THE TECHNOLOGY LEARNING ACADEMY AT QUEENSBOROUGH COMMUNITY COLLEGE

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ABSTRACT- *The Technology Learning Academy is a program that has been implemented at Queensborough Community College for the purpose of increasing retention and improving graduation rates. It provides a comprehensive program of activities which are designed to establish an environment for student success. The Technology Learning Academy is a program aimed at providing a special identity for students, grouped by academic program. The program strives to give each student a peer reference and support group and to provide faculty and staff "faces" for their program at the College. Components of the Technology Learning Academy include specialized blocked and linked courses, targeted advisement, and close interaction among individual students, groups of students, faculty and staff. The purpose is to provide our students with the best educational experience possible for them at the College, and to move them through to the achievement of their educational goals, especially graduation, in a timely fashion.*

INTRODUCTION

Throughout the United States, trends indicate that the need for people with expertise in science and technology has been increasing, and will continue to rise into the foreseeable future [1]. While opportunities in these fields are growing, there has been a decrease in the proportion of students graduating with technology degrees, resulting in a lack of qualified personnel to fill essential positions [2]. A panel of experts convened by the National Academies warns that U.S. competitiveness in the global economy could diminish if these trends continue [3]. New York's past Governor, George Pataki, stressed the concern about the decline in the study of STEM related fields, and put the state at the forefront of efforts to reverse these trends [4].

Like many colleges across the United States, Queensborough Community College (QCC) has seen a decline in the number of students entering technology and engineering programs [5]. A constituent campus of the City University of New York (CUNY), QCC is an associate degree-granting, public institution serving over 13,000 students. Queensborough is a minority serving institution with a diverse student body, approximately equally divided between White, Black, Hispanic, Asian/Pacific Islander. The school offers degrees in various technology disciplines, including Electronic Engineering Technology, Computer Engineering Technology, Mechanical Engineering Technology, Lasers and Fiber Optic Engineering Technology, New Media Technology, and Telecommunications Technology. As of September 2008, over 1000 students were registered in the engineering/technology programs at QCC.

Fewer than 30% of full-time freshmen who enter a technology program at QCC complete a degree, within the next six years [5]. There are various reasons for this. The majority of students who are entering the technology and engineering degree programs do not have the required background necessary to succeed in these programs. Many of them are required to take remedial Math and English, which delays their graduation by at least one year; during which time it likely their initial interest and hope for success fades. Many students are also economically disadvantaged, with over half reporting incomes under $25,000, and about the same number are working (full and part-time) to support themselves and family. This additional commitment, along with the extended time required to receive a degree further decreases their chances of graduating.

Queensborough is devoted to technology education and to ensuring that all students that aspire to go into these fields have a chance to succeed. To this end, QCC instituted several pedagogical initiates intended to improve the quality of technology education, in addition to allocating resources to increase the chances of student success. In the fall of 2007, QCC instituted the Technology Academy to bring together the resources of the three technology related departments. The Technology Academy provides a comprehensive academic program and enrichment activities intended to create an environment for student success.

GOALS

The Technology Academy consists of students enrolled in programs in Electronic Engineering Technology, Computer Engineering Technology, Telecommunications Technology, New Media Technology, Engineering Science, Laser and Fiber Optics Engineering Technology, Mechanical Engineering Technology and Computerized Architectural and Industrial Design. The Technology Academy's goals are five-fold:

1. To increase the number of students entering technology and engineering fields.

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2. To increase retention rates in the technology and engineering programs at QCC.
3. To increase the number of technology and engineering students continuing onto four-year colleges.
4. To strengthen student academic, vocational, and technical skills.
5. To implement quality pedagogical approaches to technology education.

The goals of the Technology Academy are consistent with the goals of local industry and who support the project, either by providing internships for the students or coming to speak at Academy events. All the technology programs at QCC have advisory boards. These individuals, many of whom are distinguished members of industry and represent a wide array of technology disciplines, continue to support their respective programs through the Academy.

The Technology Academy seeks to increase student engagement and success by enrolling students in the academy, through which they receive integrated, academic, and support services. Our records reveal that the first year is critical to most technology students. Students who drop out of these programs usually do so within the first year. Considerable effort, therefore, is devoted to entering freshmen, with continued support during consecutive years. Students who successfully complete the first year will be supported by additional activities designed to have them complete their degree and transfer to a four-year program or work in industry. The academy provides assistance in the form of scholarships, internships and other introductions.

