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Surrealistic Perspectives Useful in Science Education

Jan-Eric Mattsson[1], Ann Mutvei[2]

Abstract

This paper was induced by the observation of how children, about 6 years old, at the Magritte Museum in Brussels were introduced to the idea that the depiction of an object always differ from the object itself. They looked at a painting and discussed how facial expressions in general only partly reveal the character of a person. It clearly demonstrated how the children understood that no matter how naturalistically we depict an object, we never do catch the item itself. The picture helped them with assistance of a supervisor to create this view.

Many students are trained in trying to understand what the teacher wants to hear rather than to understand the principles of the theories taught. In science, and most other subjects in school, this results in a knowledge concept based on the quality in the reproduction of texts, formulas, or drawings and the use of important words for concepts in relation to the original presentations. Instead, teaching should result in useful skills based on the understanding of the theories taught.

Methods used in presentations of art work at galleries and museums could also be used when science is taught and learned at science museums and in the classrooms. The discrepancy between the representation and reality open up new fields of interpretations which can be used by the teacher to create curiosity. Whatever is demonstrated for students they should be induced to discuss how this should be interpreted and to construct the reality behind instead of trying to remember the representation itself.

As the creation of understanding appears in the mind of the student the teacher has to create situations stimulating the wish to understand the reality behind the object instead of the wish to reproduce the mind of the teacher. Here we give some examples of how this method could be used in science education but also how it can be used when assessing the results of teaching.

Keywords: *teaching, curiosity, art, phenomenology*

1. Introduction

This paper was induced by the observation of how children, about 6 years old, at the Magritte Museum in Brussels, were introduced to the idea that the depiction of an object always differs from the object itself. They looked at a painting of a mask at some distance in front of a face and discussed how facial expressions of people in general only partly reveal the character of the person expressing them. Out of their experiences they showed understanding of the general principle *that no matter how naturalistically we depict an object, we never do catch the item itself*. The experienced museum supervisor could with the aid of this painting and discussions help the children to create awareness about how representations (of things, actions, pictures, formulas, etc.) always are something else than the object itself.

These small children got the opportunity to understand what many grown-up students fail to do. The latter are trained in trying to understand what the teacher wants to hear or see during an examination. They repeat the words of the teacher or textbook rather than to try to understand the principles of the theories taught. In science this results in a knowledge concept where the quality knowledge is centred on the accuracy in the reproduction of texts, formulas, etc. and the use of concepts in relation to the original presentations made by the teacher. Instead, teaching should result in useful skills based on the understanding of the theories taught.

2. Surrealistic perspectives

The children at the Magritte museum understood that no matter how naturalistically we depict an object; we never do catch the item itself. Magritte gave one good example of this in his painting *La trahison des images,* (The treachery of images) [1] which shows a pipe used for smoking. The painting includes the text “Ceci n'est pas une pipe" ("This is not a pipe"). Try to stuff it with tobacco and you will be convinced. It is a painting of a pipe not the pipe itself. Similarly, teachers must be aware of the importance of distinguishing and clarify the differences between the representations of different

[1] Södertörn University, Sweden
[2] Södertörn University, Sweden

objects, reactions, processes, etc. and the reality these are supposed to represent. Also, the students have to be aware of this otherwise they focus on representations instead of the reality behind them.
These perspectives are in line with philosophical ideas of the 20th century, of which some is included here. A fair overview of these is straightforwardly presented by Bakewell [2].

3. Phenomenological methods and existentialistic ideas

According to phenomenology the observer of reality has to, and can only, rely on the phenomena perceived. All observations are based on perception which has to be transformed in cognitive processes in order to create descriptions suitable for communication. Thus, the good observer has the ability not only to clearly describe the perceived phenomena but also the talent to formulate this in order to reveal the reality behind the phenomena. These ideas of the relation between reality and the methods of the human mind to understand it were formulated by Edmund Husserl [3]. In a similar way the existentialist philosopher Martin Heidegger discussed how we in order to change the world or the reality have to use different tools manually instead of thinking or reflecting [4]. Similarly, the teacher wants the students to use their knowledge to do something instead of repeating the words or formulas they have been taught. In order to do this the student first may use skills in observation to let the objects enter into the light, be aware of them and finally use this awareness to create wider understanding and practical use of this knowledge.

