Can a Technology Grant from the National Academy Foundation Begin to Make a Difference for Minority Students in an Urban High School?

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Abstract: The challenge of improving career opportunities in technology for minority students bears particular relevance in the face of predictions of vast increases in technology related positions and severe deficits in the number of skilled workers. Minority students are confronted with numerous obstacles to success in this area: low self-esteem and motivation, inferior achievement in mathematics and science, lack of support and role models. This paper suggests that the model of the Academy of Information Technology (AOIT) of the National Academy Foundation has the potential to successfully address many of the issues that beset minority students. Using one of the pilot sites for AOIT Gorton High School in Yonkers NY, this paper explores how an urban high school has implemented the Academy and reports preliminary results on how well it is meeting its objectives. More systematic research is needed to determine its true success.

Introduction

The plight of minority students in urban schools has captured the attention of educators, politicians, and philanthropists alike. How can we help these students successfully complete high school and embark on a meaningful career? The problem becomes even more severe when we consider the low enrollment of minority students in mathematics, science, and technology programs in colleges and universities. Lack of interest in these areas can be traced to elementary school (SubbaRao 1993). Research by Reichert and Absher, (as cited in Marable 1999) summarizes some of the prominent conditions faced by minority students: “. . . inadequate academic preparation, substandard educational resources, mismatched social and academic expectations, lack of encouragement, psychological intimidation, unstable familial and financial circumstances, inadequate peer support, and lack of role modeling and mentoring.” A number of programs have been developed to counter these deficiencies. Started in New York, the BONGO program was targeted for at-risk urban high school students. It emphasizes an interdisciplinary, team-taught approach to science education with a focus on student projects. Program results show a marked increase in the number of courses passed and a significant improvement in critical thinking skills (Jablon 1993). The Gateway to Higher Education program offers minority high school students rigorous preparation for careers in areas such as engineering and technology. It is based on the assumption that a key factor in college success is entering high school with adequate preparation in mathematics and reading. Surveys of program graduates indicate a high percentage pursuing careers in areas such as computer science and planning to continue their education at the master’s and doctoral levels (Iler and Slater 1998). The Precollage Initiative for Minorities in Engineering (PRIME) program employs the strategy of using undergraduate engineering students at Tennesse Technological University as mentors for minority college-bound high school students who spend six weeks in a summer program on campus. Participants report increased confidence and self-esteem from working with the mentors (Marable 1999).

The Digital Divide

Of particular interest today is the phenomenon of the “Digital Divide,” a term that represents the demarcation between those who have access to computer technology (the “have’ s”) and those who do not ( the “have not’s”). Minority students, especially those in urban schools, typically fall into the “have not” category. The problem extends from inferior educational opportunities while in school to an inability to compete for jobs in a workforce that is increasingly reliant on technology. The solution, however, lies beyond mere access both at home and at school. Companies such as Microsoft have made significant investments in equipment and networking to bring
computers and the Internet into the classroom. Lower prices have made computers more affordable for all but the poorest families. The US Department of Commerce report in 2000, “Falling Through the Net: Toward Digital Inclusion,” shows that more minorities have access to computers. Yet, the gap between the “have’s” and “have not’s” is not being bridged. How computers are used appears to be a more significant indication of their value than mere access. Minority students tend to use computers more for low level skills such as drill and practice, games, and recreational activities; however, the key to effective use may be linked to the influence of adult supervision. Students from more affluent homes are more likely to be exposed to the research and enrichment benefits of computers than their poorer peers, whose parents typically lack the time and education to assist their children (Attewell 2001). Numerous programs acknowledge that equity in use is of paramount importance in bridging this divide. For example, the College Reach-Out Program (CROP) brings minority students to three higher education institutions in Florida where they receive instruction and mentoring from college students (Pearson, T. 2001).

The widening of the gap in the Digital Divide is exacerbated by the projected number of computer related jobs for the near future. The Bureau of Labor Statistics of the US Department of Labor projects an increase of almost 35% by the year 2012, representing one of the fastest growing segments of a workforce where today’s students will be competing for jobs (Barton 2002). The Clinton administration responded to this growing demand with the passage of the American Competitiveness in the 21st Century Act of 2000 that raised the number of employment visas issued to foreign professionals. This admission by our government that Americans cannot fill the technology positions required in our economy sends a strong message to educators that large numbers of our students lack the knowledge and skills to embark on a successful career path in technology. In addition, population growth predictions for the next ten years indicate that the minority growth rate will far outpace that of the majority (Barton 2002). Thus the attention given to mathematics, science and technology education for minorities is well placed.

