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Good morning Mr. Chairman and Members of the Committee. Thank you for the opportunity to testify on the role of community colleges in the recruitment and retention of undergraduate science, math and engineering majors. I would like to introduce myself, my name is Margaret Collins and I come to you with fourteen years of experience in higher education. My experience includes college teaching, career and workforce development, grant writing and most recently academic affairs administration. My last twelve years of employment have been at the community college. Currently, I am the Assistant Dean of Science, Business & Computer Technologies at Moraine Valley Community College.

I recognize the tremendous challenge that our nation's educational institutions face as we prepare graduates to compete in a global economy. My testimony today comes from the perspective of the community college, from my experiences at Moraine Valley Community College (MVCC). I intend to address obstacles to recruitment and retention of Science, Technology, Engineering and Math (STEM) majors at Moraine Valley Community College and discuss how we work towards minimizing the obstacles through extensive collaboration, grant funding and human capital.

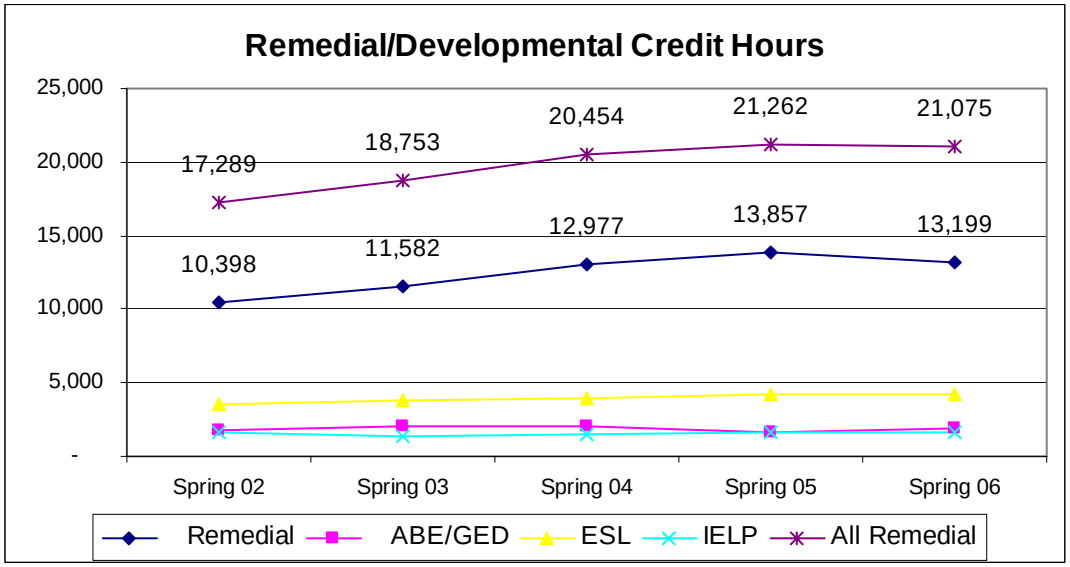
Question One:

What obstacles have I encountered at Moraine Valley Community College in recruiting and retaining STEM majors?

Students who attend community college, specifically at Moraine Valley Community College face unique obstacles that students at upper division colleges and universities may not. Regardless of the particular institution, most STEM programs remain challenged by issues considered more universal to recruitment and retention.

1. Under preparedness or college readiness (traditional aged students coming from high school). According to the United States Department of Education, (2005) college readiness is one of the seven national education priorities and although improvement has been seen in recent years, too many students remain unprepared for college.
    a. Math remediation – based on the MVCC placement test scores 54% of students in 2004 require some level of developmental math before entering college level algebra. This figure is up from 48% in 1999 (2005).

Table 1



b. High school science requirement for graduation – Graduation requirements in the State of Illinois dictate that students complete two years of science credit which is typically taken in the 9th and 10th grades. (Office of the Governor, State of Illinois, 2005). This leaves a large gap between the completion of high school science requirement and entrance into community college science.

c. Curriculum not aligned across secondary and post-secondary institutions – Secondary curriculum is aligned with the Illinois Learning Standards and the statewide standardized exam. However, community college curriculum aligns with the Illinois Articulation Initiative (IAI) and the requirements of higher level post-secondary colleges and universities. This often causes a gap in the knowledge base that contributes to under preparedness.

d. Transitional opportunities not well understood or conveyed – Developmental guidance programs in area high schools continue to improve in our region but extensive work remains related to helping students understand career paths, career development and their associated educational plan. This task has become more complex because of increasing specialization in STEM careers.

