

VIEWPOINT

MISCONCEPTIONS IN STUDENTS: HOW TO RESOLVE THEM?

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Misconception is simply 'misinformation', which is more than a set of false beliefs or faulty mental models of many of the things. This is quite persistent feature amongst students.¹ The students due to their unguided and uncontrolled observations develop a set of partial and uncoordinated schemata of understanding the real world. These misconceptions are fairly strong and tend to confront the direct and clear evidences. Students build these naive, inexperienced and innate concepts on the basis of everyday observations and experiences mix them up with scientific facts. The human brain constantly organizes experiences into some sort of coherent structure. Thus all kinds of activities can give rise to misconceptions, from day to day experiences to formal classroom encounters. This is in fact a part of learning process. If exact nature is not made clear to them, students can also misconstrue formal information such as textbook illustration. These erroneous concepts or ideas, without any scientific evidences, are brought into the teaching enterprise by the students. Students' incorrect conceptual systems, unfortunately, disable them to differentiate and understand true relationships between objects, events and processes to build the right concepts.² This often leads to miscommunication, miseducation and even a misapplication.³

The emergence of misconceptions is excellently explained by a story, 'Fish is Fish'.³ The story depicts the mental aptitude of the fish on sketching the outside-world beyond the limits of its own environment. Being an aquatic creature, the fish is bound by its own environment and due to this limitation constructs and views the outside-world based on the sphere of its activities and experiences. The fish imagines the world-outside to be all fishes in one form or the other. This restricted scope of the fish to establish new understandings onto prior understandings and experiences leads to misunderstandings and formation of misconceptions.

Many studies have been attempted to rectify the misconceptions of students on different themes. Nevertheless, most of them strongly advocate the role of a mentor or teacher in revealing, identifying and changing of the alternative conceptions.⁴⁻⁸ The two early models suggested by Hewson³, as conceptual change and concept exchange for rectifying misconceptions are replaced by a more elucidated and a better five-step process known as ECIRR (Elicit-Confront-Identify-Resolve-Reinforce) model.³

The current model works in a five stages to rectify the misconception. In the first stage of 'elicit', the teacher evokes and brings out the alternative concepts among students through activities and discussions. This stage enables the teacher to know that student has a misconception through diagnostic probes and getting diagnostics signs through an odd, unexpected or a wrong answer confirming the possible presence of a misconception.⁹ What to do when one finds a misconception? The answer is to 'confront', which is the second stage. This helps teachers to address and deal with the faulty mental model through demonstrations, implications, questions and discussions. They place the students in a state of cognitive conflict by disagreeing to their predictions and statements. After evoking and confronting alternative concepts, teachers should then 'identify' what is the underlying conceptual difficulty and in what way is the students' mental model faulty. This is the third stage in this model. The Fourth stage, 'resolve' involves healing of the faulty mental model, in which teachers replace alternative concepts and allow students to actively resolve discrepancies by themselves.

The replacement can be fostered through modelling activities using graphs, diagrams, that systematically engage students in developing models and providing their own explanations for basic phenomena, or simply through questions, experiments, or hypothetical cases.³ In order to recheck for alternative concepts, students are re-evaluated during this stage by posing conceptual questions. The final stage is the 'reinforcement' which is the most important stage to complete this model. Working all the way from revealing of the misconceptions until the stage of healing, incorrect concepts are not erased completely. It is the reinforcement that achieves it. Therefore, retrieval pathways for the correct concepts or learning are to be reinforced over time and again and under varying conditions.

Finally, it is evident through this model that teacher facilitation is definite in defining and resolving the misconceptions in students, however, the strength of this model is truly impressive. Traditional approaches for correction of the alternative concepts resulted in a failure. This was due to the fact that the processes required for eradicating misconceptions as meta-cognitive thinking and reinforcement were not applied. Habits like smoking, nail biting, thumb sucking, repeatedly washing hands can be best broken through

this EICRR model in which thinking and discussions are involved and to break the habit reminders are reinforced now and again.

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