Pesisir culture-based analogy presentation format used by elementary school students

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Abstract. The similarity in characteristics between students' life experiences and some of the science concepts supports the need to use analogies in learning science in elementary schools. This paper discusses the research results aimed at exploring the analogical thinking skills of students based on culture, especially in the Pesisir area. The discussion's main focus lies in the format of the presentation given by students when presenting the analog of the concepts of electric current and plant motion. Data were collected through observation, interviews, and literature study from various selected school sources in the Pesisir cultural area: the Tegal Regency. Derived conclusion based on data analysis and discussion stated that students' dominant presentation format to explain the scientific concepts given in this study analogically is the verbal-pictorial format.

1. Introduction

Many research studies have been concerned with the implementations of analogy in science learning [1-3], particularly those dealing with elementary school materials [4-5]. It is widely accepted that the use of analogy in elementary school science teaching varies. Several authors stated that analogy supported students’ learning activities better to understand scientific concepts [6-9], while others provided proof that it serves students for motivating their learning [4-5]. The analogy is employed with the purpose of transferring a relation between a known and a less known or even unknown area [10]. Analogy is an interesting learning device since its characteristics can relate students’ daily experiences to a specific target conveying learning concepts. Students benefit from the implementation of an analogy because they can explain their understanding of the learned materials easier [11].

The known analogy area, commonly called base/analog, can be found from students’ experience or knowledge derived from their daily culture. Based on this reason, to support the effective use of analogy in science learning, it is necessary to pay attention to students’ culture [9]. This is based on the understanding that by paying attention to students' culture, the analogy chosen can be adjusted to everything that the students already familiarize. This will make the students easier to understand the target material being studied.

Types of analogy used in learning depend on the objectives to be achieved. From the teacher’s point of view, the structure of subject matter will affect the analogy's choice, which will, in turn, be used by the students as the reference point of the generated analogy [12]. Also, the students' analogy also relates
to their visual perception [12] and vocabulary knowledge, i.e., the word's semantic features, of the student [13].

Analogy appearing in a scientific text has been classified into several categories [14], one of which is based on its presentation format. Under this category, an analogy is differentiated with the reference of its verbal and pictorial use, i.e., whether there are only words, pictures, or explanation used in it.

Word is a symbolic representation used for describing environment [15], while Fava [16] stated that drawing supports the application of analogy to understand more the learning material. In addition, analogies and visual thinking have cause and effect relation [14]. From different point of view, Kearney and Young [17] found close relationship among experience, environment, and student’s analogue reasoning. All these points have special implications for the use of word and drawing by students in expressing their generated analog.

Students' illustrative drawings can be analyzed by using a theory of aesthetic form [18]. The elements analyzed include lines, shapes, textures, and colors emerging in the illustration drawing work. These elements are studied in relation to the principles of art which include unity, balance, diversity, movement, emphasis, and rhythm. Rose, Jolley, and Burkitt [19] stated that children’s drawing competence is shaped by two environmental factors: external and internal. The external factors are parents and teacher, while the internal one is children themselves. Furthermore, it was said also that realistic drawing is more preferred by the children [19].

Based on the above explanation, a research aiming at exploring students’ culture-based analogical thinking skill has been done. The focus of this research was on the characteristics of analogy used by primary school students living in Pesisir (coastal) area when they are presenting the analog of the science concepts. Particular finding on the format of presentation will be discussed and is expected can give benefit for supporting teachers in applying analogy in science class.

2. Methodology
This qualitative research aimed at finding the characteristic of Pesisir culture-based analogy used by students in elementary school, particularly its presentation format. There were 29 students participated in the research. The format defined refers to the way of presenting the analog of a specific target implemented by the students. The data of the format was collected by implementing test method. Two target materials related to electric current and movement of plant involved in the research. A short introductory explanation of each target was given before the question to direct students' analogical thinking. The students were asked to answer the question in a form of generating analog based on their understanding of the concept possessed by each target explained. Three options of presenting the analogs: verbal, pictorial and both were provided in the answer sheet. The students can choose one of the options or use all depending on their interest. and then, analyzed by using descriptive method.

3. Results and Discussion
3.1 Results
The first question asked the students to generate the analog of electric current implicitly. The question was initiated by the introductory explanation of electric current phenomenon. It was stated that “The battery that is connected to the lamp by a conductor wire will produce an electric current that causes the light to turn on”. It was, then, followed by the question of “What events, in your daily life, can be used to compare the electric current flowing in the wire?”. In addition, the second question related to plant movement was initiated with the following short statement. “We know various kinds of plant movements, such as the motion of mimosa pudica leaves when touched, plant movements due to light stimulation, and so on”. This was, then, continued by the question of “What events, which occur in your daily life, can be used to compare the movements of these plants?”

In order to answer the questions, the students may use presentation format they like. The presentation formats defined in this research are adopted from those used by Curtis and Reigeluth [14]. The students are stated to use the verbal format if they present the chosen analog by writing it in the available sheet. Additionally, the check sign will be given into a data table representing the pictorial format if the students draw a picture representing the analog. Finally, the students are said to use both verbal and pictorial format if there are words or sentences (s) and pictures in their sheet portraying the analog. The
data analysis results are presented in Table 1, focusing on the students' characteristics of format type. Meanwhile, table 2 reflects the types of analog of both targets chosen by the students.

