

Secondary School Students' Alternative Conceptions about Genetics

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Abstract

Alternative conceptions are considered to be the dominant factor in hindering students' learning in Science. The aim of this study was to explore 11th grade students' alternative conceptions of concepts related to genetics and heredity. A sample of 186 students from Riyadh city, Kingdom of Saudi Arabia, was randomly selected and given a valid and reliable written questionnaire. The results indicated that students hold many alternative conceptions about concepts related to genetics and heredity, involving direct and indirect cell division, reduction division, sexual and asexual reproduction, and the process of genetic information transfer. Specifically, the findings revealed that students have difficulty in differentiating between asexual and sexual reproduction, and also that there is a lack in students' understanding of the mechanisms of transferring genetics and heredity characteristics in reproduction and cell division. As a result, these types of alternative conceptions may have weakened students' ability to explain their answers to the written questions. Such alternative conceptions may, in fact, hinder students' understanding of most of the biological concepts.

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Introduction

Genetics is the science that examines the nature and behaviour of the genes, and the fundamental hereditary units (The American Heritage, 2009). It is also defined as the study of biological inheritance (McClean, 2000; Joshua, and Yun, 2010), because it deals with a wide variety of inherited traits, from the ability to bear large numbers of fruit in trees, to eye colour in mammals. It is the study of how DNA is passed down from one generation to the next. Genetics and heredity include difficult concepts in the biology curricula at the primary and secondary school (Hallden, 1988; Kelly and Monger, 1974; Longden, 1982) and even at college and university levels (Brumby, 1979, 1984; Johnston and Mahmoud, 1980; Kindfield, 1994a, b).

Meanwhile, genetics education has become increasingly important with the advent of recombinant DNA technologies and the subsequent emergence and availability of genetically modified food and organisms (GMOs). Scientific understanding of genetics and genome is important for the comprehension of all types of diseases (Spradling, et al. 2006), because it can lead to better diagnosis and treatment. In addition, social