

# THE EFFECT OF USING DRAMA IN SCIENCE TEACHING ON STUDENTS' CONCEPTIONS OF THE NATURE OF SCIENCE

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## ABSTRACT

This study investigated the effect of using drama as a supporting learning strategy on students' conceptions of the nature of science (NOS). Participants were 32 grade 10 and 11 students from a private all-girls' school in Beirut, Lebanon. Fourteen students chose to participate in the extracurricular drama activity. The remaining 18 students were considered the control group and required only to attend the culminating performances. The drama group met for 36 hours over the course of 12 weeks to write scripts about the development of the concept of light using the work of four scientists. Data sources included open-ended questions about the tentative, empirical, and theory-laden NOS, group discussions, interviews, and researchers' field notes and reflections. Results showed that the drama group students exhibited more informed views than the control group about the targeted aspects of NOS.

## 1. INTRODUCTION AND RATIONALE

Unlike some typical methods of science teaching such as lecturing, use of drama to portray the lives of scientists may help students achieve meaningful learning – especially if they are required to research, write, edit, perform, and reflect on performances – and provide them with a more authentic sense of science and how it works, rather than giving them feelings of detachment, a state often experienced by science students (Bailey & Watson, 1998). It was expected that use of drama would portray the dynamics of the Nature of Science (NOS), particularly because textbooks and teachers often present science as a final product, ignoring its developmental nature (Anderson, 1987), and further, that drama would help to dismiss the myth of the “scientific method,” which is presented to students at the beginning of almost every science course (Gibbs & Lawson, 1992). By examining scientists' lives and work and playing their roles, students might come to realize that scientists fail as much as they succeed, that an algorithmic or prescribed way for doing science is not readily available, and that science and scientists are not totally objective (McComas, 1996).

In this study NOS refers to the values and assumptions inherent to science and the development of scientific knowledge (Lederman, 1992). While disagreements about a specific definition for NOS prevail among philosophers, historians, and sociologists of science, there is a level of generality regarding some aspects of NOS at which virtually no disagreements exist. These aspects are emphasized in current reform documents in science education (e.g., AAAS, 1990). The NOS aspects emphasized in this study were that science is *tentative* (subject to change), *empirical* (based on and/or derived from observing the natural world), and *theory-laden* (scientific knowledge and practices are influenced by scientists' backgrounds, knowledge, training, theoretical commitments, and assumptions).

Despite theoretical relevance, research on using drama in the science classroom is presently sparsely reported in the literature (e.g. Bailey & Watson 1998, Budzinsky, 1995). Consequently, the present study set out to investigate the effect of using drama on students' conceptions of NOS. The study was guided by the following question: *What is the influence, if any, of engagement with drama-related activities on students' conceptions of the tentative, empirical, and theory-laden NOS?*

## 2. METHOD

### *Participants and Procedures*

Participants were 32 grade 10 and 11 students from a private girls' school in Beirut, Lebanon. Fourteen students participated in the extracurricular drama activity while the remaining 18 were considered a control group and were only required to attend the culminating performances. The drama group met for three hours on Friday mornings for 12 weeks. Participants worked in heterogeneous groups that included high, low, and average achievers. Before the study was implemented, participants were instructed about writing a play. Two language teachers (Arabic and English) with experience in drama supervised the writing/editing part of the activity along with one of the researchers. Participants were divided into four groups and were asked to choose one from a list of scientists whose work they were studying or had recently studied in science. The scientists selected were Archimedes, Al-Hasan Ibn Al-Haitham, Newton, and Edison, the development of the concept of light in the work of these scientists was the focus of the drama activity.

Participants were asked to pay attention to, and reflect on, NOS and scientific knowledge when writing the scripts. They were provided a set of questions to consider, such as, how open to change were scientific theories and knowledge, how "objective" was 'their' scientist, and how much influence did a scientist's background have on his work. All drama students were expected to engage in conducting research, writing, editing scripts, providing feedback to each other, performing the play, and reflecting on their work. Following script writing, a researcher led discussions in each of the drama groups in order to integrate *explicit* and *reflective* elements about NOS into students' drama activities (Abd-El-Khalick, Bell & Lederman, 1998). In these discussions, students were explicitly asked the same questions about NOS that were supposed to guide their writing of the scripts. Following the performance of the play, all 14 drama group students were involved in