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CUISENAIRE LEARNING MEDIA FOR ADDING, SUBTRACTING, MULTIPLYING, AND DIVIDING INTEGERS

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Abstract:
This study aims to describe the manufacture and use of Cuisenaire rod learning media for understanding the concepts of addition, subtraction, multiplication, and division of integers for elementary school students. The research method used is literature study, which is a series of activities related to the methods of collecting library data, reading and recording, and processing research materials. This research uses a qualitative approach. Data sources and research results in library research in the form of a description. Data sources are bibliographic or come from various literature, including books, journals, newspapers, personal documents, etc. The research results are that the utilization of Cuisenaire rod media is more optimized on learning in elementary schools, especially in addition, subtraction, multiplication, and division of integers because Cuisenaire rod media can help understand and can concrete the concept of numbers. In addition, it can be used as reference material for research on learning addition, subtraction, multiplication, and division of integers by utilizing different learning media.

Keywords: Cuisenaire Rod, Addition, Subtraction, Multiplication, Division

MEDIA PEMBELAJARAN CUISENAIRE UNTUK PEMAMAHAN KONSEP PENJUMALAHAN, PENGURANGAN, PERKALIAN, DAN PEMBAGIAN BILANGAN BULAT

Abstrak:
Penelitian ini bertujuan untuk mendeskripsikan pembuatan dan manfaat media pembelajaran batang Cuisenaire untuk pemahaman konsep operasi penjumlahan, pengurangan, perkalian, dan pembagian bilangan bulat bagi siswa sekolah dasar. Metode penelitian yang digunakan adalah studi kepustakaan yaitu serangkaian kegiatan yang berkenaan dengan metode pengumpulan data pustaka, membaca dan mencatat serta mengolah bahan penelitian. Penelitian ini menggunakan pendekatan kualitatif. Sumber data maupun hasil penelitian dalam penelitian kepustakaan (*library research*) berupa deskripsi kata-kata. Sumber data bersifat kepustakaan atau berasal dari berbagai literatur, di antaranya buku, jurnal, surat kabar, dokumen pribadi, dan lain sebagainya. Hasil penelitian yaitu media batang Cuisenaire lebih dioptimalkan pemanfaatannya dalam pembelajaran di sekolah dasar terutama pada materi

penjumlahan, pengurangan, perkalian, dan penjumlahan bilangan bulat karena media batang Cuisenaire dapat membantu pemahaman dan dapat mengkongkritkan konsep bilangan. Selain itu, dapat digunakan sebagai bahan rujukan untuk melakukan penelitian tentang pembelajaran pada materi penjumlahan, pengurangan, perkalian, dan penjumlahan bilangan bulat dengan memanfaatkan media pembelajaran yang berbeda.

Kata Kunci: Batang Cuisenaire, Penjumalahan, Pengurangan, Perkalian, Pembagian

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INTRODUCTION

In the teaching and learning process, there are two essential elements. They are the teaching method and learning media. As we know, there are many kinds of learning media. Consequently, an educator must be able to choose suitable media in accordance with the material to be taught. Through the use of media when the learning process takes place to realize an effective and efficient learning process. Mathematics is a tool for developing ways of thinking. Mathematics is also an abstract object, so that an intermediary is needed to be understood by students' concrete thinking. One of the intermediaries is learning media.

Mathematics is concerned with structured ideas whose relationships are arranged logically. Although there is nothing singular about mathematics, we can know its nature. According to Arifin in Purwasih and Fahmi (2021), the study object of mathematics has been known, that it can also be recognized how to think about mathematics. Media selection is made when educators make teaching aids easier for students in teaching and learning activities. The more technological science develops, the more and more creative media will be developed. Therefore, media selection must be following predetermined principles, such as having goals that are in accordance with the nature and characteristics of the media to be used (Astriani, 2018; Miarso, 2009).

The use of media in learning helps students understand learning material and causes students to be happier and more enthusiastic. This mental process helps generate learning motivation, making students put more effort when they encounter various problems in the learning process. The use of this media

certainly helps teachers transform knowledge to their students. Teaching and learning activities that give birth to the interaction of human elements are a process to achieve teaching and education goals. That way, a teacher should meet educational goals, namely creative in applying and processing instructional media, where the media and learning methods greatly affect students' cognitive thinking skills and learning.

