MISCONCEPTIONS AND "LEARNING DOCTORS"

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We all talk about scientific issues such as plants, genetically modified organisms, air-water-environmental pollution, and education etc. in everyday life. But such small talks are not as simple job as it was thought, because, it is necessary to have a scientific qualification in order to state true opinions about the discussed topics. However, in order to fully understand the problem here, we must answer the following questions. Do we understand these issues in a way that does not conflict with scientific facts, and can we say we fully taught the students what we understand? Are we able to use scientific concepts correctly? What matter is our answer to these questions.

The answers to these questions reveal the damages of misconceptions and the importance of the conceptual learning. As concepts are building blocks of the learning, they are the names of the grouped similarities, events and thoughts. Mankind learns and uses these concepts, which are considered as units of thought, at every age. In this way, information networks, information clusters occur by understanding the relations between concepts. Learning the concept is a foundation for other learning and the first learning will form the ground for subsequent learning.

Starting from childhood, we learn concepts and terms that are concepts' names, classify concepts, and discover the relationships between them. Thus, we rearrange our knowledge and even create new concepts and new information. This process of learning and restructuring in our minds continues throughout our lives. However, factors such as students' daily lives, experiences, belief systems, learning environments, and their underdeveloped mental skills, and their efforts to make sense of concepts contradict the nature of science and the process of the emergence of scientific knowledge, and students misunderstand scientific knowledge in this process.

This non-scientific interpretation process has been named by researchers in different terms, in terms of "misconception" or "alternative concepts". The fact that learned concepts are not sufficiently shaped in the mind of the individual, failure in constructing correct relationships with the learners' existing schemas and the use of learned concepts out of the scientific meaning causes students' developing misconceptions in their minds. This occurs when student was left alone in the learning process, since the teacher does not guide, the student misinterprets when he/she couldn't comprehend a subject that he/she never knew before, and this leads to misconceptions. Misconceptions are not only to be observed in today's children or students – even scientists and philosophers developed and lived with many misconceptions in the past (Barke, Hazari, & Yitbarek 2009). For example, most of the students around the world imagine that the sun rises in the morning from the east, at the noon it will be at the highest point and in the evening, it will be set in the west. They imagine as if the sun cycles around the earth. Misconceptions are such obstacles at all levels of education to comprehend scientific phenomena (Oberoi, 2017). Researches show that individuals have many misconceptions that are resistant to change in many subjects we think they have successfully learned.

What is important for teachers is to minimize the number of students' misconceptions without the opportunity to create new misconceptions throughout the teaching process, because correcting the wrong information is more difficult than teaching new knowledge. Although misconceptions have a wide variety of sources, the most damaging ones today are

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misconceptions transmitted from textbooks (Barrass, 1984, Cho, Kahle, & Norland, 1985; Pearson & Hughes, 1988; Sanger, 1996) or teachers (Barrass, 1984; Lin, Yen, Liang, Chiu, & Guo, 2016; Ilyas & Saeed, 2018, Wandersee, Mintzes, & Novak, 1994). Such misconceptions are not only transmitted but also hinder meaningful learning altogether. When the teacher tries to correct the misconceptions in the textbook, the students may object to the teacher because the textbook says the opposite. The textbooks for the students are an error-free source and the books are more reliable than parents and teachers.

Determined misconceptions in textbooks can be eliminated in the light of the results of research conducted by field training experts. However, it is not enough for teachers not to have misconceptions in order to prevent misconceptions transfer from teachers to students. It is very important for teachers to be aware of the misconceptions their students might hold about the subject they are going to teach and to be aware of how these misconceptions can be eliminated. But if a teacher assumes his/her students enter the classroom without preconceptions or misconceptions, this will be a crucial mistake.

Sadler and Sonnert, (2016) revealed that teachers who were able to identify possible misconceptions of their students had higher student achievement gains than teachers who could know only the correct answers. They also report that teachers who plan their lessons in order to eliminate the misconceptions of their students had achieved a higher level of achievement than teachers who did not take into account the misconceptions. Moreover, an intriguing finding of their study was that teachers who knew their students' most common misconceptions were more likely to increase their students' science knowledge than teachers who did not. These findings suggest that a teacher's ability to identify students' most common misconceptions on multiple-choice items, a form of pedagogical content knowledge, is an additional measure of science teacher effectiveness.

Taber, 2002 suggested the metaphor of "Learning Doctors" for teachers who struggle to eliminate their students' misconceptions (Barke et al., (2009). The comparison of the teacher with medical doctors is accurate in two respects. First, just like a medical doctor, the learning doctor should use diagnostic tests as tools to guide action. Secondly, just like medical doctors, teachers are 'professionals' in the genuine sense of the term. Like medical doctors, learning doctors are in practice (the 'clinic' is the classroom or teaching laboratory). Just as medical doctors find that many patients are not textbook cases, and do not respond to treatment in the way the books suggest, so many learners have idiosyncrasies that require different individual treatments (Barke et al., (2009).

Teachers as "Learning Doctors" play a major role in the learning of the students. On the other hand, most of the teachers are not familiar with the misconceptions, which is a crucial alarming situation. Hence, teachers should be aware of the nature of misconceptions and possible remedies to mediate the misconceptions (Ilyas & Saeed, 2018). In order to have convincing lessons, it is important that young people have enough opportunities to express and compare their ideas of the nature. Only after children feel uncomfortable with their ideas, the new and current worldview should be introduced (Barke et al., 2009). It is recommended to incorporate the teaching techniques required for eliminating misconceptions in the curriculum for teacher educators. It is necessary to equip teachers with essential capabilities of continuously identifying their students' misconceptions and implementing remedial instructional strategies (Ilyas & Saeed, 2018).

Educators should be aware that newly acquired concepts are not sustainable forever and can be easily affected when the lesson is over. It is therefore necessary to repeat and intensify these newly ''acquired'' concepts in order to anchae them in the minds of students (Barke et al., 2009). Science education should be a bridge between students' misconceptions and current scientific concepts. This bridge can be constructed through classroom discourse which plays a critical role in not also enhancing students' comprehension and learning but also foster and facilitate students' critical-analytic thinking.

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Consequently, misconceptions are not only the problem of educational community, because the education level of individual is indicative of the educational level of the society in which he / she lives.

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