

## Research Article

# Development of Motion Graphics Video Based on CPA Approach to Enhance Elementary Students' Mathematical Creative Thinking Ability

Hafiziani Eka Putri\*, Fitri Nuraeni, Aisyah Herlina Arrum, Cahya Karisma Pertiwi, Rifa Nurhanifa, Hayani Wulandari

Elementary Teacher Education Study Program, Universitas Pendidikan Indonesia, Purwakarta Campus, Jl. Veteran No. 8, Purwakarta 41115, Indonesia

**ORCID**

Hafiziani Eka Putri: <https://orcid.org/0000-0002-1325-1306>

**Abstract.**

It is important to develop the creative thinking ability of elementary school students so they can tackle the challenges of today's world. This skill can be enhanced through learning activities at school, particularly in subjects like mathematics. This study aimed to create motion graphics video teaching materials based on the CPA approach to help improve students' creative thinking abilities. The 4-D model was used to develop these materials, which involves defining, designing, developing, and disseminating the materials. The experts used teaching materials assessment sheets and test items to evaluate the effectiveness of the materials. The results showed that mathematics teaching materials using motion graphics video teaching based on the CPA approach were successful in improving students' creative thinking skills. These teaching materials can be used in elementary mathematics education and for further research purposes.

**Keywords:** CPA approach, mathematical creative thinking ability, motion graphics video.

## 1. INTRODUCTION

The ability to think creatively is one of the 21st century's most-needed skills. Mastery of creative thinking skills can help students solve mathematical problems and daily life problems [1, 2]. Nevertheless, students' mathematical creative thinking skills in elementary schools are still low [3, 4]. The factors causing the low mathematical creative thinking ability include inappropriate learning approaches during the teaching and learning process.

The teacher's teaching methods tend to be monotonous and overly impose their way of thinking. As a result, students are passive, only imitating what the teacher does without understanding its meaning [5]. Therefore, it is necessary to have learning

Corresponding Author: Hafiziani Eka Putri; email: hafizianiekaputri@upi.edu

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activities that encourage students to improve their mathematical creative thinking skills. Efforts to improve the learning process are selecting appropriate and innovative learning approaches that align with the needs in mathematics learning.

One alternative to overcome students' low mathematical creative thinking skills in mathematics learning is using the Concrete Pictorial Abstract (CPA) approach. The Concrete Pictorial Abstract (CPA) approach consists of three stages of learning, including (1) physical manipulation of concrete objects, (2) pictorial representation of concrete manipulation, and (3) solving problems using abstract notation [6–8]. This approach is considered following the cognitive development of students who are still at the concrete operational stage.

Previous research results concluded that the CPA approach improved multiple mathematical abilities, including the Mathematical Creative Thinking Ability [8, 9]. Earlier in 2020, the Corona Virus Disease (Covid-19) pandemic is sweeping the world, including Indonesia. This pandemic resulted in how learning occurs, where learning activities that were previously carried out offline are now being carried out online. For this reason, the preparation of interactive multimedia-aided teaching materials can be used as an option in the online application of the CPA approach to learning mathematics in primary schools. One alternative learning media includes the use of interactive multimedia in the form of motion graphics video. The use of this interactive multimedia aims to assist students in distance learning. The presentation of media in the form of a collection of animated images attracts students' attention in increasing learning motivation that is carried out online. Motion Graphic Video can also train children's creativity in the learning process [10].

Based on the background described, this study aims to develop mathematics teaching materials using motion graphic video based on the CPA approach to improve elementary school students' mathematical creative thinking ability.

## 2. RESEARCH METHOD

This research focuses on developing mathematics teaching materials in motion graphics video based on the CPA approach as a medium to improve mathematical creative thinking ability for elementary school students. This research use research and development (R&D) method. The samples in this study were 44 students of second grade in two different public elementary schools in Purwakarta. The sampling technique was carried out using the purposive sampling technique. In developing mathematics teaching materials, the research procedure used is the 4-D model developed by Thiagarajan et al. [11].

The 4-D development model includes four stages. The first stage is Define to determine the teaching materials made based on preliminary analysis, student characteristic analysis, material structure analysis and mathematics assignments, and indicator analysis of creative thinking abilities. The second stage is Design, which is designing the learning device. The third stage is Develop, to develop teaching materials following the design that has been created in the second stage. An expert judgment is also carried out at this stage to make improvements and refinements before testing teaching materials. The last stage, namely Disseminate, is sharing whole number math material using motion graphic video.