In learning mathematics, learning media helps stimulate student motivation to learn and makes it easier to understand teaching material (Nurrita, 2018). The use of media in learning not only helps students understand learning material. The use of media but also causes students to be happier and more motivated. Motivation in individuals consists of intrinsic motivation and extrinsic motivation. Through this learning media, extrinsic motivation can be touched and motivates students to learn to achieve learning objectives. The use of instructional media certainly helps teachers transform knowledge to their students. In order for the teaching and learning process to be successful, students should be invited to take advantage of all the sensory organs. The teacher tries to display stimulus that can be processed by various senses. The more sensory organs are used to receive and process the information, the information will be able to survive and be stored in memory. According to Hamalik in Arsyad (2009), the use of media in the learning process can generate new desires and interests, create motivation and stimulation of learning activities, and even have a psychological influence on students.

The Cuisenaire rod media is a block type used to develop mathematical intelligence skills, counting, recognizing number symbols, increasing reasoning skills, adding and subtracting numbers. George Cuisenaire created the Cuisenaire block. Cuisenaire rods can be used for media and teaching aids in learning arithmetic for Elementary School students. George Cuisenaire is a character from Belgium who created the Cuisenaire rod props. The Cuisenaire rod is used to help children learn math about the concepts of addition, subtraction, division, and multiplication of integers and fractions. Cuisenaire stalks come in 10 different stalk colors. Cuisenaire rod is one of the learning media in the form of blocks that have different lengths and colors (Sundayana, 2014; Widyastuti, 2020).

Based on the above introduction, the purpose of this study is to describe the creation and benefits of Cuisenaire rod learning media for understanding the concept of addition, subtraction, multiplication, and division of integers for elementary school students.

METHODS

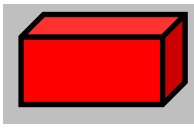
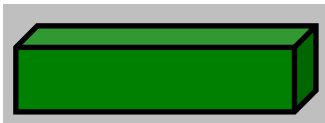
The research method used is a literature study. The literature study is a series of activities related to collecting library data, reading and taking notes, and processing research materials (Mestika, 2008; Sari & Asmendri, 2020). This research uses a qualitative approach. Because the data source and research results in library research are in the form of descriptions of words. Data sources are bibliographic or come from various literature, including books, journals, newspapers, personal documents, etc. The stages that the author must take in library research include: Collecting research materials in the form of information or empirical data from books, journals, official and scientific research reports, and other literature that supports the theme of this research; Reading bibliography to dig in-depth reading material that allows you to find new ideas related to the research title; Make research notes to conclude in a report form; Processing research notes to get a conclusion that is compiled in the form of a research report.

RESULTS AND DISCUSSION

1. The Meaning of Cuisenarie Learning Media

George Cuisenaire is a character from Belgium who created the Cuisenaire rod props. The Cuisenaire rod is used to help children learn math about the concepts of addition, subtraction, division, and multiplication of integers and fractions. Cuisenaire stalks come in 10 different stalk colors. Cuisenaire rod is one of the learning media in the form of blocks that have different lengths and colors (Sundayana, 2014). Cuisenaire learning media have a characteristic that is the media that comes from wood in the form of blocks that have different sizes on each of these blocks. Apart from various sizes, this media also has a different color for each size. According to Walle & John (2006), the Cuisenaire stem media can also be used in teaching lengths and has various colors to represent each number. The principle used by the Cuisenaire rod in counting operations is measurement. Those Cuisenaire stems look like the following.

Table 1. Colors for Cuisenaire Stems

	Size 1 x 1 x 1 (unit) white color
	Size 1 x 1 x 2 (unit) red color
	Size 1 x 1 x 3 (unit) light green color
	Size 1 x 1 x 4 (unit) purple color
	Size 1 x 1 x 5 (unit) dark yellow color
	Size 1 x 1 x 6 (unit) dark green color
	Size 1 x 1 x 7 (unit) black color
	Size 1 x 1 x 8 (unit) dark brown color
	Size 1 x 1 x 9 (unit) blue color
	Size 1 x 1 x 10 (unit) orange color

Source: Ruseffendi (1998)

In general, the Cuisenaire stems are useful for (1) apply a place value, (2) shows arithmetic operations and their properties, (3) cultivate mathematical understanding skills, (4) cultivate artistic talent, (5) shows the concept of long eternity. In addition, some of the benefits of Cuisenaire stems, as suggested by Runtukahu and Kandou (2014), by manipulating the Cuisenaire stems students can: (1) counting without understanding, (2) counting one-on-one, (3) counting

using simple rhymes in which there are numbers, (4) uses the Cuisenaire rod liberally by creating geometric shapes, such as squares, Specify addition and subtraction.