2. Lack of Opportunity

a. 1st generation college students (neither parent has a four year college degree or higher) - Ample research on first generation college students exists. These investigations consistently indicate that, compared to students whose parents are college graduates, first-generation students are more likely to leave at the end of the first year, be on a persistence track to a bachelor's degree after three years, and are less likely to stay enrolled or attain a bachelor's degree after five years. (Pascarella, Pierson, Wolniak & Terenzini, 2004). 1st generation students represent 67% of the MVCC student population.

b. Economically disadvantaged – Community colleges by nature serve populations of students with great diversity including socio-economic status. MVCC is no exception with a portion of the student based considered economically disadvantaged.
c. Multiple priorities including work, other courses, and family obligations – Community college students trend towards having multiple priorities. According to the MVCC spring 2005 Community College Survey of Student Engagement, 60% of the respondents indicated that their full time employment is likely to lead to withdrawal, while 50% of the students surveyed indicate that caring for dependents is a likely reason to withdraw from class or the college.

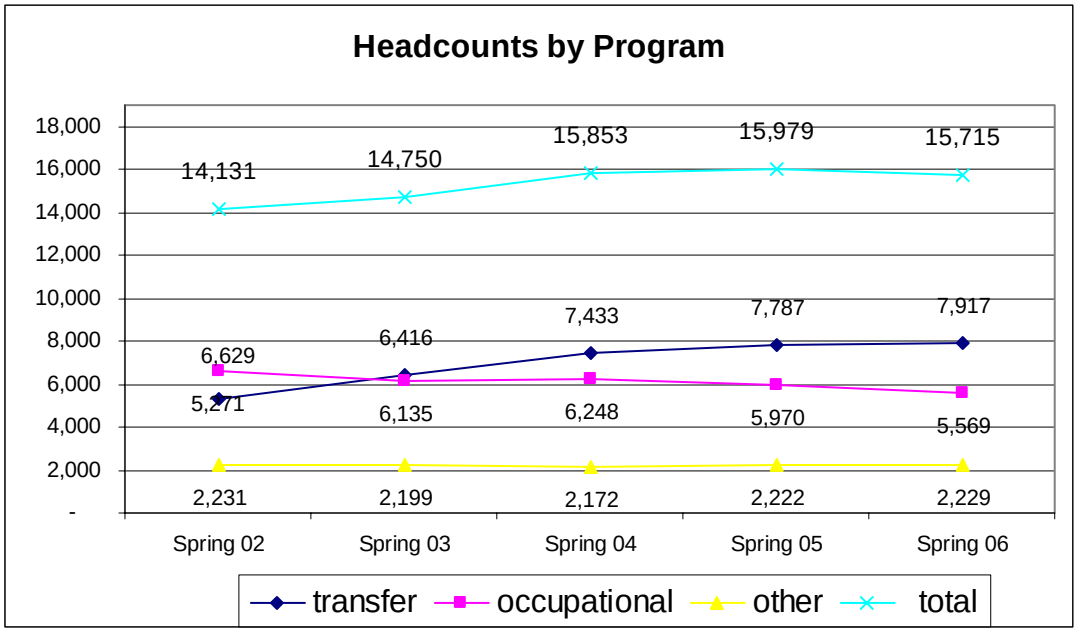
3. Negative perceptions associated with science, technology, engineering and math including:
   a. Perception of poor labor market, few job opportunities – Persistent belief that few jobs exist for science, technology, math and engineering majors continues. At MVCC, informal student surveys reflect this perception. nationally, most job outlook surveys bolster this perception. For example, in the March 10th edition of the USA Today, an excerpt from a recent study compiled by the Department of Labor (2005), showed strong job opportunities in allied health and nursing, a brief mention of technology-related jobs, and no mention of job opportunities in the traditional areas of science and engineering.
   b. Perception that STEM is unattractive, uninteresting and only for the super smart – For decades our society has perpetuated the stereotypical perception that people who work in science, math, technology and engineering tends towards being very smart and less interesting. Work to dispel the notion of the science and computer geek has not progressed. Students continue to associate these majors as being for a small group of capable and stereotypical individuals. In a recent survey of students published in the proceedings of the 2005 American Society for Engineering Education, students listed as some reasons for not persisting in STEM majors as due to the excessive work load, sedentary lifestyle, anti-social nature, dullness/tediousness and competitiveness. (Yasuhara, 2005).
   c. Perception of STEM as male oriented and male dominated – The issue of gender bias in STEM majors receives an abundance of research attention related to the perception that these are male oriented and male dominated fields. Research shows that many female students not only have low expectations of themselves in science classes, but also have stereotypical views about scientists, believing that boys are more likely to become scientists This view has a negative effect on the probability of girls considering science as a career (Bohrmann & Akerson, 2001).

