

The Use Of Mind Maps And The Theory Of Multiple Intelligences In The Science Instruction

Fen Öğretiminde Çoklu Zeka Kuramı Ve Zihin Haritalarının Kullanımı

Güliz Aydın*, Ali Günay Balım*, Ertuğ Evrekli*

ABSTRACT

In science instruction it is important to give place to modern approaches from the point of view of meaningful and permanent learning. The Theory of Multiple Intelligences is important to reveal individual differences and to get students to participate in the science class actively. The fact that there are diverse learning styles necessitates the use of different methods and techniques. In preparation of the plan the emphasis is given to activate the learners different multiple intelligences. This study aims to focus on the activities based on The Theory of Multiple Intelligences related to "The Classification of Substances and Their Transformations" in seventh grade of primary education and the examples using mind maps in lesson plan. In preparation of the plan, the emphasis is given to activate the learners' different multiple intelligences. Besides, the importance of Mind Maps and The Theory of Multiple Intelligences are discussed.

Keywords: The Theory of Multiple Intelligences, Mind Maps and The Science Instruction

ÖZET

Fen öğretiminde anlamlı ve kalıcı öğrenme açısından çağdaş yaklaşımlara yer verilmesi önemlidir. Çoklu zeka kuramı bireysel farklılıkları açığa çıkartmak ve öğrencilerin Fen derslerine etkin katılımını sağlamak bakımından önem taşımaktadır. Öğrencilerin farklı öğrenme stillerinin varlığı, çeşitli yöntem ve tekniklerin kullanımını gerektirmektedir. Ders planının hazırlanmasında öğrencilerin farklı zeka alanlarını etkinleştirmeye önem verilmiştir. Bu çalışma ilköğretim 7. sınıflarda "Maddelerin Sınıflandırılması ve Dönüşümleri" konusuna ilişkin çoklu zeka kuramını temel alan etkinliklere ve ders planında zihin haritalarının kullanımına yönelik örneklerle odaklanmaktadır. Ders planının hazırlanmasında öğrencilerin farklı zeka alanlarının etkinleştirilmesine öncelik verilmiştir. Çalışmada ayrıca zihin haritalarının önemi ve çoklu zeka kuramı tartışılmıştır.

Anahtar Sözcükler: Çoklu Zeka Kuramı, Zihin Haritaları, Fen Öğretimi

INTRODUCTION

Nowadays, modern teaching approaches are gaining importance, thus new theories, methods and techniques must be applied in Science and Technology teaching to provide meaningful learning environments. In Science Teaching, it is essential to apply scientific methods such as; learning by means of discussing, experiencing and practising. Multiple Intelligence Theory is one of those theories (Balım and Mutlu, 2005). This study consists of a sample lesson plan and activities in which Mind Mapping technique was applied. Mind Mapping is a technique that is thought to contribute to the development of intelligence areas and Multiple Intelligence theory and it enables meaningful and permanent learning. In this study, Mind Mapping activities

which are based upon Multiple Intelligence theory were applied within the lesson plan. The subject is the "The Classification and Transformation of Matter" in the unit of "The Voyage to the Inner Structure of Matter" in the curriculum of Science Teaching Programme at the 7th grade in Primary Schools. The importance of using Multiple Intelligence applications and Mind Maps in Science teaching is emphasised by this study.

Multiple Intelligence Theory

In today's world, the traditional understanding of intelligence, in which individuals are expected to use their Verbal-Linguistic and Logical-Mathematical intelligence, is replaced by the Multiple Intelligence understanding. The biggest

*Güliz Aydın, Dokuz Eylül University, Faculty of Education, Izmir-Turkey, gulizaydin@gmail.com

*Ali Günay Balım, Yrd.Doç.Dr., Dokuz Eylül University, Faculty of Education, Izmir-Turkey, agunay.balim@deu.edu.tr

*Ertuğ Evrekli, Dokuz Eylül University, Faculty of Education, Izmir-Turkey

contribution of the acceptance of Multiple Intelligence Theory in education is that individuals are not going to be classified and rated only according to their verbal and quantitative skills any longer, and individuals are going to start discovering their own skills or abilities (Özden, 2005). Criticising the traditional understanding of intelligence, Gardner suggests that intelligence contains too many skills to be able to explain with one single factor and defines intelligence as the ability to produce an output in different cultures or create effective solutions to the problems that s/he encounters in real daily life (Özmen, 2005). Functions of the brain such as; learning, thinking, remembering and perceiving are also characterized with intelligence factors. Intelligence has a multi-factorial and multi-functional holistic structure (Demirel, Başbay and Erdem, 2006).

