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THE RUBIK’S CUBE AS A VISUAL TEACHING TOOL AT A PHYSICS LESSON

Pupils and students nowadays spend a lot of time online and are used to simple and appealing explanation of any information through short videos or fun illustrations. Therefore, the traditional teaching methods are becoming less engaging by the minute. Thus, the problem of motivating students and pupils remains front and center. The teaching means and tools should correspond to the age of students and their interests, they should draw their attention and increase learning motivation, as well as help illustrate complicated concepts with elegant and simple examples [1 : 335]. In this article we focus on the ways of using the Rubik’s cube to introduce new learning content in physics, namely the theory of evolution of our Universe. The Rubik’s cube will serve as a teaching tool to introduce a new topic through inductive reasoning that starts with non-abstract, sensory and emotional perception and transforms into intellectual activity – reasoning and conclusion [2 : 42].

While solving the Rubik’s cube, the teacher asks the students to think what factors they need to consider to find the working algorithm. The answer is: the position of the pieces, their color, cluster pattern etc. If you start rotating the layers randomly from the original state, the order will decrease and the disorder will increase, and at a certain moment the disorder will reach its maximum. If we draw the parallel with our Universe, the original state of the Rubik’s cube is the cosmological singularity, that is the state of the Universe at the moment of the Big Bang. Currently the scientists do not know what exactly is happening at the point of singularity, and what forces or circumstances caused the Big Bang. The force that causes the Rubik's cube to go from singularity to maximum entropy is the movements of the person solving the puzzle. In contrast to the Universe, the Rubik's cube is an open system, while the Universe cannot be viewed as an isolated, closed or open system, being infinite and expanding, and thus not falling under the traditional definitions of the macrocosm. A closed system exchanges energy with the external world. An isolated system does not exchange energy or matter with the external world. The Rubik's cube is a great illustration of the creationist idea stating that the Big Bang was caused by the external force of the Creator, and the Universe is viewed as a closed system. We will further use the Rubik's cube to illustrate the main theories of the future of our Universe. The first theory is that after expanding to the maximum capacity the Universe will collapse to the state of singularity. In order to visualize the process, the teacher solves the cube into its original position. The second theory is the heat death of the Universe suggested by Rudolf Clausius. It reads that following the state where all energy is evenly distributed, the mechanical movement will run down. In order to illustrate this, the teacher solves the puzzle into a logical pattern other than the original state.

By means of analyzing, solving and dissolving the Rubik's cube the teacher draws the parallels and illustrates the contrast between the complicated notions of entropy, singularity, open and isolated thermodynamic systems, as well as the theories of the Big Bang and the Heat Death of the Universe, while gradually taking the students from the point of mere interest to the point of discovery and understanding. Therefore, the Rubik's cube is a powerful tool to visualize new material while ensuring feedback and engaging the learning audience.

References

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