### 3. RESULTS AND DISCUSSION

#### 3.1. Result

The results of this study will be reviewed through 4 stages in development research. The stages of the research are described as follows.

#### 3.2. Result of The Design Stage

At the define stage, focus group discussions are carried out to define mathematics teaching materials that will be developed based on indicators of mathematical creative thinking abilities. This stage generated analysis that includes: 1) characteristics of elementary school students in Purwakarta regency; 2) mathematics curriculum in elementary schools; and 3) characteristics of teaching materials that are in line with the indicators of mathematical creative thinking abilities. First, through observing students and interviews with students, teachers, and parents, the characteristics of the students are identified. It is known that during the implementation of online learning during the Covid-19 pandemic, elementary school students in Purwakarta prefer to watch YouTube videos and play games using Android instead of reading subject matter in textbooks. As [12] research states, based on observations, students who have smartphones are only used to playing social media and playing games. Not many students are looking for references to learn material outside of the material provided by the teacher. Moreover, students are rarely asked to answer questions containing indicators of mathematical creative thinking abilities during the lesson.

Second, curriculum analysis in mathematics subjects shows that all mathematics topics in elementary schools can train students' mathematical creative thinking skills,

i.e., whole number counting operations in lower elementary. Third, regarding the indicators of mathematical creative thinking skills, the teaching materials must contain real problems in everyday life, containing questions that will enhance students' mathematical creative thinking skills and provide meaningful learning activities and problem exercises. As by research [13] which states that questions that are linked to everyday life aim to improve problem-solving skills and provide meaningful learning for students.

### 3.3. Result of the Design Stage

The second stage is design. This stage is the design stage of the 4-D development procedure [14]. At the design stage, discussions were held to design the content of the lesson and its delivery. These teaching materials and content delivery are designed to utilize Video Motion Graphic based on the CPA approach. The topic's content is reflected in the lesson plan, Motion Graphic Video, and student worksheets. Figure 2 presents a scene in motion graphic video, while Figure ?? presents a part of students' worksheets. to see the complete version of the lesson plan, motion graphic video, and students' worksheet, please visit YouTube Channel: CPA Approach edu.



**Figure 1:** A scene in motion graphic video.

### 3.4. Result of the Develop Stage

At the develop stage, consultation and improvement of teaching materials are carried out with experts. The initial product design is validated before testing [15]. Data on validation of teaching materials in whole number operations for lower elementary

**LEMBAR KERJA PESERTA DIDIK KELAS EKSPERIMEN 3**

- Nama :  
 Kelas :  
 Nama sekolah :  
 Petunjuk pengerjaan :  
 1. Baca dengan teliti lembar kerja yang diterima.  
 2. Tuliskan nama lengkap.  
 3. Ikuti petunjuk yang diberikan.  
 4. Tanyakan pada guru apabila ada hal yang kurang jelas.

**Perkalian Bilangan Cacah**

**Part 1**

**Concrete**

Coba tonton video dengan mengklik tautan di bawah ini: <https://youtu.be/hYHGLtasY4s>

Setelah menonton video pada tautan tersebut jawablah pertanyaan di bawah ini.

1. Kemanakah Rara pergi?
2. Sayuran apa saja kah yang tersedia di toko tersebut?
3. Berapakah uang yang dibawa oleh Rara?

**Pictorial**

Coba tonton kembali video pada tautan yang sudah diberikan di awal pembelajaran atau klik

tautan di bawah ini: <https://youtu.be/hYHGLtasY4s>

4. Dari video tersebut gambarkan bentuk dari masing-masing sayuran yang tersedia.

5. Jika 1 kg kol bulat digambarkan dengan bentuk dan warna



- Jika 1 kg jagung digambarkan dengan bentuk dan warna



- Jika 1 kg kentang digambarkan dengan bentuk dan warna



- Jika 1 kg tomat digambarkan dengan bentuk dan warna



Gambarkan sayuran pada kemasan dengan bentuk dan warna yang sesuai petunjuk di atas!

**Abstract**

Coba tonton kembali video pada tautan yang sudah diberikan di awal pembelajaran atau klik

tautan di bawah ini: <https://youtu.be/hYHGLtasY4s>

Kemudian, jawablah pertanyaan di bawah ini!

**Figure 2:** Sample of students' worksheets..

students (grade 2) are generated at this stage. The following are the results of teaching materials validation by the experts.

