

## **Restructuring Elementary Science Education within Alternative Preparation Programs**

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### **VEXTATION: WHO'S DRIVING THIS BUS AND WHERE ARE WE GOING?**

On January 20th, 2009, I sat with my two-year old son on my lap and watched as Barack Obama was sworn in as the 44th President of the United States of America. Like millions of other people around the world, I was utterly intrigued by the events of the day. However, I was particularly interested in President Obama's inaugural address and vision for the country's future. In his speech, the President made the following remarks regarding his commitment to the role of science in our world:

*We will restore science to its rightful place and wield technology's wonders to raise health care's quality and lower its costs. We will harness the sun and the winds and the soil to fuel our cars and run our factories. And we will transform our schools and colleges and universities to meet the demands of a new age. (Presidential Inaugural Address, 2009)*

As a science educator, I found President Obama's ideas encouraging. However, I am cautiously optimistic about his call to action and its potential to affect positive change in current educational system; specifically for children of color and poor children who are often under-served by the nation's schools. Currently, I am a faculty member in Georgia State University's Urban Accelerated Certification and Master's (UACM) program; a Georgia Teacher Alternative Preparation Program (GTAPP). The UACM program is an alternative certification program for individuals who have an undergraduate degree or higher in an area other than education and are dedicated to teaching in urban elementary schools. The UACM program's mission is "to promote the success of elementary students schooled in urban contexts through the development of pedagogically competent, equity-oriented, caring, empowered teachers who are change agents inside and outside the classroom."

The UACM program is a two-year program. Students in the first year of the program experience a full year of student teaching and supervision in conjunction with university courses intended to provide a strong foundation for teaching effectively in urban schools. Students who complete the first year of the program and pass the state certification exam receive a non-degree teacher certification in early childhood education (Pre-K – 5) and an English to Speakers of Other Languages endorsement (ESOL) in Georgia. During the second year of the program, the students work toward completion of their Master's of Education (MEd) degree and teach full-time in a high-need urban elementary school classroom in the metropolitan Atlanta area. The program is organized around a cohort model and considerable attention is given to the development of a community of teachers. Students in the program are encouraged to employ both individual and collective agency in their efforts to confront problems faced by urban schools and teachers. A focus on social capital in service of social justice has created a unique culture in the UACM program.

In terms of science preparation, students enrolled in the UACM program complete a science/social studies course in their first year and a science/mathematics course in their second year. These courses are designed to provide students with the pedagogical tools needed to integrate science effectively with other content areas at the elementary level. This is a valuable and necessary strategy for ensuring that urban elementary students are exposed to science content and habits of mind. As one of two science faculty members, I am responsible for co-teaching the science/mathematics course in the second year.

In recent years, the UACM program has come under scrutiny. The program is being compared to other alternative certification programs (e.g. Teach For America), which allow a student to become certified and earn a Masters degree in as little as one calendar year. Because they require fewer courses and are therefore less expensive, these programs are often more attractive to prospective students. Consequently, the design and structure of the UACM program is being questioned and the UACM faculty has engaged itself in the trimming of the program of study and the redevelopment of many of its courses. As a member of the faculty, I am concerned with the decision to mirror one program after another for reasons other than program effectiveness. Furthermore, the UACM program, like many other alternative preparation programs, is aimed at addressing the pressing need for effective teachers in urban schools. By limiting the time needed to earn certification, these programs will certainly attract more aspiring teachers. However, we also risk flooding urban schools with poorly prepared teachers who must learn to teach while attempting to teach children in urban classrooms, a challenging task for many veteran teachers.

### **VENTURE: NEW MODELS, NEW EVIDENCE**

Research has shown that many elementary teachers feel unprepared to teach science. Furthermore, they often postpone science instruction because they believe that reading and mathematics instruction is more appropriate and relevant to elementary school. Consequently, most elementary students experience very little science instruction. When science is taught in the elementary classroom, it is rarely done in an effective manner. These findings are particularly important for students in urban schools. For these students, schools have the potential to be a powerful mechanism for leveling the playing field between different socioeconomic, cultural, and racial groups. In my research on the factors that contribute to development of successful African American scientists, engineers, and mathematicians, I found that early childhood experiences with science was a common and valuable factor in the life histories of the majority of the study participants. If we hope to answer the President's call for a transformed educational system that prepares all students for the demands of a new age, education programs must change to meet the unique needs of this new system. I am most interested in those changes that will better prepare elementary school educators to teach science effectively; particularly in urban schools.

Alternative preparation programs have become a popular avenue toward certification. The "success" of programs like Teach for America and similar programs have led some critics to question whether colleges of education are even necessary. In fact, comparisons with these other alternative preparation programs have resulted in a push to restructure the UACM program. Unfor-

unately, the UACM program has very little research based evidence of the effectiveness of its current program on teacher preparation or student achievement. As a result, the UACM faculty is currently restructuring the program.