1. How to make the Cuisenaire rod props
   Tools and materials: Wood, Wood paint (Black, White, Red, Blue, and Yellow), Hamplas, Pencil, Ruler, Sugu machine, and Chainsaw.
2. Ways of making
   a. Prepare 10 albasiyah logs measuring 1 meter;
   b. Cut the wood into 10 smaller pieces of different sizes according to the color. The shortest length of wood is 8 cm long and 4 cm high and wide, and the longest is 80 cm long and 4 cm high and wide. The wood size from smallest to largest is a multiple of 8.
      -Wood number 1 = 8 cm
      -Wood number 2 = 16 cm
      -Wood number 3 = 24 cm, etc.
   c. After the wood is cut into smaller pieces, grind the wood using a grinder (sugu).
   d. After coarsely grinding it, grind it back with sandpaper so that the wood becomes smoother.
   e. Then, paint the 10 stems of wood using different colors.
   f. Then dry the wood that has been painted.
   g. Then number 1-10 using paper that is given a clear solution according to the size of the wood, as shown below in figure 1.

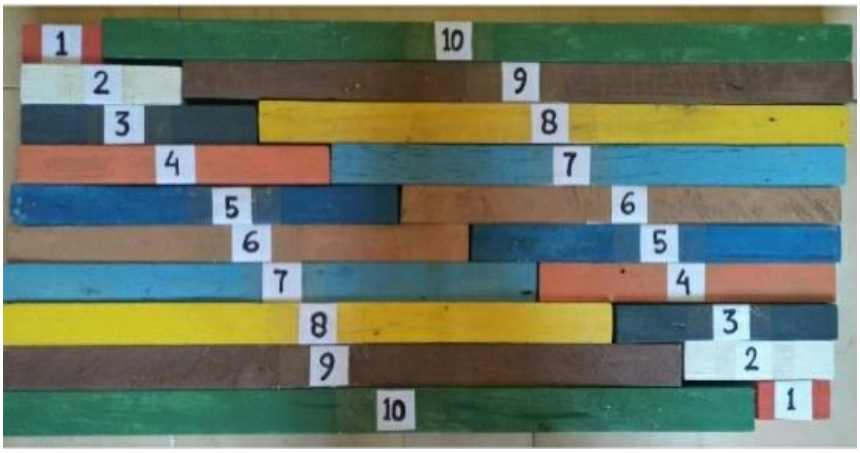


Figure 1. Cuisenaire Learning Media

3. Addition and Subtraction Operations for Integers Using the Cuisenaire Rod Trainer

a. Addition and Subtraction Operations

example: 2 + 4

Take one red stem. Then take a purple stem. Place the two rods next to the other one so that it fits perfectly into the two rods. It turns out that the stem that can coincide exactly with the two rods is a dark green stem. The length of the dark green stem is six units. Look at the following figure 2 below.

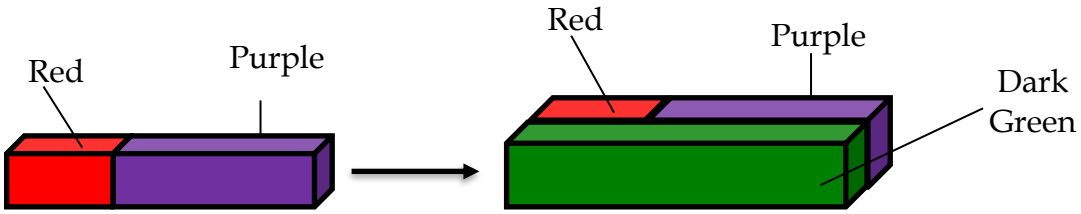


Figure 2. Showing the Cuisenaire Rod Prop for Addition

Subtraction

Find the result of 8 - 3 = …….

How:

Take a stem that is brown (8 units). Then take a light green stem (3 units) and attach it to the side of the dark brown stem exactly to one end of it. Then find a stem of another color that fits to cover the empty space. The suitable stem to cover is dark yellow or five units. Look at the following figure 3 below.

