Pre-College Science Education: Learning in Practice in K-12 Summer Institutes

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K-12 Summer Institutes Background

- From 1990-2008
- Under grants from the Howard Hughes Medical Institute
- Bryn Mawr College, their Center for Science in Society, and Haverford College have sponsored the Summer Institutes for K-12 Teachers
- A component of Bryn Mawr and Haverford College's K-16 Collaborations in Math and Science Education
- 2 Pre-College Science Education Internships are available for undergraduate students interested in careers in science education
- Interns aid and participate in the K-12 Summer Outreach Program

Purpose of the Institutes

- Interaction and Collaboration between K-12 teachers and college professors
- Discussing, reflecting on, and implementing a discovery-based approach to education
- Investigating and evaluating technology for potential use in the classrooom
- Introducing the concepts of interdsciplinarity and transdisciplinarity
- Finding value and use for classroom diversity

Purpose of the Internship

- To provide Bryn Mawr and Haverford College students with the chance to think about educational theories and practices
- Participate in conversations with K-12 educators and college professors about education
- For the students to be involved in every level of the institute from helping with presentation preparation to providing critiques of the program

My Interest in the Internship

- To take time to reflect on my own educational experience and place them in a context of educational theories and practices
- Develop and describe my own educational philosophy
- To learn about institutes goals and history in preparation for facilitating and participating
- To help the institute directors prepare for the K-12 Summer Institutes
- Take part in a variety of conversations about education, science, and the summer institutes
- To interact with local K-12 public school teachers and discuss area specific issues
- These discussion forums can be found on Serendip

Materials and Methods for the K-12 Summer Institutes

Virtual Thinking/Learning: Explorations of the Role of Computing in Education

- Directed by John Dougherty, assistant professor of Computer Science at Haverford College
- Presenters from a variety of local academic institutions
- Consisted of lectures, demonstrations, discussions, and hands-on activities
- To inform teachers about the field of computer science: it's advantages and limitations
- Describing subfields such as artificial intelligence and information science
- To foster interdisciplinary instruction by informing teachers about the connections between computing and other academic subjects
- Introduce computer applications for generating images or animations, media computations, kinesthetic learning exercises

Brain and Behavior Implications for K-12

- Lead by Paul Grobstein, Elanor A. Bliss, professor of biology at Bryn Mawr College
- Introducing the field of neuroscience
- Providing a perspective of neuroscience; it's potential applications and limitations
- Considering how recent developments in neuroscience could inform educational theory and practice
- Encouraging teachers to reflect on the relevance of neuroscience to both their classrooms and their lives
- Creating an environment where educators from all levels can interact and share insights
- Developing an interdisciplinary approach to incorporating neuroscience into science education and education in general
- Aiding teachers in producing web materials for Serendip to be shared with others

Science as Interactive, Interdisciplinary Inquiry

- Lead by Peter Brodfuehrer and Wilfred Franklin
- Primary presenters were Peter Brodfuehrer and Wil Franklin
- A returning institute participant also presented
- To discourage the stereotype that science is a difficult and elitist activity practiced by a small minority of the population
- To present science as a question based process for learning about ourselves and our environment or inquiry
- Science can be taught and understood by everyone
- Supporting the teaching of science as a discipline and an interdisciplinary ingredient to be added to a variety of curricula
- Presenting teachers with a series of inquiry-based science activities to be modified for use in their classroom

Selected Responses and Results

Sketches of Successful Moments

- A participant prepared a project, for the Brain and Behavior Institute, using a program that she had been introduced to in the Computer Science Institute.
- The choice of a participant to modify the paper-making demonstration by replacing pre-treated cotton with grass. This decision was motivated partly by her desire to see if the fibers in ordinary grass obtained from her lawn could be used to produce paper. She was also interested in sharing the environmental and scientific connections with her students.
- An account of the dreams of a paraplegic, by a paralyzed participant. This was information relevant to a conversation about the nervous system at the Brain and Behavior Institute. The fact that the participant felt comfortable sharing deeply personal information is evidence of the quality and openness of the conversations occurring.

Selected Participant Quotations

- The nervous system generates activity by it self ... Which is letting me understand that students learn by hands on, rather than pencil and paper ...
- I love the online form for this purpose. It allows us to make our points, explore what interests us and engage other people in meaningful diversions that don't slow down the pace of the overall class.
- The strawberry DNA extraction was more rewarding than I thought it would be. The procedure worked easily and as predicted. It also left us with some questions that we could pursue.

My Conclusions from the Summer

The Institutes

- Participants were excited and engaged in all three institutes
- We were able to contribute meaningfully to their educational theories and practices as they were to ours
- Participants produced wonderful projects connecting the institute presentations to their own classrooms, which are available on Serendip

Myself

- I have developed a more reflective attitude towards both my own education and that of others
- There is a chasm between the theory and practice of education, but it can be bridged
- Knowing some simple implications of the neurobiology can radically affect my perceptions of other people
- Since science and science education can be interdisciplinary, maybe it is possible to include scientific concepts and literature in a curriculum?

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