Abstraction mathematics concepts: learning innovation based on heritage culture during the pandemic COVID-19 era

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Abstract. Indonesia is archipelago country that has many heritages of culture and legacy. In the pandemic era, we need creative teacher to develop innovative learning. This research takes innovation from local culture, namely "Relief temple" that is used to be source of alternative study during pandemic. Innovative temple relief learning aims to grow up sense of nationalism pride and to strengthen self-awareness as a nation based on Pancasila. Tegowangi's Temple Relief is used as media of learning that is managed in such a way to dig the mathematics concept of student. this is a descriptive and qualitative research. the subject of this research is fourth grade of elementary school student. the result of this research is description of Tegowangi's temple relief. the subjects name the type of motif at the relief and mention type of geometry's shape at the relief. this research found a connection towards multi discipline science in learning that used the Tegowangi's relief among mathematics, history, and language.

1. Introduction

We have similar problem during pandemic, especially education. The default in our education system is now home schooling, but the big question is what resources, support, or capacity do teacher have to do it effectively? A lot of teachers struggling with the problem. We have widely variable capacity in our families and school systems. Some families have parent home all day, while other parents have to go to work. Some school systems are doing online classes all day long, and the students are fully engaged and have lots of homework, and the parents don’t need to do much. It is the first problem, based on the problem as educator needs to develop how to give smart exercise to students. As educator we need to explore mathematical thinking skill students even, they solve the problem solving. The result of identifying become base for repairing the education system [1,8,9].

Republic of Indonesia’s constitution number 20 in 2003 about national education system and declare to develop capability and to build the character. The statement indicates what important development capability and the character building are. As educators, they are required to develop student’s capability and to build the character. This is a problem for educator to develop student’s capability and build the character. Educators are required to be creative in developing teaching learning equipment to reach the aims. Character building can be formed by environment close-in student’s life. The character must reflect the value of nation. On the other hand, cultural heritage is one of Indonesia’s legacy that must be saved. Tegowangi’s temple is one of legacy temple in Kediri. The researchers have initiated to develop
teaching learning equipment based on culture by identifying Tegowangi’s relief temple as learning resource for students and used to development students’ character which is suitable with Indonesia identity.

Tegowangi temple is a heritage temple that is located at Tegowangi Village, district of Plemahan, Kediri Regency, located 4 KM from center of Kediri city. It is created around 1400 M at Majapahit Kingdom. Tegowangi temple has 4.35 meter’s height, 11.20 meter’s length and 11.20 meter’s width. Tegowangi temple is made of andesit stones that has imperfect shape. Nonetheless, temple of reliefs can be seen from the walls of building that tells unfinished Sudamala tale. Sculpted tale on the temple wall talk about Bhatari Durga and Pandawa. This tale started from Kunti who faced toward Bathari Durga at Setra Gandamayu’s cemetery for asking protection so that Pandawa is safe in Bhatarayudha war. Bathari Durga received Kunti’s request with requirement that Sadewa was given to Bathari Durga. Eventually, sadewa got married with Tambrapetra priest’s daughter as gratitude. This tale could be read clock wise. This tale is named as Sudamala tale. The following Candi Tegowangi’s images is used as study source in this research. The relief is shown in Figure 1.

Figure 1. Tegowangi’s relief temple.

Innovation of learning can be signed as study process for student that is designed creatively. It can be multiple way of learning. Learning based on innovative culture is chosen to enhance knowledge and character of student. There are several aspects which can encourage innovation, namely newness, recovery, distinctiveness, relative benefit, suitability, and complexity. Innovation is also new invention that can be different from previous invention or can be known previously with an idea, method, or product [1].

This covid pandemic era causes paradigm transformation at every sector including education sector. Learning innovation of the research is to use Tegowangi temple’s relief as learning media. Student can dig information that has related with their discipline. It will result a new knowledge and grow up the character of nation relating to philosophy of Indonesia nation.

For the purposes above it is needed some actions namely dig information, give meaning of information, make chain of information and make knowledge construction. According to [2], abstraction is an activity as vertically making organization of mathematics knowledge built previously becoming the new mathematics structure. “Vertical” term is intended to show that the new concept built at higher level than previous concepts. There are two kind of abstraction namely empirical abstraction and theoretical abstraction [3]. Furthermore [3], mention that abstraction has important role in learning of geometry to connect with triangle building and rectangular concept, when student learn geometry shape or rectangular. They identify shape with noticing similarity, do classification base on object characteristic, found the characteristics of concept containing and build concepts each shape, as shown in Table 1. The following indicators that are developed base on abstraction aspect according to [2].
Table 1. Indicator that is needed to know base on abstraction aspect.

| No | Observed Aspect | Indicator that is needed to know |
|----|-----------------|----------------------------------|
| 1. | Recognizing     | a. Understand concept beyond idea that is taught or knowable strategy  |
|    |                 | b. Know when to use mathematic idea which is knowable               |
| 2. | Composing       | a. Apply mathematic procedure which is knowable in the new context  |
|    |                 | b. Finish problem that is faced with utilizing another problem solving with small growth. |
|    |                 | c. Learn problem dependently using certain examples                  |
|    |                 | d. Systematize results and look for patterns                        |
|    |                 | e. Connect to variety representation operation and assumption        |
|    |                 | f. Use more than one way to finish a problem                        |
| 3. | Constructing    | a. Integrate concepts to create new idea (new understanding)        |
|    |                 | b. Problem explore as progressively to develop new understanding continuously |
|    |                 | c. Reflect on the solution developed and it is possible contribute to be used in the next future. |