- What actions has Moraine Valley Community College taken to over come the obstacles?

At Moraine Valley Community College addressing the obstacles faced by students in STEM majors takes on different fundamental nature depending on the precise student population at hand. Moraine Valley, like most community colleges, enrolls students interested in a community college education as a means to an end, i.e. job training. Often referred to as the career program students, at MVCC these students make up half of our student population. The other half consists of students interested in earning credit hours and/or degrees that transfer to other institutions. We refer to these students as transfer program students and they are interested in a community college education as a vehicle to a bachelor's degree or higher.

For the career program students, those interested specifically in technology and engineering programs and degrees. Critical funding from the National Science Foundation, Carl Perkins and Tech Prep has enabled several of our programs to reverse the national trend of declining enrollment. Many of our programs have experienced increased enrollment and higher retention.

Table 2



Funding from the National Science Foundation (NSF) over the past five years has resulted in significant impact on our success. These successes include the college's ATE Center and the Center for Systems Security and Information Assurances (CSSIA). The funding has resulted in helped us to:

1. Develop curriculum in mechanical design, pre-engineering, internet specialist, information technology security, wireless and Voice Over IP (through two projects and the ATE center).
2. Expand internship opportunities by hiring an internship/externship coordinator exclusively designated for CSSIA.

3. Build a “Women in Technology” mentoring program that was originally funded from a previous NSF project and now funded through CSSIA.
4. Develop an outreach program for economically disadvantaged inner city Hispanic youth who attend a computer science charter school. The student population is half female.

During the past two years, I have had the opportunity to work with a very special group of students as part of our CSSIA outreach program. The high school students, who attend the Mirta Ramirez Computer Science Academy, a charter school sponsored by Aspira of Illinois, are inner city Hispanic youth (Half Mexican and half Puerto Rican), of which half are also young women. They attend the computer science academy because they seek careers as programmers, IT professionals, IT security specialists, and network engineers.

Our efforts to assist these young people focus on providing a seamless transition from high school to college. We have sponsored several on campus events combined with activities at their own school that provide opportunity for the students to earn college credit, learn about IT careers and understand the importance of continuation their education beyond high school. We organized a community outreach event, a computer health clinic, that enabled students to assist community members by conducting virus scans and other security related operations on PCs brought to the event. The students also competed in teams and presented their projects before an audience at the all day event. The teams with the best projects were invited to Washington D.C. to present at the annual ATE conference. Twelve students traveled from their west side neighborhoods. The experience for all of us was pretty amazing and the result of hard work, dedication and good funding was visible to all.

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5. Produce video segments that show technology related careers as more appealing, interesting and attractive
6. Offer a career development course that dispels myths about the poor labor market, provides career exploration through specialized interest inventories, provides an outlet for career related research in the areas of information technology
7. Provide low or no cost teacher training and curriculum development opportunities that foster program updates. The CSSIA faculty development opportunities have enabled us to train over 800 faculty members on information assurance, network security and wireless technologies.

Carl Perkins and Tech Prep funding has significantly aided our efforts to recruit and retain STEM majors by enabling us to:

1. Provide dual credit opportunities for students in Career and Technical Education (CTE) classrooms
2. Develop a math alignment program that brings high school teachers and college faculty together to discuss math remediation and ways to better prepare high school students for college math.

3. Develop and offer a tutoring program for Management Information Systems students.
4. Provide professional development opportunities to teachers at the secondary and post-secondary level to better implement contextual learning.
5. Provide career exploration opportunities for high school and elementary students that portray technology and engineering in a more positive light.
6. Purchase updated instructional equipment supplies and equipment to meet the ever changing demands of industry.

