Research on Student Learning

Students of all ages often interpret graphs of situations as literal pictures rather than as symbolic representations of the situations. [1] Many students interpret distance/time graphs as the paths of actual journeys. [2] In addition, students confound the slope of a graph with the maximum or the minimum value and do not know that the slope of a graph is a measure of rate. [3]
When constructing graphs, middle-school and high-school students have difficulties with the notions of interval scale and coordinates even after traditional instruction in algebra. [4] For example, some students think it is legitimate to construct different scales for the positive and the negative parts of the axes. Alternatively, students think that the scales on the X and Y axes must be identical, even if that obscures the relationship. When interpreting graphs, middle-school students do not understand the effect that a scale change would have on the appearance of a graph. [5] Finally, students read graphs point-by-point and ignore their global features. This has been attributed to algebra lessons where students are given questions that they could easily answer from a table of ordered pairs. They are rarely asked questions about maximum and minimum values; intervals over which a function increases, decreases or levels off; or rates of change. [6]
Students have difficulty translating between graphical and algebraic representations, especially moving from a graph into an equation. [7] Results from the second study of the National Assessment for Educational Progress showed, for instance, that given a line with indicated intercepts, only 5% of 17-year-olds could generate the equation. [8]
Little is known about how graphic skills are learned and how graph production is related to graph interpretation. Microcomputer-based laboratories (MBLs) are known to improve the development of students' abilities to interpret graphs. For instance, MBLs can help middle-school students learn that a graph is not a picture and overcome the height/slope confusion mentioned above. [9]

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