4. Museums in science education

Methods used in presentations of art work at galleries and museums could be used when science is taught and learned at science museums, in the field and in the classrooms. When preservice teacher students wrote texts on art works selected by them, these reflections almost always were focused on 1) impressions promoting personal feelings related to the art work, 2) wishes to understand the artist's aim of the work or 3) references to previous personal experiences [5]. These different responses on the observation have all in common that there is something more, not explicitly expressed in the art work which is important. The art work is like the mask in the example from the Magritte Museum; it conceals something. That is usually the aim of masks but in this case the art work has not the aim of concealing, actually it is supposed to widening the view of the observer. The discrepancy between the representation and reality open up new fields of interpretations which can be used by the teacher to create curiosity. Whatever is demonstrated, the students should be induced to discuss different possible interpretations and how these have influence on the construction of the understanding of the reality behind them instead of trying to remember the representation itself.

5. Promote skills in using science

Students often understand science and technology in practical situations. They can describe their use of technology in specific situations but they don't regard it as knowledge in technology [6]. Almost everybody can identify a hammer, make a drawing of it, explain how it is made, and how to use it. To use a hammer is a different skill. To plan the use of the hammer is also another skill based on previous experiences of hammering. A combination of training these different skills should be included in all teaching. To use the students' previous skills and experiences is one way of achieving this [7].
Further, nurturing curiosity is essential in all science teaching and one way of doing this is to promote the students to use different types of questions and to understand the difference between different types of questions [8]. Also questioning needs training and how this may be promoted is included in one of our examples below.

6. Examples of how to promote skills in using science

Here we give some examples of how this method could be used in science education but also how it can be used when assessing the results of teaching.

6.1 Construction of a sailing boat

In groups students constructed sailing boats using half a disposable aluminium foil lunch box, a straw, plastic tape, paper, and aluminium foil (Figure 1). The boat should sail in crosswind over a washing-up bowl, load cargo and return, with the wind now from the other side of the boat [9].
In their written reports the students demonstrated how the different views of the members and the discussions in the group enhance their own understanding. They also realised the marginal importance of previous experiences of sailing. "I have been sailing since I was very young but it was not until this exercise I really understand the principles of sailing."

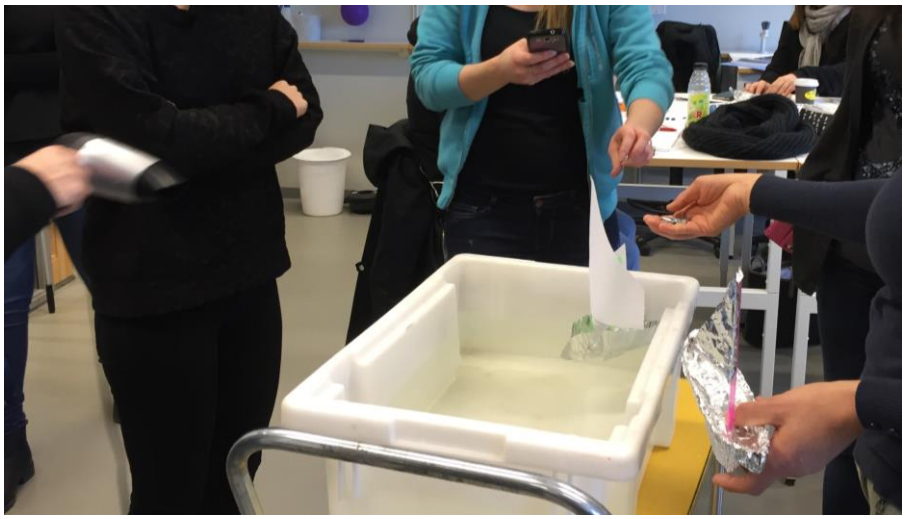

Figure 1. Construction of sailing boats.

6.2 Observation of adaptations among plants to Mediterranean climate types

The students visited the Edvard Anderson Conservatory in Bergius Botanic Garden [10]. In small groups they studied either the flora of Australia, California or South Africa with focus on morphological adaptations to similar dry climatic conditions (Figure 2). New groups of students were formed with one representative of each region and they shared their findings.

Figure 2. Examples of plants from different parts of the world adapted to similar conditions (Kew Gardens, London, UK).

Also here the students realised the importance of communication. “It was not until I presented my groups findings, out of our observations, to the others I really understood what we had seen.”

6.3 Assessment of technological literacy

Three tools of the student’s own choice based on silhouette pictures should be identified and described. They could use a rubric as support for their texts where they, e.g., were stimulated to explain function, construction, own experiences etc. [11].

Here the everyday experiences of using the tool were integrated with theoretical knowledge. “I use a spade not only when I’m digging but also when I’m cleaning the stable. The blade is made of iron and is triangular like a wedge which makes it easier to push it into the ground.”

7. Summary

The three examples above show the complexity in learning. It is important to communicate in order to understand what has been learned. It is not only a question about what is behind the phenomena that’s been observed but it also shows the importance of verbally declare and communicate the new understandings, thus connecting practice with theory.

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