2. Methods
This research is qualitative descriptive research that is held during COVID-19 pandemic era using zoom application. The research subject are 28 elementary school students grade 4. These research instruments ware writing test and interview. Test question that was adopted from the Van Hiele Geometry test developed by Usiskin [10] which was followed local cultural [4]. Many researchers [11-15] used this the Van Hiele Geometry test. The test was designed with followed local culture for identify how was abstraction geometry thinking process. The researchers become main instrument in this research. The research provides the picture of Tegowangi temple’s relief to be identified. This process is recorded using video recording by zoom. The result of research is analyzed qualitatively and descriptively with noticing table 1 indicator. Researchers noted the indicator table 1 as well as students reach and describe it. Data validity of this research is examined by using credibility test, dependability, confirmability and transferability. Data triangulation used is time triangulation, technic triangulation, prolonging observation and member check.

3. Result and Discussion
Depend on the result of writing test that was referring to LKS which was developed by researchers that can be taken the data as shown in Table 2.

Table 2. Student groups.

| Subject code | Group of student | Polygon identified | Non-Polygon | Regular | Irregular |
|--------------|------------------|--------------------|-------------|---------|----------|
| A            | High             | 10                 | 10          | 10      | 10       |
| B            | Medium           | 10                 | 10          | 7       | 7        |
| C            | Low              | 6                  | 10          | 6       | 5        |

From data acquisition all subjects at high, medium and low group can finish all solve. All indicator of reach in studying many fields with learning instrument base on culture picture of Tegowangi of temple’s relief.
| Observed Aspect | Subject Code | Writing Test | Interview | Achieved Indicator | Validity |
|-----------------|--------------|--------------|-----------|--------------------|---------|
| Recognizing     | A, B, C      | Start to build understanding concept of culture solving problem that has relation with the relief | Student can define the culture and relief heritage culture base on their own sentences. | 1a, 1b  | Valid |
| Composing       | A, B, C      | Student can write names of shape which is founded in Tegowangi temple’s relief. | Student can convey and mention shapes which is identified in Tegowangi temple’s relief | 2a, 2b, 2c, 2d, 2e, 2f | Valid |
| Constructing    | A, B, C      | Student can classify shapes which has identified according to polygon classification. | Student can distinguish shapes which has identified from relief picture of Tegowangi temple | 3a, 3b, 3c | Valid |
| Constructing    | A, B, C      | Student can accomplish and identify forty polygon shapes | Student can clarify polygon shape that has identified to relief picture. | 3a, 3b, 3c | Valid |
|                 |              |              | Student can accomplish and identify thirty four polygon shape. | 3a, 3b, 3c |         |
|                 |              |              | Student can accomplish and identify twenty seven polygon shape | 3a, 3b, 3c |         |
| Constructing    | A, B, C      | Student can provide the result of identification on classification table of student work sheet well. | Student can mention the result of shape identification as classification on student work sheet base on the result of work orally. | 3a, 3b, 3c | Valid |

Subject A, B, and C can build the culture concept and heritage that define it with their own language then connect it with the mathematics concept specially polygon shape material. It shown that They organized the mathematics knowledge, built previously becoming the new mathematics structure until make the define concept with their own language [2].

Subject A, B, and C know well polygon shape material. It can be shown that student can do the exercise correctly and can mention the names of shape. The names of shape are identified through polygon or non-polygon and regular polygon or irregular polygon. It shown that student accomplished the problem by their creativity, this was smart solution they can identified geometry object used the heritage culture. It was innovation and new invention that can be different from previous invention or can be known previously with an idea, method, or product [1]
Subject A, B and C can make classification diagram. Student can distinguish and know difference between polygon and non-polygon and regular polygon or irregular polygon. On the interview, subject assert with “yes” answer. It shown that abstraction has important role in learning of geometry to connect with triangle building and rectangular concept, when student learn geometry shape or rectangular. They identify shape with noticing similarity, do classification base on object characteristic, found the characteristics of concept containing and build concepts each shape [3].

Subject A, B, and C can accomplish problem which relate with polygon material well on the Tegowangi temple relief picture. Student can identify the relief and provide shapes, names of shape, and names of relief are illustrated and the student can explain the result in interview. It shown that student organized their knowledge, classified, and make a new mathematics structure [1-3].

4. Conclusion
Students do abstraction with use relevant characteristics (information) between relief and mathematics concepts that they did known and put aside non-relevant characteristics. Students can make classification of the similar shapes, mention the name of shapes and make a definition by their own words. We found that abstraction is a part of internal thinking processes.

From the explanation above, we can conclude that high, medium, and low subject of group can reach indicator of study accomplishment using relief images of Tegowangi Temple's Heritage as tool of mathematics learning based on based on culture. On the other hand, we can know that tool of learning based on Tegowangi temple relief culture can be applied for polygon learning at Grade four Menang elementary school. From the result, it is expected that the result of this research can be utilized for learning tool development at other schools and objectified on contextual learning specially during pandemic. This is suitable with argument [4] that local culture can be resource of learning tool development. Learning spatially as well as important early built to students [5] for getting spatial reasoning skill of students [6-8]. Students have different perspective of geometrical thinking for problem solving [9].

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