth stage is product testing conducted on three mentally retarded students.

The data analysis technique in this research is quantitative data analysis technique which consists of data analysis from the validation by the validator and data analysis from the response questionnaire. The criteria for the validity of learning media can be seen in Table 1.

Table 1. The Percentage of Product Validity Score Assessment

| No. | Rating Rate (in percent) | Criterion Valid |
|-----|--------------------------|-----------------------------------|
| 1 | $80 < x \leq 100$ | Very Valid (no need for revision) |
| 2 | $60 < x \leq 80$ | Valid (no need for revision) |
| 3 | $40 < x \leq 60$ | Less Valid (revised) |
| 4 | $20 < x \leq 40$ | Invalid (revised) |
| 5 | $0 < x \leq 20$ | Very Invalid (revised) |

Source: Sugiyono, 2017

Note: X: Assessment percentage

Learning media is said to be valid if the value is more than 60%.

The criteria for practicality of learning media can be seen in Table 2 .

Table 2. Percentage of Product Practicality Score Assessment

| No. | Rating Level | Practical Criteria |
|-----|----------------------|---------------------------------------|
| 1 | $80 < x \leq 100 \%$ | Very Practical (no need for revision) |
| 2 | $60 < x \leq 80 \%$ | Practical (no need for revision) |
| 3 | $40 < x \leq 60 \%$ | Less Practical (revised) |
| 4 | $20 < x \leq 40 \%$ | Not Practical (revised) |
| 5 | $0 < x \leq 20 \%$ | Very Impractical (revised) |

Source: Sugiyono, 2017

Note: X: Assessment percentage

Learning media is said to be practical if the assessment is more than 60%.

3. Results and Discussion

This research is a development research that aims to produce products in the form of Checker and Build Space media. The development of Ceker and Bangun Ruang media products is equipped with a manual for using media on integers, blocks and cubes for students with mild mental retardation in SMPLB. This study uses the Borg and Gall model with six stages, namely potential and problems, gathering information, product design, design validation, design revision and product testing.

Development research in this study uses 7 steps from the development research of Borg and Gall as follows

Potential and Problem Stage

The potential which is found in this study is the lack of media facilities available in the mathematics learning process. The problem that was found was that there were still many mentally retarded students who had difficulty understanding the material in mathematics learning, especially the material on numbers and shapes. Researchers collected information by making observations and interviews

Information Gathering Stage

Researchers collect information by making observations and interviews. Observations were made twice during mathematics learning, namely once at Pelita Hati High School and one at Pembina High School. The conclusion from the results of observations and interviews can be concluded that there are still many students who have difficulty understanding the integer material and spatial structures described by the teacher because mentally retarded students have difficulty concentrating and have difficulty communicating so that most of these students daydream during the learning process.

Product Design Stage

Researchers develop checker card media and building media, namely blocks and cubes. In this product design, it begins with making initial sketches using images and determining the colour of the design using Microsoft Word. The checker card media design uses a 2-color version of the Rigid PVC plastic folder Namely red and blue. The design of the block and cube frame uses acrylic which is affixed with yellow lights to show the dots on the block and the cube is also blue to show the part of the line on the block and cube. Researchers also added a tool in the form of plastic mica which is used to show parts of the plane on the blocks and cubes. Switch 1 on the media is used to turn on yellow lights, switch 2 is used to turn on blue lights, and switch 3 is used to turn on yellow and blue lights at the same time. Colour selection adapted to attractive and bright colour. The combination of bright colours was chosen with the aim of distinguishing points, lines, and planes on the blocks and cubes. The design of the manual for using

claw card media and building learning spaces was designed using Microsoft Word.

Design Validation Stage

Validation of the media design for checker cards and building spaces was carried out by providing validation sheets to 3 validators, namely 2 mathematics education lecturers and one special school teacher. In the design validation stage, the media for building space was validated by two mathematics education lecturers at Raja Ali Haji Maritime University and one SMPLB mentally retarded teacher. In the media check, it is validated by two lecturers of the Mathematics Education Study Program, FKIP Riau Islamic University and one teacher of SMPLB Pelita Hati Pekanbaru Validation is carried out in order to assess the feasibility of learning media when tested. The results of the validation from the validator regarding the checker media and space structures can be seen in Tables 3 and 4 below.

Table 3. Results of Checker Media Validation

| Indicator | Validator | | | Average |
|------------------------|------------------|------------|------------|----------------|
| | 1 | 2 | 3 | |
| <i>Auto-education</i> | 3 | 3 | 3 | 3 |
| <i>Auto-correction</i> | 3 | 3 | 3 | 3 |
| Interesting | 2 | 2 | 3 | 2.33 |
| Graded | 3 | 2 | 3 | 2.67 |
| Contextual | 3 | 3 | 3 | 3 |
| amount | 14 | 13 | 15 | 2.8 |
| Percentage | 93.3 | 86.6 | 100 | 93.3 |
| Criteria | Very Valid | Very Valid | Very Valid | |

Furthermore, the results of the validation of the Building Space learning media are shown by 3 validators in Table 4 below

Table 4. Validation Results of Build Space Media

| Indicator | Validator | | | Average |
|------------------------|------------------|------------|------------|----------------|
| | 1 | 2 | 3 | |
| <i>Auto-education</i> | 3 | 2 | 3 | 2.67 |
| <i>Auto-correction</i> | 3 | 2 | 3 | 2.67 |
| Interesting | 3 | 3 | 3 | 3 |
| Graded | 3 | 3 | 3 | 3 |
| Contextual | 3 | 2 | 3 | 2.67 |
| Amount | 15 | 12 | 15 | 2.8 |
| Percentage | 100 | 80 | 100 | 93.3 |
| Criteria | Very Valid | Very Valid | Very Valid | |

Based on Tables 3 and 4, the learning media of checkers and building spaces that have been validated by 3 validators are very valid with a percentage of 93.3 and suitable for use by schools.

Design Revision Stage

At the design revision stage, the researcher obtained comments and suggestions by the validator to improve the manual for using claw media and build space. In claw media, it is recommended not only with a rectangular shape but also it can be in the form of images of stars, butterflies and others, while in the shape of the space it is recommended to divide the line into two, namely horizontal lines and vertical lines.

Product Trial Stage

The researcher conducted product trials on two mentally retarded students at Pelita Hati High School and one mentally retarded student at SMPLB Pembina. The trial was carried out outside school hours due to the Covid-19 pandemic so that researchers went directly to the student's residence in conducting product trials. After students finish using the learning media, the researcher then reads the questions contained in the student response questionnaire sheet. The results of student responses indicate that the product developed has met the practical criteria with an average percentage of 100%.

4. Conclusion

This development of the research has produced a product of Ceker media and Build Space Blocks and Cubes along with a manual for using the media. Based on the results of the research and discussion, it was concluded that the learning media of Ceker and building spaces (blocks and cubes) for mild mental retardation students of SMPLB have met the criteria of being very valid and very practical.

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How to cite this article:

Heleni, S., Zulkarnain., & Afriliziana, L. A.,. (2021). Development of Ceker Media and Space Building for Light Mild Mental Retardation Students of SMPLB Pekanbaru. *Journal of Educational Sciences*, 5(2), 383-392.