An Analogy For Basic Computer Block System: Furniture Factory

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Abstract

A good understanding of the computer basic block system is effective in students’ understanding of computer usage and programming. This information is also necessary for choosing the right computer when purchasing a computer. Otherwise, the user may spend unnecessary money on a technology that he will not use. In this study, the basic components and system of a computer which necessary for a computer to work are likened to the parts of a factory and an analogy is designed. The motherboard is likened to the factory’s campus area, the hard drive to the warehouse, the memory to the workshop, the processor to the employees, the power supply to the cafeteria and the sales office to the graphics card. This system can also be adapted to other peripherals, for example; for example, a microphone can be likened a forklifts or the speaker to the elevator. This analogy was used in the Basic Information and Communication classes at undergraduate and associate degree level and their knowledge was tested by asking at least one question in the midterm / final exams. The success rate was found to be between 65-92% depending on the level of the class.

Analogy

Analogy; the similarity or similarities between two different things is to argue that the first one is expressed for the other. Analogy is the similarity between some aspects between concepts, principles and formulas. More precisely, analogy is a mapping of similar features of these concepts, principles and formulas (Bartha, 2013).

Lego → Cell: Just as the same lego pieces are used for all shapes, every organ in a living organism consists of the same cells.

Brick → Atom: Like an atom, brick is lifeless, different structures are built according to the way they come together. How the bricks are put together and the gap between them...
the durability and thermal insulation of the structure varies, according to the mortar used, and the atoms also exhibit different properties according to the bond structures they establish.

A variety of definitions have been made in the literature for analogy: Analogy is the process of understanding an unknown event by means of a known event, by comparing and establishing relations between two events. (Gentner & Holyoak, 1997) (Şahin, 2000). Analogy is a means of understanding the unknown through parallels between the familiar and the unknown between concepts that contain common structures (Gentner D., 1989). Analogy is similar in some ways between concepts, principles and formulas; this is the mapping between similar properties of concepts, principles and formulas (Glynn, Britton, Semrúd-Clikeman, & Muth, 1989). Analogies are used to capture well-known information in long memory and to learn new information (Lawson, 1993).

Teachers use analogies to facilitate difficult concepts and embody abstract concepts involving less familiar systems, concepts and objects with more familiar ones (R. Dagher, 2005). Analogy usage models with different names and different steps are available. (Sağırlı, 2002). The best known of these is “Teaching Model with analogies (TWA)” (Glynn, 1989) (Glynn S., 1991) (Glynn, Britton, Semrúd-Clikeman, & Muth, 1989). According to Glynn (1991), the aim in this model is to transfer the features in the source concept to the target concept (Bilaloğlu, 2006) (Kesercioğlu, Yılmaz, Huyugüzel Çavaş, & Çavaş, 2004).

In literature, 6 models of analogies except TWA have been described: (1) structure matching theory “SMT” (Gentner D., 1983) (2) the general analogy teaching model “GMAT” (Zeitoun, 1984); (3) bridging analogies “BA” (Brown & Clement, 1987) (Brown & Clement, 1989) (Clement, 1987); (4) multiple analogies model “MAM” (Spiro, Feltovich, Coulson, & Anderson, 1989) (5) student generated analogies model “SGAM” (Zeitoun, 1984); (6) narrative analogies model “NAM” (Dagher, 1995) and (7) case-based reasoning model “CBRM” (Dagher, The Case for Analogies in Teaching Science for Understanding, 1998) (Ekici, Ekici, & Aydin, 2007) (Güngör Seyhan, 2015).

Analogies are generally divided into two groups as individual and illustrated analogies. The student plays an active role in individual analogies and visualizes these events in his mind. In picture analogies, the concepts that are difficult to understand are shown with diagrams and pictures. Most of the picture analogies are accompanied by some oral narratives. Such analogies help students to simulate images to better understand the targeted concepts (Bilgin & Geban, 2001) (Thiele & Treagust, 1991).
Using the analogies in the classroom environment, it was determined that the students learned the concepts better. In a study by Gabel, it was found that if students could make a connection between the analogies used and the concepts that were aimed to be taught, such analogies reduced students' misconceptions and learned their concepts more easily (Samuel & Gabel, 1986). If the student cannot understand the aspect of the analogy used which does not resemble the intended target concepts, this may lead to misconceptions. Because when the student cannot understand this point, it draws conclusions out of the concepts that are intended to be taught by analogy and applies this knowledge to other fields such as true (Webb, 1985).

