

## Mission-Centered Collaborative Bridges to Increase STEM Motivations

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# MISSION-CENTERED COLLABORATIVE BRIDGES TO INCREASE STEM MOTIVATIONS

Colleen Duffy

## INTRODUCTION

John Goodlad (1998) was one of the first to promote school-university partnerships as opportunities for simultaneous renewal with great potential for the development of mutually beneficial relationships. Recent studies have examined the effect of K-12 and university partnerships on diversity, increased academic benefits for students and teacher candidates, and interpersonal benefits for all stakeholders (Domina & Ruzek, 2010; Magiera & Geraci, 2014; Smith et al., 2016; Williams & Shaw, 2003). Although school-university partnerships have been shown to lead to greater access to resources and opportunities for professional development, to stronger missions and identities, and to increased organizational effectiveness (Henk et al., 2013), K-12 schools and institutes of higher education generally continue to operate independent of each other (Thelin, 2011).

This essay describes the story of a mutually beneficial PK-20 partnership between the Catholic School System of the Diocese of Scranton and four collocated collegiate partners: Misericordia University, Kings College, Marywood University, and the University of Scranton. This partnership formed to address two needs. First, it addressed the need of the K-12 schools to provide new science, technology, engineering, and math (STEM) programming in grades three through five; and, second, the need of the colleges and universities to provide field opportunities to preservice teachers. What this essay highlights is the utility of the shared mission in brokering a mutually beneficial partnership.

## COMPLEMENTARY CHALLENGES AND SHARED MISSIONS

The Catholic School System of the Diocese of Scranton is comprised of 16 elementary

schools and four high schools that span Luzerne and Lackawanna Counties in Northeastern Pennsylvania. Four Catholic colleges and universities are also situated in the same geographical region: Misericordia University, Kings College, Marywood University, and the University of Scranton. All four institutes of higher education are classified as medium-sized colleges with annual enrollments falling within the range of 2,000-10,000. Each draws primarily from the same regional market, and all four are recognized on Money Magazine's list of the "best colleges in America," placing them in the top tier of nearly 4,400 colleges and universities nationwide.

Aligned challenges provided the inroads to partnership between these groups. On one side, the K-12 diocesan schools had a growing interest in STEM-based learning to develop prepared students that can pursue careers in important and timely fields. However, limited human and financial resources have greatly reduced the opportunities the diocese has had to expand educational programming to meet the evolving needs of all learners. On the other side, the colleges and universities needed to place large numbers of preservice teachers in local classrooms to meet rigid state mandates in teacher preparation. While this experiential learning is beneficial to the student teachers, it places a strain on teacher preparation programs to find opportunities and many small colleges and universities find themselves vying for a limited number of placement opportunities with their geographical competitors. In other words, the K-12 challenge – a need for STEM teaching capacity – was the solution for the other – a need to place student teachers in classrooms – and vice versa.

That said, aligned challenges are not always sufficient to produce a successful partnership; in this case, the shared missions enabled more groups

to work together than would have been possible without it. Although each PK-20 entity has its own unique mission and core values, all share a commitment to promoting intellectual, spiritual, and personal development while preserving the Catholic identity. This point of convergence serves as the foundation for this collaborative framework in which the Catholic school system has united with higher education partners. Moreover, it enabled the colleges and universities to partner despite the fact that they are natural competitors in many ways (e.g., student recruitment) and have competed to place preservice teachers in schools in the past. Putting aside competition and uniting in a shared mission to foster the intellectual and personal development of K-12 students and preservice teachers was paramount to the success of this collaborative venture.

## **THE RAISE INITIATIVE AND CLUB 8**

To overcome these challenges and to perpetuate shared missions, the K-12 administrators contacted their university counterparts to solicit interest in forming a PK-20 partnership. This resulted in the creation of the Reimagining Authentic and Innovative STEM Education (RAISE) initiative. Faculty representatives from four collegiate partners worked with K-12 administrators to extend K-12 STEM programming, provide valuable field experiences for preservice teachers, and create research opportunities for teacher preparation faculty.

During the first year of the RAISE initiative, the PK-20 partners met regularly and worked to identify needs, develop goals, and take actions to actualize their plan. The identified need that inspired the partnership was the K-12 system's desire to increase STEM programming. Once presented, collegiate partners were able to brainstorm solutions that would also serve higher education students and faculty by meeting some of their identified needs, specifically, guaranteed field placements and opportunities for faculty to carry out research. Each inter-collegiate partner brought their diverse perspective and unique experience to the collaborative venture. This enhanced and

hastened the planning process and led to greater outcomes, specifically the creation of Club 8, an after school STEM program.