The National Academy Foundation

In a move to better educate and prepare our youth for the demands of a technological society, the National Academy Foundation (NAF) and the Center for Occupational Research and Development (CORD) established the Academy of Information Technology (AOIT) in 2000. The National Academy Foundation, a non-profit organization, has a twenty year history in sustaining a network of academies to enhance the career development of high school students. Academies are small learning communities dedicated to a specific career, encouraging their members to focus on what they want to do with their lives. Existing academies include Academies of Finance and Travel/Tourism. To accomplish its goal, NAF is supported by a number of major corporations such as Citigroup, American Express, Merrill Lynch and others. The collaboration between business and education is the cornerstone of NAF’s strategy and success. Students engage in a rigorous academic program with a focus on a particular career. Yet, the emphasis is not on a narrow field of interest. On the contrary, the goals of the academy call for an exposure to a broad range of career opportunities. The academy model has been very successful with over 90% of academy graduates continuing their education beyond high school (Weill n.d.). The success of the career academy model has been documented by studies conducted by MDRC, a non-profit social policy research organization that specializes in improving conditions for low income people. A recent MDRC study attributes an increase in earning power of young males in part to their participation in career academies (Ferrandino 2004).

One of the most salient features of NAF Academies is the paid internship. In the summer between their junior and senior years, students have the opportunity to apply the knowledge and skills they learn in the classroom to a real world environment. In addition, they are exposed to the culture and dynamics of a specific business area. Students can learn valuable lessons in problem solving, group work and communication skills that can assist them in selecting a career. In preparation, students receive training in resume writing and interviewing skills. The internship can be a vehicle through which students can build their future, both personally and professionally. Businesses also benefit by grooming potential entry level employees. NAF’s foray into student internships predates the federally funded School to Work (STW) program and is of particular importance now that STW has ended. To determine the potential benefits of NAF’s internship program on participating businesses, a group of researchers from Teachers College, Columbia University conducted a case study of employers in the NAF program to explore both the advantages and disadvantages of their participation in the program (Hughes, Karp, & Orr 2002). The study found that most employers were interested in contributing to the education and career preparation of the students. The majority was extremely satisfied with the interns and many offered the students a full time position. The only
problem noted was the lack of availability of the students. The fact that many employers remained in the program for many years is an indication of their high level of satisfaction with the internship program.

Another key component of the academy model is the Advisory Board. Composed of educators, administrators, local business leaders, and parents, the Board provides guidance, advice and encouragement to the program director and staff. Its responsibilities include forming liaisons with higher education, offering internships and encouraging local businesses to participate in the internship program, arranging for class tours of a variety of businesses, providing shadowing and mentoring experiences for students, raising funds for academy activities, and soliciting scholarships and other awards for qualified students.

To determine the effect of the NAF academies on students’ educational and career plans, a recent research study (Orr, Hughes, & Karp 2003) surveyed almost 200 graduating academy seniors and compared them to an equivalent group of non-academy graduates. Results indicate positive experiences for the academy students but no improvement in academic achievement when compared to the control group. In addition, academy students found their course work more interesting and more relevant to college and career planning. In their transition to college and careers, the academy influenced their planning for and acceptance into college. Students reported a positive outlook on their choice of careers and, more importantly, most alumni were in career-track positions five and ten years after graduation. The study found important benefits for teachers and employers as well.

**The Academy of Information Technology**

Encouraged by the positive results from its Academies of Finance and Travel/Tourism and responding to a request from the Lucent Technologies Foundation to design an academy to prepare students to fill the gap in information technology, in 1999 NAF announced its intention to add the Academy of Information Technology (AOIT) (Gehring 2000). The announcement coincided with a Commerce Department report indicating over 1.3 million new information technology jobs will be required by the year 2006. President Clinton hailed the initiative as an important step in filling the shortage of jobs in the information technology sector. A separate report of the National Telecommunications and Information Administration of the Commerce Department highlighted not only the growing Digital Divide but suggested that, regardless of income, whites are more likely to have computer and Internet access than minorities such as blacks and Hispanics. Since most of the academies would be targeted for urban schools, Clinton was optimistic that the academies could reduce this gap (Cummings and Simons 1999).

NAF and CORD initiated a pilot group of twelve Academies of Information Technology in 2000. A national school reform leader, CORD’s specialty is in curriculum design. They have a twenty year history of creating programs that combine academic rigor in the context of real-world experiences and are linked to national and local standards. NAF’s contribution to the venture is in the delivery of the curriculum through its academy system. Professional development is a joint venture of both organizations and can take the form of both on-site and distance learning as well as instruction provided at conferences. Among the objectives of AOIT are to offer students a strong academic grounding to prepare them for a career in technology or a technology-related field, to encourage them to stay in school by establishing personal goals that are attainable, to expose them to a broad range of career possibilities, to prepare them to continue their education, and to lay the groundwork for lifelong learning. While a motivating factor in the development of AOIT is to prepare students for careers in technology, the program has a holistic focus that addresses the entire individual and integrates the information technology content throughout the curriculum into English, mathematics, science, social studies and foreign languages (Lewis 2001 & Pearson, S. 2000). Research has corroborated the appropriateness of this strategy. For example, in a study to determine the effectiveness of a science program for urban at-risk students, results indicate that success in science requires a restructuring of the entire academic experience, where science must be integrated with other academic areas (Jablon 1993).