Analogies are a bridge between preliminary information and new information. Preliminary information or past status as analogue; the source, new information or the new situation is called as the target. Therefore, analogical reasoning requires the transfer of structural information from a known system to a new and relatively unknown system. According to Vosniadou (1989), analogies are divided into two groups: within-domain analogies and between-domain analogies. “A tiger is like a cat” is an example of the first group of analogies, and, "electric current is like water flowing from a straw" is an example of the second group (Kesercioğlu, Yılmaz, Huyugüzel Çavaş, & Çavaş, 2004).

According to Gentner and Holyoak (1997) analogies are strong mechanisms to use for learning new abstractions and to make new inferences. According to these two researchers, analogy is the process of understanding an unknown event by considering an unknown event under the conditions of a known event, by comparing and establishing relationships between the two events. The known event, phenomenon or concept constitutes a kind of model to draw conclusions about “source”, unknown event, phenomenon or concept “target” (Heywood, 2002).

Analogies are especially effective in teaching physics, chemistry and biology concepts which are not included in students' lives. As a result of the use of analogy, strong bridges are established between the information in the students' lives and the information they will acquire. The findings of the studies support that the analogies increase interest, curiosity and motivation in students (Keller, 1983), support conceptual change (Dagher, 1994) and are an effective tool in establishing the relationships between concepts (Stepich & Newby, 1988).

Principles to be considered in the selection of analogies:
1. Content and target should be well defined
2. For an unknown new concept, a similar (familiar) analogue should be used
3. For abstract new target concept, concrete analogue should be used
4. Select the links that can be associated with the structure of the new concept
5. Characteristics, preliminary knowledge of students should be taken into consideration

According to Stepich and Newby (1988), analogies should be given when new topics are introduced. It is called Analogical Advance Organizer (Curtis & Reigeluth, 1984). Mayer (1987) stated that analogies as pre-regulators should take place in teaching when students are unfamiliar with the new concept and analogies are concrete. Curtis & Rigeluth (1984) states that analogies can be given during teaching when concepts are complex; also concluded that the subject can be used at the end of the teaching and concatenation stage (Kesercioğlu, Yılmaz, Huyugüzel Çavaş, & Çavaş, 2004).

The concept of analogy is sometimes confused with simulation and sometimes with metaphor. Simulation is to perform risky, dangerous, costly, time consuming operations on a virtual environment or model. For example, to describe internal organs on a model or to use training cabin for flight training (Kincaid & Westerlund, 2009). Metaphor means trope. It is to use another word instead of a concept to beautify and make the expression more effective without the need for any analogy. For example, in the phrase nature wakes up every morning, nature is a metaphor for awakening.

Computer

The computer is a programmable electronic machine that can store, process and export data, and perform mathematical and logical operations. It was originally designed to perform mathematical calculations that can be completed in very long periods of time. Later on, it gained the ability to store and process large amounts of data, the variety of input-output devices increased and prices decreased. With the invention of the transistor, the most important feature that shrinks, accelerates and inexpensively separates computers from the calculator is that it is programmable. Over time, computers that are commercially manufactured and opened for personal use have become simple devices in almost every home. Smart mobile phones are also computers. We buy a new computer every 3-5 years regardless of type, and there are more than one computer in every house. So, besides using computers, we should also know how this machine works, and understand what parts are important. If the basic operating principle and functions are not known when purchasing a computer or repairing / upgrading, we can give more money to the components (Hazer, Gül, & Buğday, 2005).

Theoretically, the computer needs 5 basic units to operate, and with the invention of the monitors and the graphics cards included in the computer, it is essential to know in detail
what the 6 components are for. These are the motherboard, processor, memory, hard drive, power supply and graphics card as an additional unit (GÖZÜ & Han, 2009).