Based on the expert's validation above, the quality of the teaching materials developed meets the standards for use by improving some parts as suggested. This finding follows Arikunto's assertion [16] that expert validation is achieved when the instrument is appropriately built based on current theories and provisions. Material, language, and writing questions are all part of the evaluation. Thus, creative thinking questions about the whole number are given to the second grade of elementary school students. In presenting student work results, the researcher will only discuss one of the students' work and analyze it. The following figures show the students' results in doing the

**LEMBAR PERNYATAAN JUDGEMENT  
INSTRUMENT PENELITIAN**

Setelah meneliti lebih lanjut mengenai instrument tes yang digunakan bimbingan skripsi

Nama : Aisyah Herlina Arrum  
 NIM : 1704779  
 Jurusan : S-1 PGSD  
 Judul : Pengaruh Pendekatan *Concrete Pictorial Abstract (CPA)* Berbantuan Multimedia Interaktif Dalam Pembelajaran Daring Terhadap Peningkatan Kemampuan Berpikir Kreatif Matematis Siswa Sekolah Dasar

Dengan ini,

Nama : Prof. Turmudi, M.Ed., M.Sc., Ph.D.  
 NIP : 19610112 198703 1 003


Menyatakan telah konsultasi dan pengkajian, maka diberikan saran-saran sebagai berikut,  
 Bisa digunakan  
 Bisa digunakan dengan perbaikan  
 Tidak bisa digunakan

1. \_\_\_\_\_
2. \_\_\_\_\_

Selanjutnya instrument ini dinyatakan valid dan reliabel digunakan untuk mengukur variabel penelitian.

Purwakarta, 16 Februari 2020

Expert,



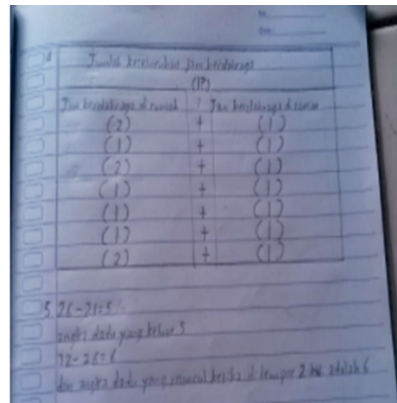
Prof. Turmudi, M.Ed., M.Sc., Ph.D.  
 NIP. 196101121987031003

Keterangan  beri tanda ceklis

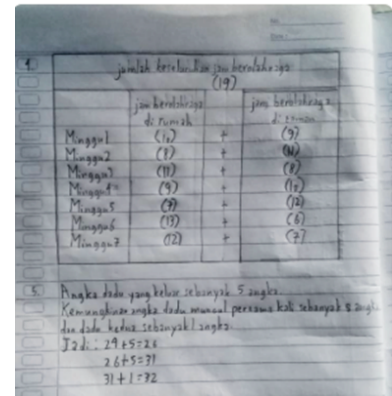
**Figure 3:** Results of expert validation of mathematics teaching materials to facilitate mathematical creative thinking ability.

mathematical creative thinking ability test questions before and after learning using Motion Graphic teaching materials based on the CPA approach.

There are several findings that the researchers note regarding the student's work above. First, students try to write down the solution to the creative thinking problem. Second, students use their knowledge to solve the problems given. Third, students give various answers according to the indicators of creative thinking to solve these problems. Fourth, the students' ability to solve creative thinking problems was much better after students learned using teaching materials in motion graphic video based on