**AOIT at Gorton High School**

Gorton High School in Yonkers, NY was awarded a $10, 000. grant to be one of the twelve pilot academies in 2000. As with many urban high schools, Gorton has a large population of minority students (about 78%), many of whom are immigrants or children of immigrants. A computer magnet school for over twenty years, Gorton was well
positioned to offer its Academy students an enriched curriculum beyond that of the computer magnet. They had much of the hardware, software and teacher expertise in place. Core area teachers worked with Teachers College, Columbia University and the Center for Technology and School Reform on integrating technology. Some of the goals for the Academy at Gorton articulated in the grant application are: to enhance written and oral communications skills, develop habits of mind which contribute to critical thinking, combine classroom based learning with work based experiences, integrate academic and technological knowledge into all curricular areas, and work with others in a spirit of cooperation.

The award was a major accomplishment for the Yonkers Public Schools and for Gorton High School in particular. The educational and business communities enthusiastically welcomed the news and joined to lend their support and encouragement for this important undertaking. A Director was named to develop and oversee the program based on local requirements or NAF mandates, work with teachers to implement the curriculum, and act as liaison with the Yonkers Public School Administration. An Advisory Board was established to provide guidance and assistance in managing and monitoring the activities of the Academy. Members from the local community include representatives of the City of Yonkers IT Department, the Jewish Council of Yonkers, Junior Achievement, and the Yonkers Public Library. The educational representatives provide college affiliations with Iona College, The College of Westchester, and Westchester Community College. The Director is a member of the Advisory Board and reports student activities and accomplishments to the Board. According to its by-laws, the primary objective of the Advisory Board is to support the Academy by securing quality, paid internships; supporting field trips, mentoring and shadowing experiences; raising funds for student activities and scholarships; assisting in curriculum development and revisions; and raising awareness of the Academy and building community support. To fulfill these responsibilities, the Advisory Board established standing committees for Student Activities, Industry Education/Curriculum Overview, Fundraising/Scholarships, and Internship/Mentoring.

The Student Activities committee has sponsored field trips to local businesses such as IBM, Hitachi, and Consumer Union. Students are taken on guided tours of the facilities and receive first hand explanations of various technology positions. The committee also sponsors a recognition breakfast at the end of the year to honor Academy students. This event provides an opportunity for students to present projects they have worked on during the year to parents, teachers, administrators and advisory board members. Students have demonstrated their accomplishments in multimedia, web design, and programming as well as in English, science and mathematics.

The Industry Education/Curriculum Overview committee made recommendations to modify the basic curriculum suggested by CORD to best meet the needs of Gorton students. The current curriculum for ninth grade is Introduction to Information Technology and Web Page Design I; for tenth grade, Web Page Design II and Programming Logic (using Scheme); for eleventh grade, Advanced Web Tools and Programming in Java; and for twelfth grade, Database Management, Digital Media, Systems Support and Maintenance, and Digital Networks.

The Fundraising/Scholarships committee has raised monies for student activities and has solicited scholarships from local organizations and higher education institutions.

The Internship/Mentoring committee has provided quality internship experiences for students in the summer between eleventh and twelfth grades. Among those sponsoring internships are Bartizan, CBS, City of Yonkers, HBO, Iona College, Wen Labs and Yonkers Public Library. Students had diverse experiences such as technical support, integrating Java programming into Access applications and developing a web site from design to implementation featuring all the parks in the City of Yonkers. To prepare them for their internships, students took a course to introduce them to the dynamics of the business world and assisted them in resume writing and interviewing skills.

Questions for Consideration

Now that the program has been in place for four years and the first graduating class has moved on to continue their education and begin their careers, it seems an appropriate time to reflect on the experience and ask a few pertinent
questions. Is the Academy at Gorton meeting NAF’s goals? How are Academy students performing academically? Are they doing better than their peers who are not Academy members? How do students feel about being members of the Academy? Has the internship experience expanded students’ horizons? What are students’ attitudes toward college and careers? How do they see their future after Gorton? Do teachers feel prepared to teach the new curriculum? What are teachers’ reactions to the Academy students? Are administrators satisfied with the perception of the Academy in the community? Are internship participants satisfied with the performance of Academy students? In general, has this grant opportunity made a difference at Gorton High School?