Students come to the classroom environment with their own individual learning differences. Multiple Intelligence Theory underlines the importance of individual learning differences. There is no such thing as *a student who cannot learn* according to the Multiple Intelligence Theory. When teaching activities are organized according to the intelligence types of students, all students can learn. Thus, teaching activities, which are applied in concordance with the intelligence type of each individual student, are called Multiple Intelligence-Based Teaching (Ekici, 2003). To this theory; the branches of intelligence that each student can actively use are different from each other. Multiple Intelligence Theory has a great importance in discovering the individual differences and providing active participation of students to the lessons who have different types of intelligence. To Gardner, every human being has one or a few branches of intelligence peculiar to him/herself and learning is realized more easily if the branch of intelligence is well addressed. As suggested by Gardner, there are 8 branches of intelligence that individuals have and it is as follows:

1. **Verbal-Linguistic Intelligence:** It includes the ability to use words effectively, reading, and writing, listening and speaking and so on.
2. **Logical-Mathematical Intelligence:** It is the capacity to use numbers effectively and to reason well. This intelligence includes sensitivity to logical patterns and relationships, statements and propositions (if-then, cause-effect), functions, and other related abstractions.
3. **Visual-Spatial Intelligence:** It is the ability to perceive the visual/spatial world accurately. This intelligence involves sensitivity to colour, line, shape, space, form, and art activities and so forth. It includes the capacity to graphically represent visual or spatial ideas.
4. **Musical Intelligence:** It is the capacity to perceive, discriminate, transform, and express musical forms and play instruments. This intelligence includes sensitivity to the rhythm, melody etc. in a musical piece.
5. **Bodily- Kinaesthetic Intelligence:** It is expertise in using the whole body to express ideas and feelings. This intelligence includes specific skills such as coordination, balance, dexterity, strength, flexibility, and speed.
6. **Social-Interpersonal Intelligence:** It is the ability to communicate with one's environment, recognize people and so forth. It includes the tendency to do group-work and be cooperative and capacity to use the body language, create empathy and convince people.
7. **Intrapersonal Intelligence:** It is self-knowledge. This intelligence includes having an accurate picture of oneself (strengths and limitations), awareness of inner moods, intentions, motivations, temperaments, and desires as well as the capacity for self-discipline, self-understanding, and self-esteem.
8. **Naturalistic Intelligence:** This type of intelligence is about getting to know, understand and protect nature, classifying plants and animals. It includes sensitivity to the environmental issues and excursions.

If each individual's eight branches of intelligence work together, it can be said that each type of intelligence has its own way of working. Branches of intelligence work in a complicated manner (Akboy, 2005). A football player uses his Bodily-Kinaesthetic Intelligence when he runs, catches the ball and kicks it. He uses his Visual-Spatial Intelligence when he gets to know the field and learns his task, likewise; his Verbal-Linguistic and Social Intelligence when he learns the rules of the game and discusses or shares something with his team mates and finally his Intrapersonal Intelligence when he evaluates himself (Armstrong, 1994 narrated by Kaptan and Korkmaz, 2000).

According to Armstrong (1994; cited by Demirel, 2005), the best way to use Multiple Intelligence theory in lessons is to think and find out how to adapt the subject to teach from

one intelligence to another and correlate the symbol system in the language to visual, bodily, musical, logical, social and intrapersonal intelligences.

Multiple Intelligence theory puts its argument on the basis that students' different intelligence branches must be aroused and activated by means of activities in lessons. It is believed that students will be more active and have the chance to develop their different intelligence branches if only lessons are given by considering their individual differences.

Mind Mapping Technique

According to the Multiple Intelligence theory, various teaching methods and techniques should be used to enable meaningful learning by using different branches of intelligence. When individuals learn something, the area of the brain for the learning gets active and depending on what the person does, the related hemisphere of the brain gets active (Demirel, Başbay and Erdem, 2006). To enable both hemispheres of the brain to work together effectively, various learning experiences should be used to address students' different senses. As the Mind Mapping technique already contains visual elements such as; correlations, images, words, colours, figures, which help students use their brains more effectively, it is expected that students will be more interested and active as learning will be fun. Effective techniques should be used to work both lobes of the brain together (Balım, Evrekli and Aydın, 2006). Mind Map is one of the techniques which encourage students to use their full potentials and it makes learning easier. The Mind Maps, a natural function of the mind, are the fastest way to think creatively (Rostron, 2002: 117). Mind mapping helps a group capture complex ideas quickly, easily, and visually, to see the big picture and identify relationships among ideas and processes (Streibel, 2002: 118).