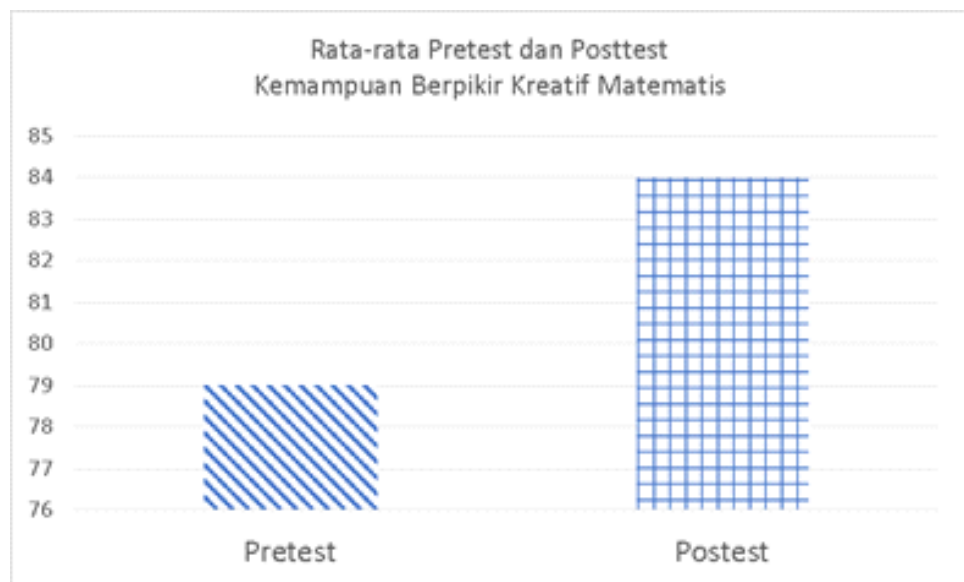
(a) BEFORE



(b) AFTER

**Figure 4:** Student’s work in doing the mathematical creative thinking ability test questions before and after learning using motion graphic teaching materials based on the CPA approach.

the CPA approach. This finding aligns with research by [17], which states that students who study using CPA learning are better than students who study using conventional learning in creative thinking skills. The results of the average post-test score of the students’ creative thinking ability in this study were also enhanced as compared to the average pre-test score. Figure 5 illustrates a comparison between the mean score of pre-test and post-test.



**Figure 5:** Mean score of mathematical creative thinking ability pre-test and post-test.

The pre-test and post-test results show that using Motion Graphic Video teaching materials based on the CPA approach can improve elementary school students’ mathematical creative thinking skills.



### 3.5. Result of the Develop Stage

Motion Graphic Video based on the CPA approach about counting operations for lower elementary is then revised based on expert's suggestions and then distributed to students and the broader community in varied ways. First, it is shared through WhatsApp Group and Google Classroom. Second, the files are uploaded on Google Drive, and the link is shared with students via WhatsApp group. Third, it is published on the CPA Approach edu YouTube channel. In addition, the link to download students' worksheets is available in the description box of the video. This fact aligns with studies performed by [18] disseminating the completed product and socializing it to instructors and students so that they are easy to operate and the messages in the product are easy to comprehend.

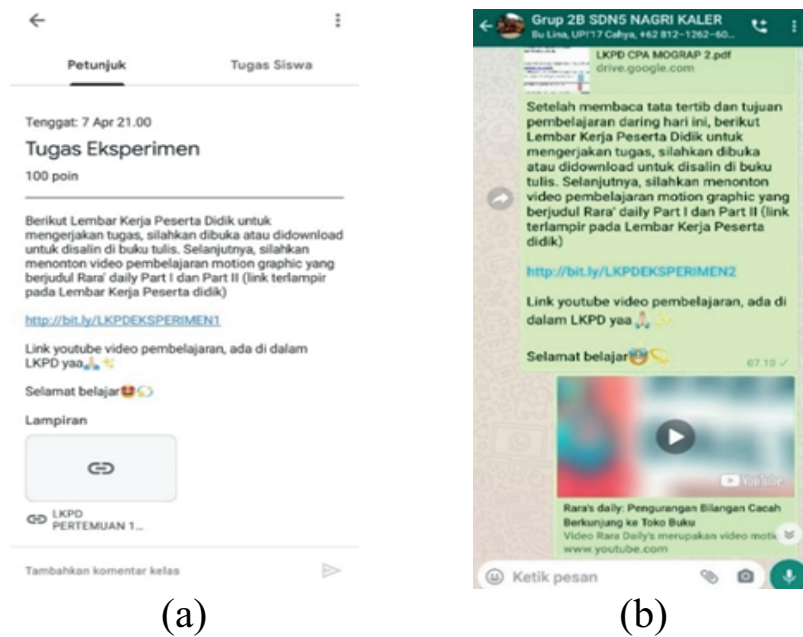


Figure 6: Disseminate teaching materials through google classroom and whatsapp group.