To begin to address some of these questions, preliminary data was gathered through class room observations, student surveys, and interviews with students and an experienced teacher in the program. Eleventh and twelfth grade students were observed in some of their classes. The technology in the Gorton classroom is excellent. Each student in these upper level classes has access to a computer during class. The teacher’s computer is connected to a SmartBoard which allows interaction with the presentation. The SmartBoard also permits the teacher to view each student’s computer screen and to project his/her screen onto the student’s screen. Although having a computer on the desk can sometimes be a distraction for certain students, most students were attentive and engaged during the lessons. There was an observable camaraderie in the classroom, as students happily assisted each other to follow the teacher’s directives. The teacher had created a comfortable environment that encouraged student learning.

A survey was administered to forty-five students (19 eleventh graders and 26 twelfth graders) to determine some of their opinions about the program. The survey revealed that while all of the students found their classes more interesting than their other classes, only 44% found their classes more challenging. This result could be attributed to the fact that since their interest level is high, work for these classes is not deemed “challenging” for high school students. It was particularly encouraging to find that 98% of the students saw the connection between their Academy classes and the rest of their classes, since scheduling problems sometimes inhibit these students from being together in core classes such as mathematics, science, and English. Nearly all students look forward to attending their AOIT classes and enjoy the experience of working with their peers. Students reported that they had learned facts about technology careers they were unaware of before their AOIT experience. In summary, all students agreed that they were happy to be members of the Academy. The survey also included some open ended questions to elicit fuller responses about the program. Students cited Web courses and Java programming among their favorite classes and reported learning about new and advanced technologies as their favorite part of the AOIT program. They would like to see more advanced technologies in the classroom and especially opportunities for class trips to experience technology careers first hand. Perhaps one of the most significant themes that emerged from reading the open responses was their comments about being part of a “special” group. It appears that belonging to a cohort allows them not only to learn from one another but imparts a sense of identity, confidence, and belonging – traits that are often lacking among urban minority students. One student remarked, “The program taught me a lot. Best of all, teachers help when you have troubles.” Another student wrote, “I think I will achieve in my future career with the experience I am already receiving.”

Interviews were held with some of the students who had technology internships. Their reaction was overwhelmingly positive. The jobs gave them a sense of accomplishment that they had not anticipated. Students learned first hand the central role that group work has in today’s business environment. In some instances, their internships challenged them to use the skills they learned in their AOIT classes to tackle real world problems. An interview with one of the AOIT teachers confirmed much of what was learned from the students. They are enthusiastic learners and are passionate about being members of the Academy. The curriculum of the program far exceeds that of the computer magnet classes, since it focuses on preparation for college work in computer science and computer engineering as well as rewarding technology careers that may not require a college degree. Teachers benefit from this experience by being challenged to learn new technologies, thus enhancing their own professional development while offering students a richer academic experience.

Conclusion

A more systematic investigation into these issues is clearly needed to adequately address the effectiveness of this grant opportunity to establish an Academy of Information Technology at Gorton High School. The need for such research appears to be justified not only for the local needs and interests of Gorton but also within the larger context of preparing minority youths for careers in technology. Problems confronting these students are well documented:
lack of motivation to stay in school, low self-esteem, inadequate support from teachers and parents, low achievement in mathematics and science, unequal access to and use of computer technology both at home and at school. A recent Educational Testing Service study suggests that the NAF Academy model has great potential to address a number of these issues (Barton 2002). The study identified several factors related to low mathematics and science achievement in minority students. For example, they are unlikely to have a strong peer group or feel a connection with school. The Academy provides a cohort within which students form an identity and which encourages group work and school involvement. The study revealed that minorities often fail to receive adequate preparation for mathematics and science courses. The AOIT curriculum is a demanding course of study that integrates technology into core curriculum areas such as mathematics and science. In addition, a rigorous high school curriculum was found to be the single most important factor in determining a minority student’s success in completing college. Minority students often do not have access to assistance required to research colleges and complete college applications. Academy students have the resources of teachers and staff who are dedicated to helping them achieve their goals. Minority students who do achieve success are distinguished by their high level of persistence, which is fostered by the educational environment of their schools. Academy students are encouraged to participate in various activities such as presentations of their work both within the school setting and outside at conferences and other events. These persisters reported that professionals they met in summer jobs influenced their decision to pursue a career in science and engineering even more than parents, teachers and friends. Thus, programs that provide opportunities for work in these areas should be strongly encouraged. A highlight of the Academy model is the internship experience which emphasizes the close connection between school and work.

When we consider the employment predictions for vast increases in computer science and in computer-related positions coupled with the lack of skilled workers, the rapid increase in minority population growth, and the current low achievement rate of minorities in science and technology, the necessity of exploring ways to improve the outlook for minority students for careers in technology becomes apparent. Further investigation of the NAF Academy model in a specific urban minority high school may lead to some solutions for these pressing issues in our society. The ultimate question may be whether or not schools such as Gorton can sustain the progress made from the initial grant from the National Academy Foundation.

References