**Table 1.** Characteristics of presentation format chosen by the students

| No | Students | Electric current | Plant movement |
|----|----------|------------------|----------------|
|    |          | Verbal           | Pictorial      | Verbal-Pictorial | Verbal | Pictorial | Verbal-Pictorial |
| 1  | A        | √                |                | √               |        |          |                |
| 2  | B        | √                |                | √               |        |          |                |
| 3  | C        | √                |                |                |        |          |                |
| 4  | D        | √                |                | √               |        |          |                |
| 5  | E        | √                |                |                |        |          |                |
| 6  | F        | √                |                |                |        |          |                |
| 7  | G        | √                |                | √               |        |          |                |
| 8  | H        | √                |                |                |        |          |                |
| 9  | I        | √                |                |                |        |          |                |
| 10 | J        | √                |                | √               |        |          |                |
| 11 | K        | √                |                |                |        |          |                |
| 12 | L        | √                |                |                |        |          |                |
| 13 | M        | √                |                |                |        |          |                |
| 14 | N        | √                |                |                |        |          |                |
| 15 | O        | √                |                |                |        |          |                |
| 16 | P        | √                |                |                |        |          |                |
| 17 | Q        | √                |                |                |        |          |                |
| 18 | R        | √                |                |                |        |          |                |
| 19 | S        | √                |                |                |        |          |                |
| 20 | T        | √                |                |                |        |          |                |
| 21 | U        | √                |                |                |        |          |                |
| 22 | V        | √                |                |                |        |          |                |
| 23 | W        | √                |                |                |        |          |                |
| 24 | X        | √                |                |                |        |          |                |
| 25 | Y        | √                |                |                |        |          |                |
| 26 | Z        | √                |                |                |        |          |                |
| 27 | A1       | √                |                |                |        |          |                |
| 28 | A2       | √                |                |                |        |          |                |
| 29 | A3       | √                |                |                |        |          |                |
Table 2. Analogs chosen by the students

| No | Students | Analog      |
|----|----------|-------------|
|    |          | Electric current | Plant movement       |
| 1  | A        | Television, HP | Kantong semar       |
| 2  | B        | Car           | Putri malu          |
| 3  | C        | Man           | Plant               |
| 4  | D        | Water         | Ball                |
| 5  | E        | Water         | Putri malu          |
| 6  | F        | River         | Kantong semar       |
| 7  | G        | Water         | Kantong semar       |
| 8  | H        | Water, wind   | Plant               |
| 9  | I        | Sun           | Plant               |
| 10 | J        | Water, gasoline | Plant             |
| 11 | K        | Water         | Plant               |
| 12 | L        | Water         | Wind                |
| 13 | M        | Water         | Table, chair        |
| 14 | N        | Battery       | Sun light           |
| 15 | O        | Water         | Putri malu          |
| 16 | P        | Water         | Putri malu          |
| 17 | Q        | Television    | Plant leaf          |
| 18 | R        | Water         | Marble              |
| 19 | S        | Water, wind   | Putri malu          |
| 20 | T        | Water         | Ballpoint           |
| 21 | U        | Water         | Putri malu          |
| 22 | V        | HP            | Water color         |
| 23 | W        | Television    | Putri malu          |
| 24 | X        | Water         | Remote control      |
| 25 | Y        | Water         | Plant               |
| 26 | Z        | Television    | HP                  |
| 27 | A1       | Water         | Table               |
| 28 | A2       | Water         | Kantong semar       |
| 29 | A3       | Water, wind   | Table               |

3.2 Discussion

Table 1 shows that most students used verbal-pictorial presentation format for presenting their analog of both targets: electric current and plant movement. There were 25 students employing the format for electric current and 19 students using the same one for plant movement target. Besides writing text mentioning and explaining the analog, the students have also drawn pictures describing the analog visually. The use of both formats, i.e., verbal-pictorial, for presenting the analog indicates that the students tried to answer analog as straightforward. This means that students have relational reasoning ability in both terms: words and images [20].

The students use three kinds of the written text in conveying their analog ideas: word, simple sentence, and complex sentence. The students mainly chose the word forms. This type of student was still unable to convey the logic of thought or analogy they have in mind regarding the context presented coherently or entirely. Students still tend to use keywords, such as “water” and “wind” that will produce a complete logic of how water and wind move from one place to another if they are translated. The simple sentence was the second type of text employed by the students to state their analog. An example of the sentence is “water flows from mountains. Although this sentence cannot be categorized as a complete sentence, its idea structure is more comprehensive. It already represents the correct logic of the idea. The last type is a complete sentence in which the students express their analog in a longer and more complete idea. The example of this sentence is water is like an electric current that flows
everywhere. This sentence is not structured properly and correctly. However, the expressed idea is already presented in a longer sentence. Another examples of sentence that are more coherent in their structure and logic are "The movement of the *mimosa pudica* plant that will close its leaf when it is touched" and "For example, if a table is pushed, it will displace."