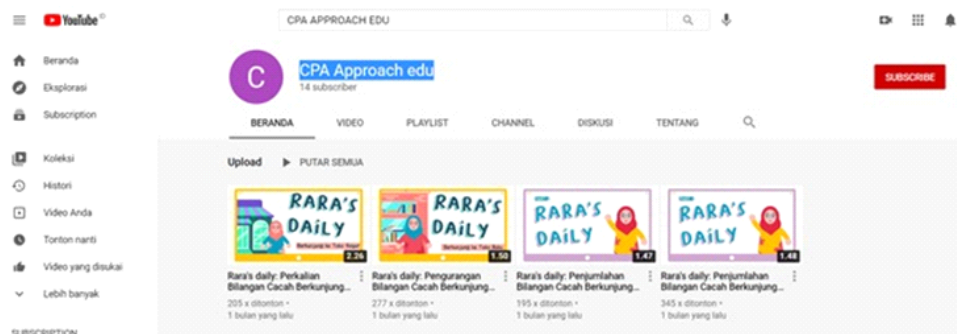


Figure 7: Disseminate teaching materials through CPA approach edu youtube channel.



### 3.6. Discussion

Teaching materials can support the learning process to train elementary school students' mathematical creative thinking skills. One of the findings of this study is that teaching materials using Motion Graphic Video based on the CPA approach can stimulate students to hone their mathematical creative thinking ability. By presenting open-ended questions such as "Provide a variety of possible answers according to each student's study habits, students are asked to count the number of study hours at school and home in one week". From these questions, students will produce various answers to each item of the question. This finding is in line with the prerequisite for the ability to think creatively, which states that the ability to think creatively is the ability to produce many possible solutions or various ways of solving problems. With different and unique answers, students will think in more detail and complex to improve their mathematical creative thinking skills [19, 20]. This study also indicates that students who learned using motion graphics teaching materials based on the CPA approach have enhanced their creative thinking skills. These results are consistent with several previous studies, one of which is research conducted by [21, 22] which states that the enhance in learning outcomes of elementary school students who learn through the CPA approach is better than students who learn with conventional approaches. Furthermore, research conducted by [8] shows that students have enhanced their mathematical creative thinking skills by using education game teaching materials assisted by android. These two studies reinforce the research results obtained in this study. Thus, motion graphics teaching materials based on the CPA approach can be used as an alternative option that teachers can use to improve the creative thinking skills of elementary school students.

## 4. CONCLUSION

The conclusion obtained in this study is that the teaching materials for the mathematics subject on whole number operations for second grade elementary can be said to have facilitated students' creative thinking abilities. This conclusion is obtained based on research results showing that the developed teaching materials based on the validator's assessment are proper. The creative thinking test results also showed the improvement of students' creative thinking skills after learning with teaching materials in the form of motion graphic videos based on the CPA approach. The development of this teaching material needs to be followed up by conducting trials with more samples to produce

higher-quality teaching materials. For this reason, researchers suggest further research on the same learning theme and broader trial subjects.

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## References

- [1] Agustina V, Masrukan M, Walid W. Analysis of mathematical creative thinking ability in terms of self-regulated learning in creative problem solving learning model with performance assessment Vena Agustina. 2023;11(5):31–44.
- [2] Supardi S. Peran Kedisiplinan Belajar dan Kecerdasan Matematis Logis Dalam Pembelajaran Matematika. *Formatif: Jurnal Ilmiah Pendidikan MIPA*. 2015;4(2):80–8.
- [3] Fardah DK. “Analisis Proses dan Kemampuan Berpikir Kreatif Siswa Dalam Matematika Melalui Tugas Open-Ended. Semarang: Universitas Negeri Semarang,.” *Jurnal kreano*. vol. 3, no. 2, pp. 1–10, 2012.
- [4] Yayuk E, Purwanto AR, Rahman A, Subanji S. As’Ari, and Subanji, “Primary school students’ creative thinking skills in mathematics problem solving,.” *European Journal of Educational Research*. 2020;9(3):1281–95.
- [5] Aldila Afriansyah E, Herman T, Turmudi, Afgani Dahlan J. “Critical thinking skills in mathematics.” *Journal of Physics: Conference Series*. vol. 1778, no. 1, p. 2021.
- [6] Putri HE, Wahyudy MA, Yuliyanto A, Nuraeni F. Development of instruments to measure mathematical anxiety of elementary school students. *International Journal of Learning, Teaching and Educational Research*. 2020;19(6):282–302.
- [7] Putri HE. “Influence of concrete pictorial abstract approach to the improvement of spatial sense ability of elementary school students.” *Journal of Physics: Conference Series*. vol. 1157, no. 4, p. 2019. <https://doi.org/10.1088/1742-6596/1157/4/042083>.
- [8] Putri HE, Misnarti M, Saptini RD. “Influence of Concrete-pictorial-abstract (Cpa) approach towards the enhancement of mathematical connection ability of elementary school students..” *EduHumaniora | Jurnal Pendidikan Dasar Kampus Cibiru*. vol. 10, no. 2, p. 61, 2018. <https://doi.org/10.17509/eh.v10i2.10915>.