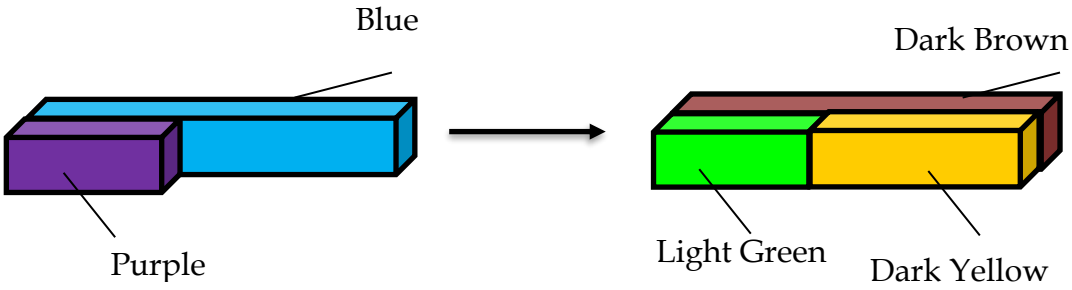


Figure 3. Cuisenaire Learning Media for Subtraction

b. Multiplication and Division Operations

Multiplication

Suppose we are going to show that 4 x 3 is 12.

Multiplication is a repeated addition, so 4 x 3 = 3 + 3 +3 +3

How:

Take 4 stems that are three units long each (light green color). Place the three units of light green stems at the ends.

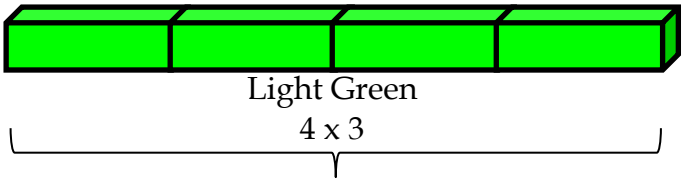


Figure 4. Multiplication Cuisenaire

Find a stem that is just the right length to cover the stem at the top. It turns out that the suitable stems are the orange stem (10 units) and the red stem (2 units). There may be other alternative solutions that students find. Suppose two dark green stems (6 units) or six red stems (2 units).

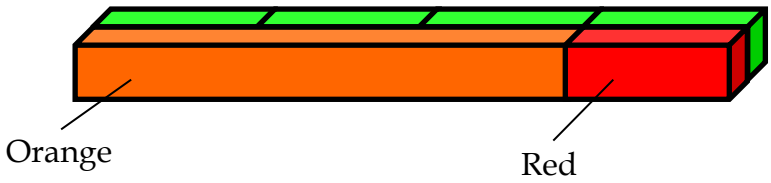


Figure 5. Alternative Solutions

Figure 6 showing the Cuisenaire Rod prop for multiplication using a two-dimensional image as follows.

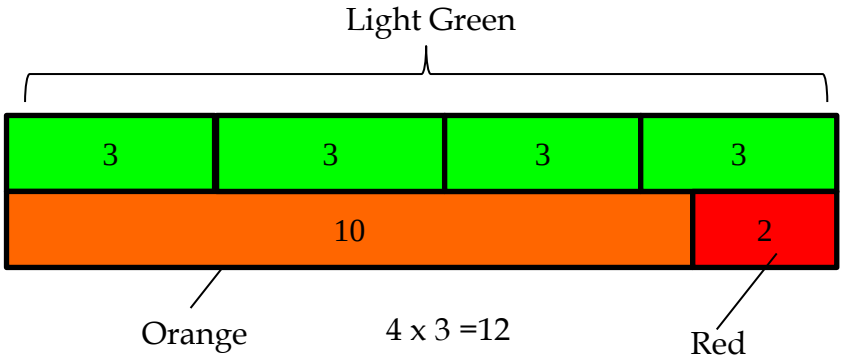


Figure 6. Multiplication Using a Two-Dimensional

Division

Suppose define the quotient of 10 : 2 = ……

To solve 10 : 2 is as follows.

Division can be interpreted as repeated subtraction so that the number divided by the divisor becomes zero. Take a Cuisenaire stem that is orange color (10 units). Then place on the side a couple of Cuisenaire stems of 2 pieces that exactly cover the orange stem. Because it takes five red stems, the size of 2 units that can fit the orange stem, so the result of 10 : 2 is 5.