ACTIVITIES

Queensborough's Technology Academy includes and integrates, technological infrastructure, faculty development, mandatory student orientation; personalized academic advisement; specialized blocked and linked courses; learning communities; tutoring; and writing intensive courses, all of which facilitate close interaction between students and faculty, adjuncts and staff throughout the students' academic career at the College. A full description of the Academy components is provided below to illustrate the long-term vision and potential to support student success.

Recruitment

Through various projects intended for high schools, QCC has developed a working relationship with many faculty and administrators in the New York City school system. Technology Academy personnel have developed recruitment materials and have been actively recruiting in NYC high schools. Program faculty visit high schools to talk to students about technology as a career and the programs at QCC.

Technology Academy personnel have also been recruiting through the College Now and Tech Prep programs at Queensborough. College Now is a program that enables students to take college classes while in high school. The program at QCC is affiliated with 10 local high schools and serves over 400 students.

The Tech-Prep Consortium of Queens has been in operation since 1993. The program provides seamless transition between the last two years of high school and the first two years of college. Its basis of operation is an articulation and institutional agreement among member schools. Tech Prep currently supports 706 students and has articulation agreements with 8 technical high schools. The Tech Prep program has been instrumental in directing students towards STEM careers and the Technology Academy.

Summer Technology Academy

Queensborough is an open admission college. As a result, students often sign up for the technology programs without adequate academic groundwork. These students have potential and could do well in technology with better preparation. The Summer Technology Academy is designed to rectify this situation. Students, who are at risk of not completing the degree either because they do not have the academic background, or who have failed the placement test required of all entering freshmen, participate in the summer immersion program. This program allows students to take an integrated program designed to prepare them for the required placement exams in Math and English, learn basic academic skills, and, through project based learning, give them an introduction to major areas of study in engineering technology. The students in the summer program are also given advisement and are pre-enrolled in their first semester classes.

Currently the office of Academic Affairs at QCC has a summer program intended to address deficiencies in English and Math. They include special sections for technology students and provide the English and Math instructors. These instructors collaborate with the technology instructors to provide a seamless experience. Currently Math and English is taught without consideration to the students program of study, only to passing the exam. Students learn English and Math in context to their intended profession (technology and engineering) and how all courses are inter-connected. In fact, the technology instructors also assist in teaching English and Math.

The technology component for the summer program introduces the students to various applications of technology. Students participate in activities intended to have them learn about the different technology fields. These activities include: putting together electronic components,

learning to use AutoCAD, programming a robot, and putting together and testing fiber optic cable.

The integrated summer experience also contains elements of "Introduction to College Life (ST-100)", a course intended to have students learn basic academic skills. In addition to teaching students study skills, this course familiarizes them to the various support services available on campus and introduces them to the various technology majors at QCC. The course has been modified to incorporate an orientation to and use of the Library to ensure that students understand and utilize these resources for academic success.

Students are not required to pay for the Summer Technology Academy. The project provides public transportation in the form of a Metrocard to help alleviate some of the financial burden put on them by not being able to work during the last month of summer.

Personalized Academic Advisement

Quality academic advising is crucial to student retention, progress and graduation. In fact, our experience suggests that the weaker the student's academic background and the greater the financial obstacles in their way, the more impact quality advising makes. Recent changes in the advising system at Queensborough support this fact. Using a combination of faculty members and an expanded number of advisors, there has been a sharp increase in the percentage of students receiving at least one individualized, high-quality advising experience per semester. Tangible results include fewer course cancellations, better planning of course additions, and an expanded number of courses linked via the learning community's model.

Learning Communities

Learning Communities have been shown to improve student retention [6], and performance [7]. The learning communities are classes that are linked or clustered during an academic term, often around an interdisciplinary theme, and enroll a common cohort of students. A variety of approaches are used to build these learning communities, with all intended to restructure the students' time, credit, and learning experiences to build community among students, between students and their teachers, and among faculty members and disciplines. This, combined with the other components of the Technology Learning Academy, creates an environment for success that increases student retention through the critical first year.

Students in the Technology Academy take a series of linked courses and participate in activities intended to have them become a learning community [8]. The students selected for the Technology Academy have no academic deficiencies, having passed all the placement exams. Students selected are provided with $250 vouchers that may be used to purchase books for the school year as an incentive. They are required to sign up for a linked course (Learning Community) each semester of their freshman year.

Introduction to Technology **-** This learning community is composed of the introductory English (EN-101, "English Composition I") and Math (MA-114, "College Algebra and Trigonometry for Technical Students") courses required of all first semester technology students, in addition to a technology course. This course is offered in the first semester of the freshman year.

Technology for Success – This course will is composed of the second semester English (EN-102, "English Composition II") and Math (MA-128, "Calculus for Technical and Business Students") courses, in addition to the General Physics (PH-201) course. This course is offered in the second semester of the freshman year.