The processor is the unit that processes the computer, it is the task of this part to process commands, perform mathematical and logical operations. Since it is the most working and most heated part of the computer, it is also cooled with a cooler. It is one of the two most important parts that determine the price and performance of the computer.

The hard disk is where data is stored permanently. The data is stored here before and after processing. The data is not deleted even if there is no power. The price is not too high; but the data in it is very valuable. It should be used and stored sensitively.

Memory is where data is retrieved from the hard disk for processing. Data is not stored here, but is kept temporarily for processing. The data is also erased during a power failure. It is effective in computer performance. But contrary to popular belief, performance does not always increase or decrease when it increases or decreases. What is important here is the need. If you have a lot more memory than the operations you do, it will not affect the speed; but if it is less than you need, your speed will decrease. In other words, if memory is less than needed, performance decreases and performance is not affected.

A motherboard is the unit to which all parts of the computer are directly or indirectly connected and communicating. It is the most important part that determines the speed and quality together with the processor. How long the computer will run healthy depends largely on the quality of the motherboard.

Power Supply is the unit that distributes the electrical energy coming from the grid to the voltage required by other units. Although it is not mentioned as a basic unit in most sources, it is the most important part that determines the health of the computer. Because if the units are sent more or less voltage than they need, the units do not work or break down.

The graphics card is not necessary theoretically for the working of the computer; but nowadays all computers produce images. Therefore, there is an on-board / internal or external graphics card. The effect of the graphics card to performance is during graphic process. The video card has no effect on the mathematical and logical operations that are among the basic functions expected from a computer (Khan Academy, 2019) (GÖZÜ & Han, 2009) (Li, 2019).
Recommended Analogy
The basic block structure and operating principle of the computer is very similar to that of a factory. In this section, analogy developed based on this similarity is discussed in detail. The computer is likened to a furniture factory so that it is easier to understand, because it is easier for students to understand this example since furniture factories are located almost everywhere. The following table presents the basic elements of analogy.

Table 1. Computer-Factory Analogy

<table>
<thead>
<tr>
<th>Target Concept</th>
<th>Analog Concept</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processor</td>
<td>Staff</td>
</tr>
<tr>
<td>Hard Drive</td>
<td>Storage</td>
</tr>
<tr>
<td>Memory</td>
<td>Workshop</td>
</tr>
<tr>
<td>Motherboard</td>
<td>Campus area</td>
</tr>
<tr>
<td>Power Supply</td>
<td>Dining hall</td>
</tr>
<tr>
<td>Display card</td>
<td>Showroom</td>
</tr>
</tbody>
</table>

The processor is like employees; the more they are, the faster they finish things. At the same time, air conditioners are needed in working environments because they are sweating while working. And the air conditioners in the factory, like the cooling fans in the computer, make a lot of noise. Similarly, since most of the workforce is provided through employees, one of the most expensive items is employee salaries.

The hard drive is like a storage. Untreated raw wood and furniture are stored in the warehouses in the factory. The raw and processed data on the computer is also stored on the hard disk. The warehouses themselves are not very valuable; but the materials stored in them are very valuable. Therefore, warehouses should be protected and used sensitively against fire, flood, humidity and theft.

Memory is like a factory workshop. The data is brought here for processing. The processed data is returned to the repository. If there is not enough storage for the number of employees, some employees have to wait in line, which means that performance is reduced. But if there is a workshop that is much larger than the number of employees, unnecessary money will be spent and it will not affect

The motherboard is like the factory’s campus area. There is a connection between all buildings. Covering the area, the width of the roads, the quality of the asphalt used, the
type of the door affect many factors such as transmission, the durability of the ground and foundations are decisive in the life of the factory.

The power supply is like a cafeteria in a factory. All employees need different calories according to the work they do. If food is distributed according to their position, not according to the needs of the employees, the managers will fall asleep because they eat too much, and the workers will get tired and unable to work because they eat less. As a result, all work at the factory will stop. That is why it is vitally important to distribute food to everyone as needed.

The graphics card can be considered as the factory showroom or retail store. The produced furniture is taken to a store for sale and conveyed to those in need.

The system described can also be adapted to peripherals. For example, external storage units can be likened to transport vehicles, keyboards to forklift, speaker to elevators.

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References