- [9] Putri HE, Julianti R, Adjie N, Suryani NE. PENGARUH PENDEKATAN CONCRETE-PICTORIAL-ABSTRACT (CPA) TERHADAP PENCAPAIAN KEMAMPUAN SPATIAL SENSE (KSS) SISWA SD., 2017.
- [10] Kristanto YD, Putu D, Putra W. "STUDENTS ' MATHEMATICAL REASONING,." pp. 383–392,.
- [11] Prasetyo NA, Perwiraningtyas P. Pengembangan Buku Ajar Berbasis Lingkungan Hidup pada Matakuliah Biologi di Universitas Tribhuwana Tungadewi. *Jurnal Pendidikan Biologi Indonesia*. 2017;3(1):19–27.
- [12] Nurhayati E. "Meningkatkan Keaktifan Siswa Dalam Pembelajaran Daring Melalui Media Game Edukasi Quiziz Pada Masa Pencegahan Penyebaran Covid-19,." *Jurnal Paedagogy: Jurnal PeneJurnal Bahasa Indonesia Prima (BIP)litian dan Pengembangan Pendidikan*. 2020;7(3):145–150. <https://doi.org/10.33394/jp.v7i3.2645>.
- [13] Setiyani S, Fitriyani N, Sagita L. Improving student's mathematical problem solving skills through Quizizz [ *Journal of Research and Advances in Mathematics Education*]. *JRAMathEdu*. 2020;5(3):276–88.
- [14] Buchori A, Rahmawati ND. "Pengembangan E-Modul Geometri Dengan Pendekatan Matematika Realistik Di Sekolah Dasar." *Sekolah Dasar: Kajian Teori dan Praktik Pendidikan*. 2017;26(1):23–29. <https://doi.org/10.17977/um009v26i12017p023>.
- [15] Anjaya PD, Susilaningsih E, Yulianto A. Development of assessment instruments for learning process of mathematics in drawing geometry at the elementary school level of Karanganyar Regency. *Journal of Primary Education*. 2019;8(3):309–14.
- [16] Maisyarah S, Prahmana RC. Pembelajaran Luas Permukaan Bangun Ruang Sisi Datar Menggunakan Pendekatan Pendidikan Matematika Realistik Indonesia. *J Elem*. 2020;6(1):68–88.
- [17] Abdulloh A. "Pengaruh Pendekatan Concrete-Pictorial-Abstract (Cpa) Terhadap Peningkatan Kemampuan Berpikir Kreatif Matematis Siswa Di ...." <http://repository.upi.edu/id/eprint/51666>, (2020).
- [18] Dunlosky J, Rawson KA, Marsh EJ, Nathan MJ, Willingham DT. Improving Students' Learning With Effective Learning Techniques: Promising Directions From Cognitive and Educational Psychology. *Psychol Sci Public Interest*. 2013 Jan;14(1):4–58.
- [19] Siswono TY. "Leveling Student's Creativity in Solving and Posing Matehematical Problem." *IndoMS. J.M. E*. 2010;1(1):17–40.
- [20] Samuntya F, Susiswo S, Muksar M. Analisis kemampuan berpikir kreatif siswa dalam menyelesaikan soal open ended berdasarkan kemampuan pemahaman matematis. *Jurnal Kajian Pembelajaran Matematika*. 2022;6(1):29.

- [21] Yuliyanto A, Turmudi T, Agustin M, Putri HE, Muqodas I. The interaction between concrete-pictorial-abstract (CPA) approach and elementary students' self-efficacy in learning mathematics. *Al Ibtida: Jurnal Pendidikan Guru MI*. 2019;6(2):244.
- [22] Hendawati Y, Pratomo S, Suhaedah S, Lestari NA, Ridwan T, Majid NWA. "Contextual teaching and learning of physics at elementary school." *Journal of Physics: Conference Series*. vol. 1318, no. 1, p. 2019. <https://doi.org/10.1088/1742-6596/1318/1/012130>.