Like the courses in the Summer Technology Academy, the academy during the school year has the courses taught in a seamless, interdisciplinary fashion so that students appreciate that all courses are interconnected. The Learning Communities incorporate project-based learning, which may be used to provide the common element for the different disciplines.

Projects are integral to the Technology Learning Academy concept. Projects help students to develop the skills they need to be successful in their internships and foster interest, motivation and engagement. Project-Based Learning is built on the principle that "people learn best by doing". Hands-on practical projects are incorporated into courses to give students relevance and early success. In the classroom, Project-Based Learning provides many unique opportunities for teachers to build relationships with students. Teachers may fill the varied roles of mentor, facilitator, and co-learner. Finished products, plans, drafts, and prototypes all make excellent "conversation pieces" around which teachers and students can discuss the learning that is taking place.

The Learning Communities are also writing intensive (WI). The Writing across the Curriculum program at Queensborough has a long history of successful experimentation and skilled nurturing, which culminated in the November 2004 mandate by the Academic Senate that all students – beginning in fall 2005 – take a minimum of two writing intensive (WI) courses to qualify for graduation. This universal requirement requires that students express themselves effectively by writing and take a course that requires significant writing as part of the course work. The WI program is a critical component of the Academy and student success. Writing is not only a critical skill in today's workplace, but also a key element in the ability of our students to perform well in all college-level work.

The Technology Learning Academy community also serves as a site for testing new curricular approaches for strengthening teaching and learning. It offers a more coherent opportunity for the teaching of literacy skills, such as reading, writing, and speaking, and a more coherent pathway for students to engage in the general education curriculum. It offers a robust way to address interdisciplinary ideas and a more coordinated platform for study in the major. For example, students may bring their technology laboratory report to their English class for review and revision. The Technology Learning Academy also addresses a variety of societal issues such as the increasing fragmentation of information and student alienation toward participation and engagement. With an emphasis on interpersonal dialogue, collaboration, and experiential learning within the context of diversity, ethics, and lifelong learning these programs address a decreasing sense of community and connection and allow students to relate their college-level learning to larger personal and global questions. Learning communities between social science and technology courses provide students with an interdisciplinary sense of community.

Financial Support

Many students at QCC are economically disadvantaged and have to work to support themselves, and families, while attending school [5]. This added burden is considered by many at the college to be the greatest obstacle to having students successfully complete their degree. To help ameliorate this situation Technology Academy personnel have made a considerable effort to identify and acquire financial support for technology students. All students in the academy receive a $250 voucher during their first year that may be used to help cover the cost of books. In a recent survey the cost of books was the number one item students were most dissatisfied with at QCC.

More recently the Physics and the Electrical and Computer Engineering Technology Departments at QCC have received a National Science Foundation SSTEM (Scholarships in Science, Technology, Engineering, and Math) grant that provides a scholarship for students to complete their program of study in technology.

Peer Mentors and Tutors

As part of the Academy students beyond the first year are encouraged to become peer mentors and tutors. Students are paired based on commonalities and field of study. Technology Academy personnel supervise the mentoring, with the assistance of the department liaisons. All academic tutoring for the technology students is administered by the Technology Learning Academy using "best practices" and materials gleaned from the Instructional Support Services Department. The difference being that the tutoring provided within the Academy is more technology and discipline specific. Students receive tutoring that is managed by a part-time coordinator (anticipated to be a department faculty member) within the academy. All tutoring and tutor training is facilitated and scheduled by this coordinator. It is felt that the increased support structures assist with first year retention, while the interaction with the younger students helps second year students reinforce what they learn, as well as giving them a sense of accomplishment.

Supporting Transfers

One of the goals of Technology Learning Academy is to encourage students to continue their education beyond the associate's degree. To this end the Academy has formed collaborations with various four-year colleges in the area. As part of the CUNY system, courses taken at QCC are accepted at all CUNY four-year colleges, most of which offer Bachelor's degrees in technology.

To encourage students to continue their education, and to help them select what college to go to, Academy participants are exposed to four-year colleges in the New York City area that offer technology programs. Through the years, Technology Academy personnel have developed working relationships with faculty and administrators at these colleges and frequently have students visit their campuses. Personnel from four-year technology colleges also visit QCC and talk to the students.

Transitioning to Industry

Students who do not continue on to a four-year college are encouraged to obtain jobs in industry, utilizing the skills they have mastered as technology students. Through professional contacts, alumni, and advisory boards, the technology programs at QCC have developed a close working relationship with many local technology companies. The decline in enrollment in the technology fields has affected these companies, and many have had difficulties hiring qualified personnel. As a result, these companies are committed to technology education and have expressed an interest in having the Technology Academy succeed.