The obstacles for transfer students, although similar to those of career program students, are handled differently and through different funding streams:

Specifically, the college has several large Department of Education (DOE) grants from the TRIO program (Upward Bound, Talent Search and Student Support Services) that help us overcome obstacles and address recruitment and retention for STEM majors through activities that:

1. Provide support services, academic advising and career planning for students already attending MVCC.
2. Create awareness about college opportunities for pre-high school underrepresented students who are economically disadvantaged and/or first generation college bound.
3. Provide tutoring and academic support that addresses remediation issues for under prepared students.
4. Offer career development opportunities that emphasize the importance of college education after high school.

In addition to grant funds that enable Moraine Valley Community College to directly address issues of recruitment and retention for STEM majors, the college also utilizes operational funds that assist to:

1. Provide dual enrollment opportunities for Advanced Placement high school students in calculus, statistics, college algebra, trigonometry, biology and chemistry.
2. Create 2+2 agreements in mechanical design and information technology that assist MVCC student's transition into engineering and computer science bachelor's degree programs.
3. Improve diversity in our full-time teaching faculty through a strong commitment to diversity in our hiring practices.

- How are we measuring the effectiveness of these actions?

Measuring the effectiveness of our efforts to recruit and retain STEM majors is a multi-tiered process. Because grant funded programs require high standards of accountability and because NSF grants specifically are awarded on a competitive basis, we adhere to stringent standards for program evaluation and effectiveness. The best model for

evaluating program effectiveness comes from a process recommended by the National Science Foundation. With help from the NSF we contract an external evaluator whose purpose is to monitor our progress against our grant objectives. A National Visiting Committee is also designated to assist in the evaluation of CSSIA. This committee provides an annual appraisal with extensive feedback. Also through NSF funds we conduct large scale surveys that assess productivity and accomplishment.

In addition to NSF determined evaluation processes, at MVCC, we benefit from opportunities available to us through our resource development and institutional research offices. These resources assist front line program administrators and coordinators with report writing, data gathering and quality analysis of our programs.

Through Tech Prep funding we contract a research associate to perform a longitudinal inquiry on dual credit and articulation related data. The outcomes from our extensive assessment of programs and yearly reporting on effectiveness are used as a basis for continuation of activities as well as in the development of new initiatives.

Question Two:

What are the obstacles to implementing similar improvements at other institutions of higher education?

An issue of importance to all academic institutions and an issue often difficult to fully address concerns the magnitude of role models related to retention of STEM majors. At MVCC we address this issue with a strong effort towards diversifying the faculty. Hiring is a long term commitment that requires a constant focus every single year and consumes a great deal of resources.

A major obstacle faced by other institutions of higher education is the lack of financial resources necessary to pursue competitive funding programs. In the state of Illinois our level of state funding has declined over the past few years and continues to decline. The college now finds itself more dependent on grant funded initiatives like NSF, Perkins and Tech Prep. Due to the volatile status of funding it becomes difficult to make long term plans. We have a strong commitment to pursue NSF funding but it is very competitive. Unlike many other institutions of higher education, our institution is committed to providing the time and resources needed for the extensive proposal process.

Illinois community colleges were plagued by a lack of statewide curriculum alignment. The standardized general education core (Illinois Articulation Initiative) helps to alleviate the problems. Other states continue to struggle with this alignment.

Question Three:

What role have federal agencies, particularly the National Science Foundation (NSF) played in improving undergraduate STEM education? What more should federal agencies be doing in this area?

This has been addressed in the context above.

What more should federal agencies be doing in this area?

- Federal agencies should continue to emphasize the seriousness of the social and economic issues related to recruitment and retention of STEM majors.
- Federal agencies should provide more recognition to the role of community colleges in providing pathways and opportunities in high education especially for the underserved and underrepresented.
- More support should come from the federal agencies related to secondary-post-secondary collaboration (Tech Prep, Carl Perkins)
- Curriculum alignment and refinement of standards in STEM should remain a priority of the federal agencies.
- Social issues including gender and race bias in higher education should remain high priority for federal agencies.
- Continued federal support of faculty development programs should remain a priority through NSF and DOE grants.
- Investment in replicating best practices and programs that experience continued successful achievement should be prioritized at a national level.

In closing, thank you again for allowing the voice of the community college to be present at this hearing today. Community Colleges have become and will remain a vital means for students, otherwise unable, to participate in high education. The issue of recruitment and retention of science, technology, engineering and math majors is a crucial economic and social issue that demands greater consideration. I feel honored to have been afforded this opportunity to contribute to the discussion and look forward to the positive outcomes that result from this conversation. Thank you.

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