Mind map consists of a central word or concept, around the central word it is drawn 5 to 10 main ideas that relate to that word. Then it is taken each of those child words and again draws the 5 to 10 main ideas that relate to each of those words. Images and graphics may be added to this representation (Bidarra, Guimaraes and Kommers, 2000).

It is believed that Mind Mapping is an effective technique in learning Science subjects related to one another and developing a holistic point of view as the technique enable students to use their different intelligence branches.

A Sample Lesson Activity With Mind Maps

Prepared On The Basis Of Multiple Intelligence Theory

Much care has been taken to activate students' different intelligence branches while planning this lesson. The plan includes the name of the unit, subject, time, materials and tools, acquisitions, the beginning, middle and end of the lesson, multiple intelligence branches and how mind maps can be used in some of those areas.

Grade: 7

Unit: The Voyage to the Inner Structure of Matter

Subject: The Classification and Transformation of Matter (Classifying Matter as Solid, Liquid and Gas)

Objectives: Comprehending the classification of matter

Acquisitions:

Giving examples by classifying matter and explaining the differences between states of matter.

Defining density and comparing the density of different matters with experiments.

Materials: Course-book, Mind Manager Pro 6, colour pencils, a piece of paper, some water, soil, olive oil and a sprayer, syringe and stones.

Learning-Teaching Activities:

Verbal-Linguistic Intelligence: Students are expected to explain the concept "classification" after questions such as; "What is the use of classification of matter?", "Does any of you collect stones, leaves, stamp, coin etc?", "According to what criteria do you classify your collection?".

Students are expected to define Matter, Classification and express the concepts and knowledge related to the subject with keywords and writes them on the board.

Logical-Mathematical Intelligence: Students are encouraged to create logical correlations between the keywords written on the board. Ask them why the liquids do not have a certain form. By asking them the question; "Which state of matter has the most energy, among the three states of matter, solid, liquid and gas?" they can discuss and explain the reasons. It is made sure that the students form graphics and tables by calculating the density of various matters.

Social-Interpersonal Intelligence: The correlations that students create between the concepts and knowledge can be discussed in groups. They are encouraged to discuss how matter is classified. By giving them a scenario

about how matter transforms, they are motivated to act in classroom.

Let students empty the soil in a container onto a piece of paper on the floor, then pour some water on the floor of the classroom. Lastly, spray some water from the sprayer in the classroom and ask them if they could see the water from the sprayer on the floor or not. Encourage them to discuss which features of matter are different and how to classify matter.

Ask them how to understand if a substance is pure or mixed and let them discuss the differences between pure and mixed substances?

Visual-Spatial Intelligence: Ask students to express and symbolize their correlations and keywords by using images and figures and then let them form their mind maps. Ask them to fill out the Semantic Feature Analysis (Table 1), which is on classification of matter as solid, liquid and gas. Motivate them to draw pictures of the particles/molecules that form the substance in solid, liquid or gas states.

Bodily-Kinaesthetic Intelligence: Some of the students who are known to have this type of intelligence beforehand are encouraged to present and explain their own mind maps in classroom.

Five students stand up and illustrate how the particles/molecules of substances (in solid,

liquid and gas states) line up and how they move.

Ask students in each group to fill their syringes with air and then close the tip of the syringe to pressure the air in it. Then ask them to do the same with water this time. Let them compare and discuss their findings.

Intrapersonal Intelligence: Let students form their own mind maps freely. Ask them to write their thoughts as a composition on why densities of matters are different.

Musical Intelligence: Ask students to write poems on the classification and transformation of matter and encourage them to compose those poems.

Naturalistic Intelligence: Ask students to collect various substance samples from nature and bring to the classroom and classify them. Encourage them give examples from elements, composites, mixtures and substances in the states of solid, liquid and gas.

Finally, additional activities can be given to students according to the analysis of their mind maps, thus problems in learning the classification and transformation of matter are discovered. The Semantic Feature Analysis, which are on the classification of matter as solid, liquid and gas, are collected and checked.

Below is an example of a Mind Map on the subject of The Classification and Transformation of Matter.

