Session Title:
The Impact of Different Early-College/Dual-Enrollment Programs on Minority Student Persistence in Science Disciplines

MSP Project Name:
Minority Student Pipeline MSP – (MSP)2

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Project Session

Strand 3

Summary:
In the United States, minorities are generally underrepresented in the STEM fields. There is considerable evidence that minority students benefit from early exposure to college-credit courses while in high school. In an effort to ameliorate the representation gap in the sciences, our MSP has implemented multiple early-college/dual-enrollment courses for high-school students, following different instructional models. One program is a full-time, residential, summer program, and the other is a school-year program with single courses that take place in the high schools. This ongoing study employs mixed methods to determine the effects of these different dual-enrollment programs on students’ persistence in college and choice of major. Newly available data on college attendance patterns for student participants will be shared.

Section 1: Questions framing the session:
1. Does exposure to college-credit courses in high school result in higher college attendance rates by underrepresented minorities?
2. Do opportunities to take college-level science courses in high school increase the likelihood that minority students will consider majoring in science?
3. What differences can be found on these questions between the two programmatic models, and what factors may account for them?

Section 2: Conceptual framework:
*This proposal addresses conference strand 3(a): Measuring and monitoring implementation. How do we know if we are making a difference? How do we know what aspects are contributing to the difference?*
Minorities’ underrepresentation in STEM

Minority students are underrepresented in STEM disciplines throughout higher education and into employment or vocation, despite beginning college interested in majoring in STEM fields at rates similar to those of white students. This is largely due to lack of preparation in mathematics and science in the early elementary grades, but there are also significant socio-cultural. Students’ struggles with stereotypical images, negative perceptions from teachers, and the absence of minority role models also play a part.

[Seymour and Hewitt (1997) found many different factors that influence minority undergraduates in their decision to leave or remain in a science or math major. Some of these factors are shared by white students, such as having chosen a major for inappropriate reasons (e.g. to please other people in their lives) or inadequate pre-college preparation. Other factors are specific to students of color, such as lack of structural coherence among advisory, tutorial, financial, and mentoring functions of the institution, or racism (Seymour & Hewitt, 1997).]

Minority student predisposition to pursue higher education

Some research has examined students’ postsecondary decision-making processes, and identified three phases of this process: predisposition to attend college, the search for the right college, and the choice of where to apply and enroll. To illuminate the different types of predisposition among Black students, Freeman (2005) constructed a model in which she defined the following roles students take during this early phase:

- **Knowers** – have always recognized they would attend college; usually come from families who have set the expectation and it’s automatically assumed the child would attend college
- **Seekers** – students who, between 1st and 5th grade, have identified that college attendance is possible and a goal
- **Dreamers** – begin considering postsecondary plans between 7th and 12th grades, but are much less likely to believe college is an option

This model may be useful for beginning an analysis of the reasons different students persist to different degrees in the pursuit of a STEM major in college, and so we are adopting it for this study.

The benefits of dual enrollment

Dual enrollment programs allow high school students to earn credit at both the high school and college levels. Students are usually taught by postsecondary faculty, either at the college campus or high school. Studies have found that dual enrollment is positively related to a student’s likelihood of earning a high-school diploma, enrolling in a four-year institution, persisting to a second semester and second year in college, and achieving a higher grade-point average in college than non-dual enrollment students, and that underrepresented minority students in particular benefit from early exposure to college courses.

The question of whether or not these benefits of dual enrollment for minority students include increased persistence specifically in science fields has been largely unexplored. There is some evidence that programs designed to support students’
transition from high school or community college into four-year institutions are particularly helpful for bringing first-generation and minority students to college with an interest in STEM majors, but we are not aware of studies that examine the specific benefits of dual-enrollment programs for minorities in science. This study aims to explore these questions in the more specific context.

Methodology
A positive association has been documented between dual enrollment opportunities and college matriculation, retention, and graduation. In this study, we test this association – particularly in science – in the context of specific dual-enrollment interventions implemented in a large majority-minority school district. To this end, the study was designed as a mixed-method, longitudinal case study involving the two different dual-enrollment programs.

Data Sources
Our project, “Minority Student Pipeline MSP” or (MSP)², aims to expand the minority student pipeline into science fields in higher education. The project includes two different dual-enrollment programs for high-school students:

1. A concurrent-enrollment program: science faculty from Prince George’s Community College (PGCC) come to area high schools and teach credit-bearing science courses during the regular school year. To date, 225 students have participated.
2. A summer residential program: on the campus of Bowie State University (BSU), area high-school students enroll for three consecutive summers during their high-school careers. Students get supplemental courses and tutoring in mathematics and college skills along with credit-bearing science courses. To date, 70 students have participated.

