Work in Progress - Engineering the Magic School Creativity and Innovation in Context

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Abstract - **We review the past three years of our experience and results from the Villanova PIVOTS Science & Theatre Magic Program, a 3-week academic summer program where students and faculty work with teams of teenagers to apply scientific principles in the creation and staging of a "School of Magic" – a fantastic day-long adventure that they then share with younger, underprivileged children. The teens act as guides/teachers (and powerful role models), and deliver science-inspired "magic lessons." Hundreds of younger children, many from economically impoverished urban neighborhoods, have visited the magic school that the teenagers created. The foundations of the program rest on a novel combination of features, each of demonstrated pedagogic value and critical to the preparation of a globalization-ready science and engineering workforce: 1) Integration of STEM with theatre and creative arts; 2) Service learning; and 3) Multidisciplinary exploration with a clear design focus. A partnership between academia, industry, government, non-profit organizations, and K-20 educators was created through this initiative, enabling the program to evolve and embrace complementary goals for diverse populations of students and faculty, entailing new challenges and opportunities.**

Index Terms - Creative design experiences, K-20 initiatives and partnerships, Performing Arts, Service-learning.

INTRODUCTION

In 2005, a group of Villanova University faculty designed and implemented an innovative, two-week multidisciplinary summer program for teenagers entitled the Science & Theatre Magic Program. The foundations of the program rest on a novel combination of features, each of demonstrated pedagogic value and critical to the preparation of a globalization-ready science and engineering workforce: 1) Integration of STEM with theatre and creative arts; 2) Service learning; and 3) Multidisciplinary exploration with a clear design focus (a full bibliography is given in [1], but see for example, [2-5]). Through this project, the Peer Interdisciplinary Volunteer Outreach with Theatre and Science (PIVOTS) partnership was created, bridging academia, industry, government, non-profit organizations, and K-20 educators. This partnership enabled the program to evolve and embrace complementary goals for diverse populations of students and faculty, entailing new challenges and opportunities.

In this paper we review results from the 2006 Science & Theatre Magic Program and discuss the PIVOTS partnership and its role in fostering diversity.

The 2005 and 2006 programs each enrolled 14 participants. These teens attended inquiry-based science and theatre classes taught by Villanova faculty and were given a rough sketch of a storyline for an "American School of Magic," which they were to flesh out using their own ideas, and especially what they learned in their science classes, and to then perform for groups of younger children during the last week. Inspired by the *Harry Potter* series of books [6] (but not requiring familiarity with, or affinity to the HP story), this culminating day-long event was performed three times during the last week of the program.

THE 2006 SCIENCE & THEATRE MAGIC PROGRAM

Significant changes were implemented in 2006 to address challenges identified during the 2005 program. An extra week made it possible to develop lesson ideas, characterization, and written materials to distribute. In addition, although the Magic School clearly succeeded in giving both groups (creators and visitors) an experience that they would eagerly pursue again, for the younger children there was a need to make the connection with science more clear and to provide follow-up that takes advantage of the interest generated. Thus, in 2006, with help from their faculty mentors, participants created booklets describing and explaining the types of tricks that they designed and preformed in the magic school. These booklets were integrated with the story of the magic school. They were referred to as "Spellbooks" and, during the performance, were "sold" (using "magical money" obtained at the "magic bank") to the younger children as part of their "school supplies." For the counselors and other adults that come in regular contact with a wider population of younger children, spellbooks provided something to take back to their summer camp with

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easy-to-use written instructions for science activities – activities that their charges were eager to revisit.

The 2006 program also saw further growth as PIVOTS partnerships expanded or became well established; the project began also expanding its scope by forging alliances with school teachers and other educators and by beginning to seriously address questions of diversity at every level.

While the students enrolling in the Science & Theatre Magic Program tend to come from suburban middle class backgrounds, they perform their "magic school" for groups of children drawn primarily from economically impoverished urban neighborhoods. In 2006, funding was secured to offer scholarships to enable teenagers from these neighborhoods to enroll in the program and to provide transportation and small stipends. With the inclusion of teens from these neighborhoods it was essential to attempt to forge a real connection between the two populations of children. We were able to do this with assistance from the Philadelphia Department of Recreation, which runs 140 summer recreation camps around Philadelphia, so it was possible to choose groups of children to visit the magic school based on the zipcodes of the teen participants, which in turn allowed the young children to observe older peers from their neighborhood as positive role models.

ASSESSMENT

A formal assessment of the 2006 program [7] was carried out by the Villanova Office of Planning, Training, and Institutional Research (OPTIR), based on the assessment model developed by Debra Kossman of National Analysts, Inc (Philadelphia) the previous year [8]. Data were collected from the 14 teens using a standard focus group process and a written survey.

Overall, the students felt very positive about the Program. On a on a five-point scale ranging from "hated the Program" (1) to "loved it" (5), the average score from students was 4.6. Of the fourteen students, ten indicated that their interest in science increased, with the remaining four indicating it stayed about the same. Many came away with a deepening respect for the teaching and acting professions, indicating a better appreciation for how much work goes into being an effective actor and teacher. A number of the students indicated that they were not yet thinking about what careers they would like to pursue, but that it did help them better clarify where their interests lie. In terms of interest in STEM careers, students indicated they gained a better appreciation and awareness of science, theatre and teaching. This included being less intimidated by the sciences and an awareness of the positive effect of theatre experience on improving public speaking skills.

CONCLUSIONS AND FUTURE WORK

The 2007 summer program will again be informed by the internal and external assessments to improve the program. The most significant changes for 2007 will be expansion of faculty/counselor orientation and training and development of a volunteer network

As with any novel undertaking, a challenge remains to find ways to recognize and reward significant contributions made by faculty, administrators, and other individuals through this project[9]. The PIVOTS initiative must address this issue in order to sustain itself and in order to reach its full potential. The global spirit of philanthropy and volunteerism raises the possibility that a campus may bring forth a great wave of good will. It is critical that mechanisms be in place to efficiently and effectively direct this collective energy towards promising projects and ideas, to allow the administration to share in these efforts by appropriately rewarding individual contributions, and to maximize opportunities for a campus community to experience the intrinsic rewards connected with service.

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