The Impact of a Professional Development Program Integrating Informal Science Education on Early Childhood Teachers’ Self-Efficacy and Beliefs About Inquiry-Based Science Teaching

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Abstract

This report aimed to measure the impact of a unique professional development program entitled Project ASTER III (Active Science Teaching Encourages Reform) on teachers’ self-efficacy and perceptions about inquiry-based science teaching. Project ASTER III enabled teachers to explore inquiry-based science teaching through exhibit-based hands-on/minds-on investigations at a science museum and to develop a science curriculum aligned with museum exhibits and state and national science education standards. Quantitative data indicated that teacher beliefs were positively and significantly impacted by the professional development program and confirmed that programs like ASTER III are effective but need to be provided on a continuous basis to reinforce these beliefs in the teachers. Finally, three themes emerged from the analysis of the qualitative data from the participant journals: (1) impact on teacher understanding of inquiry, (2) increased confidence about science teaching, and (3) benefits of collaboration.

Introduction

The influence of informal science education has long been acknowledged as an effective tool to enhance the more formal methods of classroom teaching and learning. The successful integration of informal science education can serve as a powerful catalyst encouraging students and teachers to have unique, memorable, and motivating learning experiences in settings that extend far beyond classrooms. Community resources such as zoos, science centers, parks, planetariums, and art museums can be highly engaging places for science teachers and students. The establishment in 1984 of the Informal Science Education program of the National Science Foundation (NSF) is a testament to the nation’s high regard for the opportunities that these resources provide to students and teachers. Furthermore, NSF is committed to the principle that scientific discoveries can be understood and enjoyed by all, and it has long recognized that understanding and excitement about science come from self-directed, voluntary explorations. NSF calls these processes...
“informal learning.” In an era in which state and national standards permeate the school curriculum, designing inquiry-based approaches at informal science centers while aligning with state and national science standards can pose a challenge to educators, curriculum directors, and informal science center directors. It is well-documented that teacher self-efficacy is associated with inquiry-based teaching. Therefore, it is imperative that professional development programs in both formal and informal settings help the teacher feel more comfortable teaching science. This paper explores the effect of a unique professional development program aimed at improving teachers’ self-efficacy and perceptions about inquiry-based science teaching while designing effective curriculum and field trips for K-3 students all aligned with state and national science education standards.

**Literature Review**

**Informal Science Education**

Worldwide support of the valuable role informal science centers play in the science curriculum has been reflected throughout multiple reform documents. In the United States, for instance, the *National Science Education Standards* (*NSES*) call upon educators to identify resources outside of the school setting as they reveal, “The classroom is a limited environment. The school science program must extend beyond the walls of the school to the resources of the community” (National Research Council [NRC], 1996, p. 45). Additional support is expressed in the National Science Teachers Association’s (NSTA) (1999) *Position Statement on Informal Science Education* that states, “NSTA recognizes and encourages the development of sustained links between the informal institutions and schools.” Furthermore, “NSTA strongly supports and advocates informal science education because we share a common mission and vision articulated by the National Science Education Standards. . . . Informal science education complements, supplements, deepens, and enhances classroom science studies. It increases the amount of time participants can be engaged in a project or topic. It can be the proving ground for curriculum materials.” Recently, McComas (2006) explained that museums have become purposefully more engaging and interactive as a way to encourage inquiry and hands-on investigation. This trend is in contrast to the past when museums tended to operate on a look but do not touch philosophy.

The positive impact of integrating museum learning into the science classroom has been widely reported in the literature (Falk & Dierking, 1997; Morrell, 2003; Price & Hein, 1991; Rennie & McClafferty, 1995). For example, Ramey-Gassert, Walberg, and Walberg (1994) examined the collaborative efforts between science museums and schools and provided a list of benefits of museum learning such as providing opportunities for active engagement with real objects intended to enhance the classroom learning experiences. These authors emphasized that more collaborative efforts are needed between science museums and schools as both entities complement each other through different facets of learning. Furthermore, the cognitive impact of a field trip experience was examined by Morrell (2003) and revealed that students increased and retained their knowledge after participation in the field trip experience. An earlier study by Falk and Dierking (1997) found that nearly 100% of the individuals they interviewed could remember at least one thing they learned during an early-elementary school field trip, and most individuals could relate three or more things many years after the field trip ended, thus showing the impact a field trip can have on students.