

Enhancing conceptual change using argumentative essays

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We show the utility of following up collaborative group work with written exercises. In a previous paper we discussed promoting conceptual change using collaborative group exercises in a manner based on the notion of conceptual conflict developed by Hewson and Hewson in which representatives of differing viewpoints debate their outlook. In this paper, we describe an enhancement of this method based on Feyerabend's principle of counterinduction—the process by which one theory or idea is used to affect change in its rival. Students were required to follow up the conceptual conflict exercises with a written critique. Evaluations were done using the same enhanced version of the force concept inventory as administered to the students in the previous study.

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I. THE ORIGINAL EXPERIMENT

In our original experiment, each intervention began with a collaborative group exercise in a manner based on the notion of conceptual conflict developed by Hewson and Hewson. Students were asked to take on a particular role within each group of three to four students. The students remained in the same group for all the exercises, but could change roles of reporter, scribe, time keeper, or critic in each activity. The only training students received was a warm-up exercise in which students had to come to a joint decision on who were the three greatest scientists of all time. Unlike the regular treatment sessions, all groups were asked to report on their findings.

For each exercise, students were presented with a demonstration or qualitative problem and were asked to discuss it for a fixed time. The time limits were set so that none of the groups had to wait for other groups to complete the task.

Two groups were selected because they had developed different concepts to explain a particular physical phenomenon.

A conceptual conflict was set up by having these two groups report to the class. The spokespersons of each group then debated the issue and the rest of the students were invited to address questions to this panel of “experts.” To emphasize that there were two concepts in conflict, the opposing issues presented by the two groups were clearly stated and the class then voted on which concept best resolved the problem. This voting is essential because students who have compartmentalized concepts often misinterpret statements in view of their eclectic viewpoint. Then the professor resolved the conflict by explaining with the aid of experiments from Ref. 4 how the replacement concept explained the demonstration or