### ***Redesigning the Science Course***

My proposed venture, rooted in this opportunity, has two parts. First, as a UACM faculty member, I am actively involved in the redesign of the program. The changes to the program's science education courses must compliment the changes to the overall program structure, meet the needs of the teachers, and fit with the current educational context. Given the focus of Science at the Crossroads and the expertise of the conference participants, I am seeking concrete advice on how to best redesign the program's science education course. There are a host of existing models that provide some guidance. These include on-site or field-based courses, integrated courses, online courses, and curriculum-based courses. The UACM program has incorporated aspects of some of these course structures into its program. For example, the current science course is an integrated science/mathematics course with a strong field-based component. Unfortunately, the course does not sufficiently meet the needs its students, nor does it prepare teachers to meet the challenges outlined in President Obama's science initiatives. For example, the current course focuses on (1) integrated science and mathematics curricula, (2) science and mathematics content pedagogy, and (3) pedagogy specific to the urban context. It is not designed to cultivate the teachers' understanding of the *science content* outlined in the standards. In fact, UACM teachers do not participate in any courses designed to address their science content knowledge. Also, the course represents one of only two opportunities that UACM students have to explore science pedagogy and science content pedagogy. In both of the courses, the focus is shared between science and another content area. It is my hope that the redesigned course will address both of these deficiencies and better prepare teachers to serve students enrolled in urban elementary schools.

The process of redesigning the course is made more challenging by the criteria for the redesigned UACM program structure. These criteria, designed to align the UACM program with alternative preparation programs like Teach For America, include *fewer* required courses, *fewer* university-based courses in the second year of the program, a focus on preparation in mathematics, language arts, and reading, and larger program enrollment. At the same time, the redesigned science course must meet the specialized needs of the UACM program and its mission. In addition to creating opportunities for students to strengthen their understanding of science content pedagogy, the course must also improve the teachers' understanding of elementary science content, prepare teachers for the specific context of urban schools, and support the continued development of social capital as a vehicle for activism and equity pedagogy. In many ways, the needs of the program seem to require an expansion of the course. However, given the desire to reduce the size of the UACM program as a means of remaining competitive and cost-effective, it is unlikely that any consideration will be given to the addition or expansion of courses. What is needed is a course structure that fits contemporary parameters for alternative preparation programs and supports the mission of UACM program to provide students in urban schools with "pedagogically competent, equity-oriented, caring, empowered teachers who are change agents inside and outside the classroom." The task of designing such a course offers a unique challenge.

### ***Evidence of Effectiveness***

The second part of my venture focuses on the development of a research program aimed at measuring and providing evidence of the UACM program's and, more specifically, the science course's effectiveness. While it is questionable whether research can provide adequate evidence of a program's impact on student achievement, careful investigation can offer insight into the effects of a given program on teacher related outcomes such as science content knowledge, teacher self-efficacy, or teacher retention. Unfortunately, the bottom line for educational effectiveness continues to be student achievement as demonstrated by scores on standardized test. Consequently, programs like the UACM are hard pressed to provide legitimate evidence of the connection between their work with pre-service and in-service teachers and the academic success of children in the classroom. This leaves them vulnerable to accusations of incompetence and insignificance. Furthermore, if programs like UACM cannot provide ample evidence of their ultimate effect on student achievement then they are at risk of being labeled as mere credentialing institutions.

What is needed is research that moves the focus from test scores to other measures of teacher effectiveness. Currently, the UACM program is collecting data on its current students and graduates. Preliminary analysis of the data from the science education course has provided valuable insight into the teachers' development as science educators and their potential to serve urban communities successfully. . However, I am unable to uncover any findings that indicate a clear connection between the experiences in the course and student achievement in the classroom as defined by school officials. As a result, I find it difficult to develop an argument to justify the structure and objectives of the science education course or the UACM program as a whole. This is a problem facing much of the educational community. Solving it will provide teacher educators with the ammunition needed to defend their work and legitimate their collective voice as valuable part of conversation on the reform of our educational system.

While I am convinced that this venture will result in an improved program and course, I have a number of questions which need to be answered before I move forward. First, what are the necessary features of an in-service science course that provides the specific pedagogy and content knowledge needed to serve as an effective teacher in an urban elementary school? I understand that the answer to this particular question may point to non-traditional models of teacher development. However, the suggested models must satisfy two sets of parameters which, in many ways, seem opposed to each other. Finally, given the context of the current educational system, what evidence is necessary to prove the effectiveness of the proposed course? This question is a necessary companion to the question of course design. If I am unable to prove the *effectiveness* of course design then I will surely fall prey to a arguments for program *efficiency*. Inevitably, we will create programs and courses that efficiently produce inadequate teachers to work with children who continue to be underserved by our educational system.