Students get both college and high-school credit for these dual-enrollment science courses. College-tuition support is provided by the grant. The programs have been running for the past 3 years.

The unique structure of this intervention allows for comparisons that make this study different from most others. A comparison will be made between the two types of dual-enrollment programs employed in this project to help determine what factors are most important for increasing postsecondary matriculation and choice of science major among underrepresented minorities.

Our primary quantitative data sources include a longitudinal unit-record database, tracking the course-taking behavior and retention of student participants (and appropriate comparison groups) through their high-school careers and (in many cases) into college. In addition, written surveys are administered to each student at the beginning and end of each early-college course, focusing on interest in science and in attending college. Focus group interviews on the same topics were conducted with a subset of 25 students.

The primary qualitative data source used in this study is a series of interviews with 10 students. Although the interview protocol includes general questions about a student’s interest in going to college and majoring in science or math, the chief aim was to discern students’ predisposition for applying to college, following the model of Freeman (2005)
described above. Students were interviewed individually during the period of their dual enrollment, and categorized based on their predisposition. We intend to follow up with them at least twice after graduation from high school, to determine the impact of the dual-enrollment program on their schooling and to identify the extent to which they maintained the college plans they expressed as high-school seniors.

The written surveys, focus group findings, and data from the unit-record database are also being collected from appropriate comparison groups in the same school district. Data from student participants will not only be compared with comparison groups, but also across cases, among students of the summer early-college courses at BSU, students taking early-college courses at their own schools (taught by PGCC faculty), and students who might take advantage of both opportunities.

Our expectation is that both types of dual-enrollment opportunities increase the likelihood both of college attendance and of majoring in science, but that a stronger effect would be seen with the summer residential program at BSU due to its longer duration.

Section 3: Explanatory framework:

On the written survey, most students indicated both a high interest in pursuing a science degree and science-related career, and a very high likelihood of attending college. Nearly as many stated that they felt well prepared for college work. There were no statistical differences between pre-program and post-program surveys, and none between the participants in each kind of dual-enrollment program (summer residential vs. in-school). These results, confirmed by reports from school officials, suggest that participant students are already highly motivated to attend college and pursue science, as indeed they already are by enrolling in these early-college science programs.

The focus groups revealed various trends in students’ thinking, including these key findings:

- Students are generally positive about the prospect of attending college. However, they are somewhat anxious about choosing the college that best suits their needs. Students do not think that high schools have an atmosphere that supports discussions about college and life after high school with teachers or other students.
- Students see family and media/marketing as important factors in the college choice process.
- Students’ top reasons for going to college are directly related to enhancing their opportunities for career and earning power.

Of the 10 students who were interviewed individually, one was categorized as a Knower, 7 as Seekers, and 2 as Dreamers (Freeman, 2005). The Knower was very focused, intrinsically motivated, and encouraged by family to pursue college from a young age. The Seekers had varying degrees of focus and knowledge about the college-going process. The two Dreamers came to their decision to attend college later than the others, but were among the best-prepared and most focused participants. General themes emerged from these 10 interviews; they are described in Table 1.

These results reconfirm many findings of the earlier studies described above, in particular, that:

- Those who consider college earlier have time on their side, so students should be introduced to the idea of college as early as possible;
• Teachers play a vital role in the process for students, especially since school counselors’ workloads often do not allow them to focus on college guidance; and
• Being around like-minded peers is beneficial.
What’s more, although Freeman (2005) states that *Dreamers* are less likely to go to college, she notes that it is possible. The *Dreamers* here are good examples of that – with good grades, guidance, resources, and an understanding of what a higher education has to offer, these students have the potential to do very well in college.

Section 4: Discussion:

With this study, we hope to learn a great deal about how to help minority students persist in college science. For example, if we find differences in some measures between students of the summer early-college program and those of the in-school courses and can attribute them to the programs’ different structures, it would have implications for how best to design future dual-enrollment programs.

However, our intention is to understand more fully *all* points on the college-decision continuum. Our interviews with a subset of student participants shed light on the importance of peer, family, and institutional support in shaping their predisposition to attend college and pursue science. Future interviews with these students, as well as longitudinal analysis of student records, will help us assess the long-term impact of dual-enrollment on students’ decision-making processes.

Ultimately, we would like institutions to incorporate those practices that positively impact underrepresented groups’ persistence to science degrees and careers.

Section 5: How will you structure this session? What is your plan for participant interaction?

We will lead a guided discussion, punctuated with some Powerpoint slides for information purposes. The Powerpoint slides will also be handed out in advance, and include questions for discussion. If audience members do not raise their hands initially, we will ask them to talk to their neighbors about specific questions first and then ask them to report back to the group.