The above results mirror the students’ age. The students involved in the research were around 10 or 11 years old. At this age, they belong to the age of children entering the concrete operational stage [21], having abilities of sorting and classifying things which involve in thematic processing [22] and logical thinking [23]. The use of verbal format shows that students’ analogical reasoning is affected by the verbal system [24] and working memory [25,26].

Based on table 2, it can be said that water and wind are fluids mostly chosen by the students to be the analog of electric current, while various kinds of plant, e.g., *kantong semar*, a tropical pitcher plant, and *putri malu* (*mimosa pudica*), and other solid object which can be found in students’ surrounding area are selected by the students to be the analogs of plant movement. Result of analysis showed that although the student only mentioned the analog with one word, but the picture added gave more explanation related to the characteristics of the the analog, i.e., the similarity of its behavior with that owned by the target. In case of electric current analog, the most behavior used as a reference is the ability of flowing of the analog from one place to another having different height or air pressure. Meanwhile, the analogs of plant movement are those which have similarity in their behavior of moving due to a particular cause, e.g., touched, pushed, or pulled, to the target analog. The use of water as the analog represents similarity of ideas between students and those which have been confirmed by another research, as in [27] and [28]. This means that although the students and the other researchers have different location, there is still a possibility to produce any same idea and interpretation of the same event: water flows. Students also picked some objects they are familiar with to be the analogs, such as handphone and television for electric current and chair and table for plant movement. This result indicates that the students have more knowledge about the objects, i.e., the objects have same characteristic with the target. The knowledge is obtained by students from their daily lives experiences which are often associated with these objects. This result supported the research of Christensen & Ball [29] and Fotou & Abrahams [30] that reported that experience support analogical reasoning and of Zangori & Forbes [31] which stated that such reasoning falls into the category of anthropomorphic analogies.

Most students tried to use picture in giving analog of the targets. Based on the analysis, it can be said that the picture employed belongs to illustration. Etymologically, illustration comes from the Latin "illustrare" which means to explain. Illustration is interpreted as an additional explanation in the form of examples, comparisons, and so on which are used to further clarify an explanation. Meanwhile, in terms of terminology, illustration can be interpreted as a picture, painting or printed work of art that explains, represents visually, clarifies, or only as a decoration and complement to written text, which may be literary or commercial in nature [32]. In general, the function of illustration is to clarify and explain certain texts or information [33].

From the data gathered, it can be stated that pencil was used by all students to visualize their ideas in their illustrative drawings on the paper. Therefore, the color element used was only one type of color, namely the dark gray. The visible lines on the drawn object are dominated by the use of curved lines with several variations of straight lines. The shape employed was dominated by the utilization of organic forms to describe the objects encountered in students’ daily lives. The used texture was the same texture that appears through shading or repetition of lines or small dots applied in students’ objects drawing such as leaves or flowers. In addition, unity in the illustration work produced by students appears through the consistency of line thickness and the similarity of organic forms. Most of the visual elements were arranged by applying symmetrical balance, where students place the object in the center of the drawing area. The flow of readability (visual movement) used is from left to right, and top to bottom. The rhythm in the illustration works appears through the repetition of elements such as wavy lines (to show water), organic leaves in the form of more than one number, and other elements. Figure 1 shows the illustration drawn by a student implementing art principle in showing visual elements.
Figure 1. Implementation of art principle in showing visual elements on students’ illustration

Data analysis also depicts that the conceptual aspect of creating student illustrative drawings relates to inner realities and sensory experiences obtained from environmental experiences. This supports Chou and Chan [34] that found the influence of family members and mass media on students’ conceptions of engineers based on the student’s drawing and Alvarez's research [35] found the influence of students’ experience on their written narratives and drawings. Through visual analysis carried out on students’ drawings, similar patterns can be found in approaches and techniques to visualize the information that students have written in the form of answer text.

The student's drawing style tends to be simple and straightforward describes the characteristics of students aged 8-11 who are in an exploratory period. With a drawing style using one line drawn, students can see the flexibility in visualizing what their ideas are, without fear of being wrong or looking not beautiful. The spontaneity they show in their illustrative drawings also illustrates the characteristics of coastal community life that tend to be open and egalitarian affected by ecological and demographic conditions [36].

The results of documenting student illustration drawings show the important role of images in text processing for children. The visual aspect helps students to articulate better the understanding of the text that is in their minds [37-38]. In this process, the process of meaning construction is also implied, in which the verbal and visual aspects occur by utilizing the drawing skills that children generally have naturally [39-40].

4. Conclusion

Based on the discussion, it can be concluded that students' dominant presentation format to explain the scientific concepts given in this study analogically is the verbal-pictorial format. The verbal type lies in simple sentences, while the pictorial type is mainly in the form of non-complex pictures characterizing picture drawn by children. The finding suggests developing students' verbal and visual abilities during the study to support their analogical thinking skills.

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