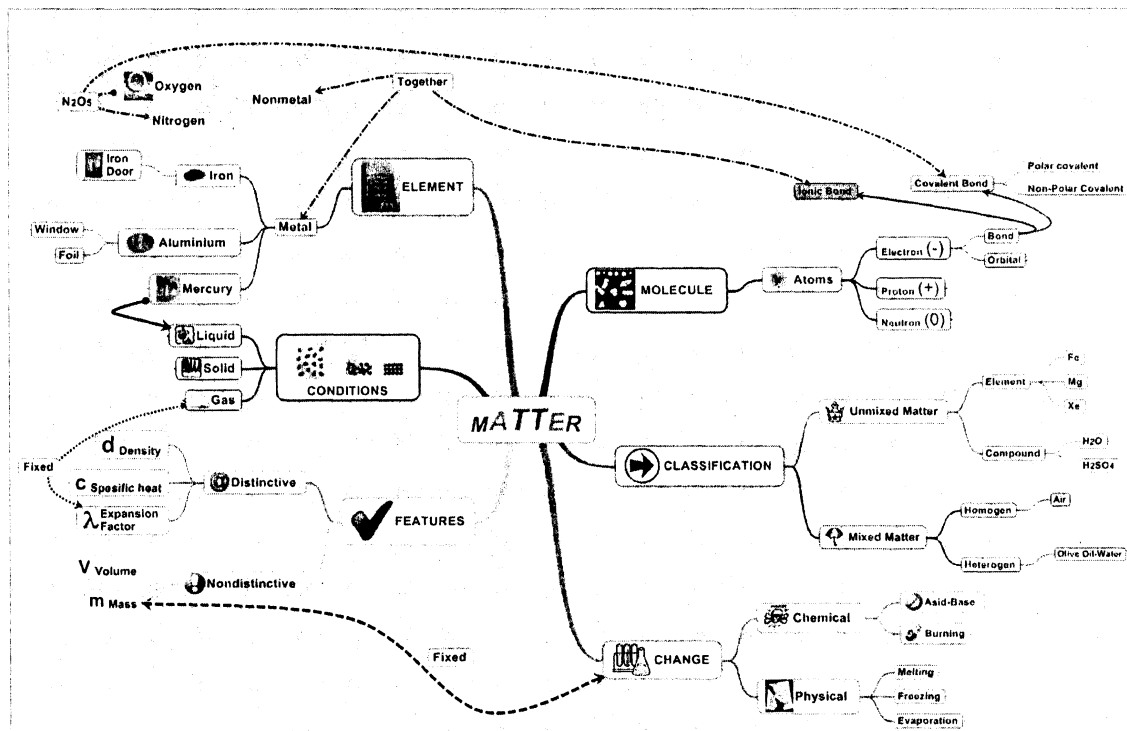


Figure 1. A Mind Map Related to The Classification and Transformation of Matter.

Table 1. A Semantic Feature Analysis Related to The Classification of Matter as Solid, Liquid and Gas.

Classification Substances	Solid	Liquid	Gas
Soil			
Iron Filings			
Cologne			
Air			
Gas			
Water			
Oxygen			
Ice			
Olive Oil			
Salt			
Carbon dioxide			

DISCUSSION AND CONCLUSION

It is believed that Mind Maps are effective in realizing meaningful learning and using multiple intelligence branches more actively as they engage both hemispheres of the brain to work fully. It is highly expected that the Mind Mapping technique will contribute to the development of all multiple intelligence branches, because in this technique; written expression of knowledge contributes to the Verbal-Linguistic intelligence, creating correlations between images and knowledge contributes to the Logical-Mathematical intelligence, being able to draw figures contributes to the Visual-Spatial intelligence, using mind maps in cooperative learning environments contributes to the Social-Interpersonal intelligence.

It is essential that different regions of the brain be aroused at the same time to provide meaningful learning. Permanent learning is enabled and different sense organs get more attracted when different regions of the brain are aroused (Demirel, Başbay and Erdem, 2006). It is pointed out that if lessons are given by taking multiple intelligence branches into consideration, problem-solving skills and productivities of students will increase, lessons will be more enjoyable and learning more permanent (Yavuz, narrated from 2001 by Balım and Özaçıkırdem, 2006).

According to The Multiple Intelligence Theory, individuals need to use their different intelligence branches to learn. It is thought that using the Mind Maps within this theory will help Science teaching, which includes many issues and relations between concepts. Therefore, teachers of Science courses are advised to learn how to use Mind Maps within the Multiple Intelligence Theory effectively and encourage their students to make use of Mind Maps too.

It has been established to carry out that skills of problem solving and producing an outcome has increased when individuals are provided with a learning process in which their active intelligence branches are considered (Karamustafaoğlu and Yaman, 2006). Teachers should encourage students to give their less-developed intelligence branches a chance and develop them by using their developed intelligence branches in the lesson activities. Each intelligence branch can be developed up to a degree by good-planning and lesson activities. Teachers should know their students well and enrich the learning environment with activities and materials to let students use their different intelligence types.

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