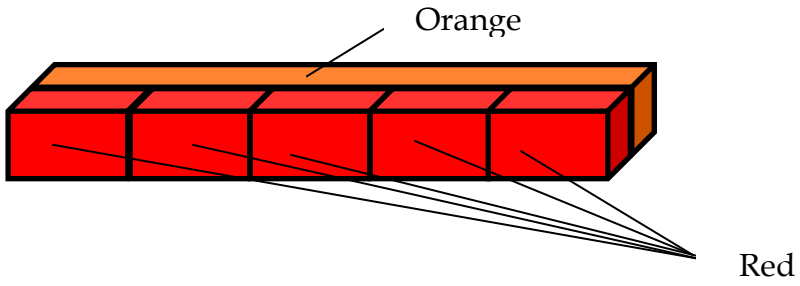
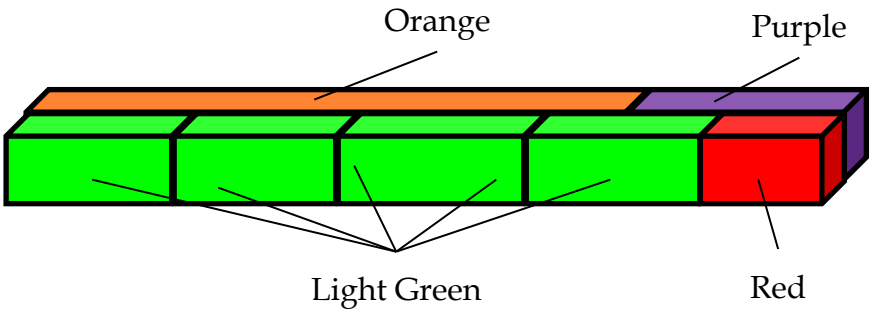


Figure 7. Divisioan Cuisenaire

Let the quotient of 14 : 3 = ……

Install 10 units and 4 units of Cuisenaire stems. Then take several Cuisenaire stems of 3 units to cover the sides of the Cuisenaire stems of 14 units. Look at the following figure 8 below.



Light Green 14 : 3 = 4 remaining 2

Figure 8. Cuisenaire Learning Media for Dividing

Cuisenaire stems of 14 require four light green stems (3 units) and still have some left over to cover. The remaining stems are properly covered by one red stem (2 units). Cuisenaire stems with various lengths and colors will help teachers in the learning process of addition, subtraction, multiplication, and division in elementary schools, especially in low grades (Komariyah, 2017). In addition, the Cuisenaire stem also has many functions. Apart from addition and subtraction media, it can also explore students' creativity in learning mathematics, such as composing it into geometric shapes and developing

students' language and reasoning abilities. In addition, the learning process using the Cuisenaire stem media can create an active and fun learning atmosphere for students. This is based on the theory of Bruner (Suherman, 2013), which states that there are three stages of the child's learning process in the formation of mathematical concepts. The three stages in the learning process are: (a) Enactive Stage, at this stage, the students learn mathematics using something "concrete" or "Real", which means it can be observed using the five senses; (b) The iconic stage, students can learn knowledge in the form of pictures or diagrams as a manifestation of activities that use concrete or real objects; 3) Symbolic stage, the stage where the knowledge is manifested in the form of abstract symbols. Other research also says that media utilization Cuisenaire in classroom action research. This is due to applying a more effective learning model, reward, and motivation to every effort made. Students are proven to be able to grow their confidence in answering the questions that have been given (Permana et al., 2016). In addition, Astuti (2018) stated that Cuisenaire learning media is created to develop children's numeracy skills, number recognition and improve children's reasoning skills.

CONCLUSION

Stem Cuisenaire is a set of block-shaped rods that have different colors and lengths. The color and length of each block represent numbers 1 to 10. The use of props Cuisenaire rods is very precise in learning mathematics, especially regarding understanding the concept of multiplication counting operations. This is because, in the use of the Cuisenaire rod, students are directly involved how the result of the process of multiplication operations through concrete props. Cuisenaire rod media is more optimized in elementary schools, especially in addition, subtraction, multiplication, and division of integers, because it can help understand and concretize number concepts. In addition, it can be used as reference material for conducting research on learning in addition, subtraction, multiplication, and division of integers by utilizing different learning media.

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