Having industry partners encourages students to continue towards a degree for a variety of reasons. Often, students do not feel that textbook learning can be applied in the 'real world' and they become discouraged and lose their initial sense of purpose about their academic goals. Meeting with industry specialists and learning about various career opportunities at area companies shows them that there are material benefits to be gained by pursuing higher education and developing workplace competencies. Similarly, students will be much more likely to achieve their goals if they have a concrete sense of what they are working toward.

As a continuation to the Introduction to Technology Orientation Course, selected students are offered a summer internship (either internal with college staff or external in industry). At the end of their experience, these students write a report/paper to be presented at a College Conference or Professional Conference (i.e., IEEE, ASEE, NYS Tech Prep).

ASSESSMENT

The project is being evaluated on a number of levels, consistent with the multiple tasks and goals of the project. Thus assessment focuses on student beliefs, competencies, as well as recruitment, retention, and graduation rates. Assessment results will be the focus of another paper at a later date. Preliminary analysis of the data suggests that students had higher concept and skill mastery, in addition to enjoying their education experience. Furthermore, with our initial data, we have seen a rise in both retention and graduation rates.

SUMMARY

The Technology Academy was designed in mind for the students enrolled in the technology programs at Queensborough Community College. The Technology Academy's goals are to increase the number of students entering technology and engineering fields, to increase retention rates in the technology and engineering programs at QCC, to increase the number of technology and engineering students continuing on to four-year colleges, to strengthen students' academic, vocational, and technical skills, and to implement quality pedagogical approaches to technology education. The project brings together the resources of the technology departments and administrative offices at QCC. The Academy seeks to increase student engagement and success by enrolling students in learning communities, through which they will receive integrated academic, and support services. The project focuses on recruitment/enrollment, retention, and degree completion in the technology programs. Queensborough's Technology Academy includes and integrates faculty development, mandatory student orientation, personalized academic advisement, specialized blocked and linked courses, learning communities, tutoring and writing intensive courses, all of which will facilitate close interaction between students and faculty, adjuncts and staff throughout the students' academic career at the College.

All incoming technology freshmen are targeted for membership in the Academy. The Academy is presented to students, not as a choice, but as the way in which education is carried out at QCC. From the beginning, the emphasis is on academic success and on goal setting, mutual self-help, responsibility and full utilization of support services. Plans to graduate in two to three years are formulated and emphasized. We have tried to apply what we have learned about the most effective pedagogies to the Academy.

Most incoming Academy members are placed into blocked classes, which may also be linked (Learning Communities). The blocks include an Introduction to the College orientation class, aimed at academy students. For those students needing developmental work to reach the levels of the Academy blocks, we make additional efforts to channel them into summer early immersion programs. Academic advising for programs is structured through the Academy.

Among the ideas that have been put forward to build a sense of belonging within the Academy is a dedicated room for the Academy, to serve as its tangible headquarters. Regular speakers, focused on the discipline's academic and career challenges and possibilities is as important, as the regular structured contact with faculty. Internships and campus jobs are another dimension. Furthermore, visible symbols such as banners, caps and t-shirts are used to foster a sense of community.

These activities have proven successful in other academic settings, but to our knowledge no minority-serving community college has attempted this in a technology program. This project is a natural progression of previous pedagogical initiatives and informal education workshops at Queensborough intended to increase student interest and conceptual understanding in technology.

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REFERENCES

1. National Science Foundation, Division of Science Resources Statistics. (2003).
2. National Science Board. (2000). Science and Engineering Indicators – 2000. National Science Foundation NSB 00-1.
3. Broad, W. J. (2005), "*Top Advisory Panel Warns of an Erosion of the U.S. Completive Edge in Science",* New York Times, October 10.
4. Arenson, K. W. (2006), "*Officials heed call to stop slide in science and math",* New York Times, January 6.
5. Office of Institutional Research and Analysis (2005), Queensborough Community College.
6. Johnson, J. L. (2000), *"Learning Communities and Special Efforts in the Retention of University Students: What Works, what doesn't, and is the Return Worth the Investment?",* J. Coll. Student Retention, 2(3), 219-238.
7. Tinto, V. (1995). *"Learning Communities, Collaborative Learning, and the Pedagogy of Educational Citizenship"*, AAHE Bulletin, 47, 11-13.
8. Tinto, V. (1997), *"Classrooms as Communities: Exploring the Educational Character of Student Persistence"*, Journal of Higher Education, 68, 599-623.