

Chapter 5

Active Use of Analogy Method With Technology in Education

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ABSTRACT

The aim of this study is to reveal the analogy, which is an essential part of human thought in comprehending and comprehending concepts, and also an educational method compiled from the studies made in the literature. Analogies are a type of model, and their main purpose is to simplify and thus help us focus on the attributes of a particular part or a specific feature. In this chapter, the analogy method as an educational method is discussed in detail, the types of analogy, the issues to be considered in use and the development in technology, and the active use of the analogy method with technology are explained.

WHAT IS ANALOGY?

The term ‘analogy’, which expresses the comparison of the structures and relationships between two fields or concepts, is considered as a teaching strategy, and a teaching technique in a wide range of sources in the literature. Often used as a teaching method in physical sciences, analogies are defined as a means of understanding the unknown concept through the parallels between the known and unknown concepts among the concepts consisting of common structures (Gentner, 1983), using a well-known concept in describing a new (firstly encountered) concept that is complicated or difficult to understand and thus explaining this new (unknown) situation (Dagher, 1995), and a strategy that facilitates learning and helps relate new information to the knowledge the students have already learned (Bilaloglu, 2005). Using analogies, it is essential to use a previously known fact/situation to describe a new phenomenon/situation encountered for the first time. Herein, the word “target” is used to refer to the newly-encountered phenomenon/situation to be learned/taught for the first time, while the words “source, tool or analog” are used referring to the previously known, familiar fact/situation in order to explain this situation (Dagher, 1995; Gentner, 1983; Spellman & Holyoak, 1996). Analogies are a type of model and its main purpose is to simplify what try to understand and thus help us focus on the attributes of a particular part

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or a specific feature (Coll, 2009). According to Coll, the working principle of analogies is to establish mental connections between the familiar concept and the scientific concept (the one that is tried to be understood). Analogies represent the comparison of structures and relationships between two fields. One of two fields in question is a familiar concept that is already known, while the other one (the target concept) is defined based on the information in the known concept (Duit, 1991). Analogy, in the most general sense, is the ability to think of relational patterns (Gentner et al., 2001).

Analogy is one of the effective cognitive mechanisms used to find out new concepts and draw conclusions. It has a significant role in learning and developing cognitive concepts. Analogies have long been known to contribute to the emergence of new discoveries as well as the revelation of the embedded ideas or concepts (Thiele & Treagust, 1991, p.5). Analogies have long been used since they have an intense reminding power, present mental pictures to the listener and allow them to transfer the information from the known to the unknown quite instantaneously (Harrison, 1992).

The process of associating concepts using analogies is an essential part of human thinking (Glynn, 1989). This is because learning is essentially about creating analogies between the concepts to be learned and the ones that are already known. Analogies serve as a bridge between the existing knowledge and the new information; they give new insights and viewpoints to the learner and provide the opportunity to concretize abstract concepts and visualize and make sense of them (Yerrick, Doster, Nugent, Parke & Crawley, 2003). Therefore, analogies could be suggested to play a significant role in the constructivist learning theory (Duit, 1991; Pittman, 1999).

HISTORY OF ANALOGIES IN EDUCATION

Analogies have long been used in science (Thiele & Treagust, 1991). As a method, analogies are among the oldest means of communication. As a matter of fact, analogies used frequently from political discourses and religious interpretations to scientific and daily speeches have a significant place in the historical development of scientific knowledge. It is known that analogies were used in historical texts. An excerpt from the epic of Babylon, written about four thousand years ago reads as "... coming over the body of his hero friend Enkidu, Gilgamesh covered Enkidu's face with a veil just like a bride's face is covered with a bride's veil. ... stood by his friend's body like an eagle or a lioness over its prey..." (Gentner et al. 2001). The fact that recording the use of analogies to develop the oldest analytical theory constituted the hypothesis that sound propagates through the air in the waveform. During the reign of Emperor Augustus, a Roman architect and an engineer named Vitruvius explained the nature of sound using the analogy of water waves (Gentner et al. 2001).

The influence of analogies can also be traced back to the emergence of important discoveries throughout history. It is obvious that important laws and theories have been put forward starting from analogical thinking as seen in the following examples: examining corks through the light microscope in 1665, Robert Hooke saw that the cork consisted of many pores and slivers surrounded by thin walls, and he coined the term "cell" to name these pores because they reminded him of the small cells in which the priests lived (Glynn & Takahashi, 1998); Newton discovered the gravity upon an apple's falling on his head while sitting under a tree; Aristotle related the volume of water overflowing from the bath to the volume of metal of the king's crown; and Kepler made discoveries about the motions of the planets by likening the motions of the particles inside a clock to the motions of the planets. The works of the philosopher Mary Hesse on analogy in science have shown that analogies have a powerful influence on discoveries

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