# The Earth in Space: Developing & Implementing a Learning Unit and Testing its Impact on Understanding the Seasons of the Year

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## Abstract

Astronomy and space science are becoming more popular than ever. Space exploration and new astronomical findings, accompanied by beautiful photos, are bringing home far away worlds to millions of people.

In spite of this rising interest in astronomy, many children and even adults do not understand the meaning of the simplest astronomical terms.

In this study we underline the problematic aspects of instructing the correct and formal view of the cause of the seasons. It is demonstrated in this work and in other studies that students hold various conceptions (if any) about the cause of the seasons, that are most wrong. Though the common way to describe those concepts is by calling them 'alternative conceptions' we have demonstrated here that the notion 'spontaneous thought' might be the more appropriate way to describe them. In order to achieve the understanding of the formal view, more elementary conceptions, concerning earth in space, must be taught. These basic conceptions cannot be instructed by 'chalk and blackboard', or text books, because of the 3D nature of them, and because the students hold many alternative conceptions (that are extremely resistance to change) about them. We have developed and offered an instructional program that teaches the basic concepts in a 3D manner, and allows the student to construct a model of the cause of the seasons by synthesize them. The research group included ninety two 8th grade students who were instructed according to the new program, and were assessed by means of questionnaires (3D and content knowledge) and interviews. This study demonstrates that even by following the programs' 3D exercises, and in a three months interval between instruction and interviews, hybrid models appear in most of the seasonal change models presented by students. There was no change in 3D abilities of the students following instruction.