During its pilot year in the 2018-19 academic year, Club 8 was offered at two different elementary schools, one in Luzerne County and one in Lackawanna County. The K-12 administrators were responsible for securing grant funding, purchasing necessary materials for Club 8, conducting a needs assessment to identify two schools to serve as pilot schools, recruiting teachers to help facilitate the program, guaranteeing field placements for preservice teachers from the partner universities, and supporting the collaborative facilitation of the program. The collegiate partners were responsible for curriculum planning, providing professional development to the K-12 faculty centered on STEM based learning, recruiting preservice teachers from their programs to facilitate the program, designing and implementing research studies to determine the effect of Club 8, evaluating the quality of the after school program, and supporting the facilitation of the program.

Preservice teachers from the partner institutions under the guidance of K-12 teachers facilitated the after-school program for the 66 boys and girls in grades three through five that participated in the 10-week pilot program at the two Catholic elementary schools in the fall and again in the spring. Notably, the intercollegiate nature of this collaboration maximized the benefits of Club 8. Two elementary schools were able to offer the program in neighboring counties, which benefitted a greater number of K-12 learners and provided twice the amount of field placements for preservice teachers.

Curriculum and resources developed by NASA's Beginning Engineering Science and Technology (BEST), were used in this program. The students were able to develop problem solving skills and strengthen their 21st century skills as they assumed the authentic role of engineers. Working collaboratively to solve a weekly challenge, for

example, designing a lunar pod that could carry a space buggy and withstand a two-story drop; students asked a question, imagined a solution, planned a design, created a model, experimented and tested that model, then improved the original design as they accomplished the identified challenge.

To gauge the efficacy of the program and partnership, higher education faculty partners conducted a quantitative, pre-test/post-test design study that measured the effect of Club 8 using the Common Instrument Suite (CIS), a youth self-report survey that used a 4-pt Likert scale to determine what effect, if any, participation in Club 8 had on the study participants' STEM engagement, interest, and motivations (Partners in Education and Resilience Institute, 2018). Inferential analysis using Pearson r correlation reveals that Club 8 did have substantive significance. A positive effect on participants' motivations and interests about STEM was observed, indicating the students were more motivated and interested in STEM as a result of the program. Post-test responses also indicate that 59% of participants "strongly agreed" that they had interest in STEM and that 59% of participants "strongly agreed" that they enjoyed participating in STEM activities.

## DISCUSSION

Collaborative relationships between K-12 educators and university faculty can provide opportunities for growth and promote the development and sustainability of quality educational programming (Smith et al., 2016). The partnership described herein is a prime example of this idea; both groups benefitted from the experience. For the K-12 schools, their students had the benefit of participating in an after-school STEM program that was shown to increase their STEM interest, STEM participation, and STEM motivations. For the colleges and universities, sixteen preservice teachers had

guaranteed field placements facilitating the program that did not previously exist and afforded them the opportunity to apply classroom knowledge in an authentic and significant way.

Importantly, uniting around the mission was critical to secure multiple collegiate partners, which may have competed under different circumstances. As noted above, engaging multiple collegiate partners led to an enhanced STEM program – both in design and in implementation capacity. While mission was the bridge to a partnership, the partnership also provided multiple avenues for promoting intellectual, spiritual, and personal development, promoting the Catholic identity. Higher education faculty had the opportunity to engage in service to the profession and the community by providing professional development for their K-12 colleagues. This work supported the transformation of learning environments from a traditional, teacher-centered model, to a student-centered inquiry-based model, through the use of the NASA's BEST curriculum and resources.

The partnership also led to multiple avenues for continued scholarship as faculty engaged in research related to STEM programming and the effect of K-12 and intercollegiate collaborations.

The benefits this mission-centered PK-20 collaboration provided to K-12 learners, K-12 teachers, preservice teachers, and higher education faculty prompt this author to encourage other educational leaders to consider identifying PK-20 partners, even those typically considered competitors, with a shared mission. Breaking away from common practice, where PK-12 and higher education operate independently of each other (Thelin, 2011), holds great potential for promoting intellectual, spiritual, and personal development.

**"Collaborative relationships between K-12 educators and university faculty can provide opportunities for growth and promote the development and sustainability of quality educational programming."**

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Colleen M. Duffy, Ed.D. is currently serving as chair of the Teacher Education Department and the director of Graduate Teacher Education at Misericordia University in Dallas, PA. She is a former k-12 biology and environmental science teacher and earned her doctorate in Educational Leadership with a focus in educational technology from Wilkes University in 2016. Her teaching and research interests are focused on assessment, the effective integration of technology to increase achievement, and all things STEM. She seeks to improve teacher preparation by infusing frequent opportunities for students to engage in authentic, performance-based assessments and inter-professional education opportunities.