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ABSTRACT

The purpose of this paper is to explain the Technology Awareness Program that was implemented at a southern university to increase the exposure of information systems to high school minority students including females. The details of the program, industry participation, sponsorship, and the student project are presented and discussed. Prior research on interactive learning is included as support for the project and interactive learning methods employed in the program.

Keywords

IS/IT enrollments, minority students, IS education, gender, underrepresentation

"Bringing more women and minorities into the world of science and engineering, is not only the right thing to do, it must be an essential part of any national strategy to remain competitive and continue to lead the world in innovation."

INTRODUCTION

The prior quote is from Anne M. Mulcahy, the Chairman of the Board and CEO of the Xerox Corporation, keynote speaker at AeA's Annual High Tech Government dinner on June 8, 2005. According to the U.S. Bureau of Labor Statistics, all types of jobs are expected to grow by 10.4% during the years 2006 and 2016; however computer specialist jobs are predicted to grow by 25.2% (Dohm and Shniper, 2007). Computer specialist jobs as defined by the US Bureau of Labor Statistics include systems analysts, database administrators, computer programmers and software engineers. Three of four of these jobs are possible positions for students graduating with an IS degree. At the same time job demand is increasing, enrollment in information systems (IS) programs in the United States has decreased (Panko, 2008; Scott, Fuller, MacIndoe, and Joshi, 2009). A variety of studies have been conducted to determine why students choose not to major in MIS (Scott et al., 2009; Walstrom, Schambach, Jones, and Crampton, 2008.) Another venue of information dissemination within the IS community has been to share strategies for how to increase enrollment in IS programs (Scott et al., 2009; Dick et al., 2007; Watson and Keil, 2006). Most recently, Koch and Kayworth (2009) shared a variety of strategies used over 2.5 years, including a student-driven approach to increasing enrollment. Kuechler, McLeod, and Simkin (2009) report on a survey of 200 plus students their findings regarding actions faculty can take to increase MIS majors. The purpose of this paper is to present a strategy, the Technology Awareness Program (TAP), used at a southern university to attract more students to major in MIS. A unique contribution of this particular strategy is the focus on minority students and women.

LITERATURE REVIEW

IS Enrollment Crisis

A major factor that impacts the IS enrollment crisis relates to the image of the IS field. Students often have an incorrect mental picture of what an IS professional actually does on the job (Dick et al., 2007; Scott et al., 2009; Walstrom et al., 2008). Kuechler et al., (2009) used empirical data to identify three aspects of the prevailing image problem. First, many college students perceived IS to be a "…synonym for "programming" that would lead to purely technical jobs in windowless basement offices…" (p. 412). The second aspect of the image problem is the failure to understand what a career in IS looks like. The last issue related to the students perceptions of how much time and effort is required to major in IS and ultimately to work in IS. Another aspect of the IS enrollment crisis is the failure of IS programs to market the major to the students, parents, counselors and peers (Koch and Kayworth, 2009).

Interactive Instruction/Education

According to research conducted by Merrill (2002) in which he reviewed multiple instructional design theories, "…the most effective learning products or environments are those that are problem-centered and involve the student in four distinct phases of learning: (a) activation of prior experience, (b) demonstration of skills, (c) application of skills, and (d) integration

of these skills into real-world activities" (p. 44). The focus of TAP is problem-centered instruction. See Appendix A for a synopsis of the problem the students are asked to solve during their five days on campus.

Looking more specifically at the learning environment, Merrill (2002) identified five principles of problem-centered instruction. These are
1. Learning is promoted when learners are engaged in solving real-world problems.
2. Learning is promoted when existing knowledge is activated as a foundation for new knowledge.
3. Learning is promoted when new knowledge is demonstrated to the learner.
4. Learning is promoted when new knowledge is applied to the learner.
5. Learning is promoted when new knowledge is integrated into the learner's world. (pages 44-45)

As the various components of TAP are explained throughout the paper, the link between strategies of the program and education literature will be addressed. The next section identifies several research projects that are in progress regarding the minorities and women in IT.

Minorities and Women

As of February 23, 2010, the National Science Foundation has awarded over $8.4 million in the Research on Gender in Science and Engineering Program in the Division of Human Resource Development (National Science Foundation, 2010). Of particular interest are several studies that are currently in progress regarding the underrepresentation of women in the Science, Technology, Engineering, and Math (STEM) disciplines. In one grant that has been awarded to Eileen Trauth at the Pennsylvania State University (NSF 0204246), she and her co- investigators are exploring race, ethnicity, and social class in addition to gender to determine if new explanations can be found regarding the underrepresentation of women in IT (National Science Foundation, 2010). In another study (NSF 0624724) being conducted at the University of Virginia, 900 secondary students are followed for three years to determine how their STEM characteristics, remain stable, develop or vary over time for girls, ages 10-17, compared to boys and considering varying ethnicities and socioeconomic backgrounds.

GOALS AND OBJECTIVES OF TAP

The main goals of TAP are to expose minority students to the exciting and rewarding world of technology and to entice students to come to the southern university to major or minor in information systems in the college of business. However, considering the Computing Curricula 2005 report given by the ACM (Shackelford et al., 2006), emphasis is placed on the importance of identity for each of the computing disciplines—computer science, information systems, computer engineering, and information technology. While the ultimate goal is for students to major in information systems, an identification with and ultimate major in any of the computing disciplines is considered a success of the program. For TAP, women are considered to be classified as a minority class. This classification is used as directed by the IT executives who sponsor the program. Getting to know the faculty, working with state of the art technology at the University, and expelling myths (Kuechler et al., 2009) about the IS field are a few of TAP's objectives. Other objectives are to increase enrollment in the information systems major and to develop working relationships with Information Systems college student mentors and University college student counselors (Koch and Kayworth, 2009).

DETAILED DESCRIPTION OF THE 2009 TAP PROGRAM

TAP is a five day event for high school students (sophomores, juniors and seniors) to learn about Information Technology and the University and to showcase what they have learned by making a presentation at the end of the program. There were 22 students who attended the 2009 TAP Program, 7 females and 15 males. All students were of minority representation including the females. There were 15 African American students, 6 Hispanic students, and 1 multi-racial student. In order to identify potential students for participation in the program, the Office of Diversity Programs at the University works with high school counselors from a 5 state area to encourage students to submit an application. For this particular program, the Office of Diversity Programs considers all females as potential participants. For more details regarding the program, access http://waltoncollege.uark.edu/diversity/tap.asp. By working with the high school counselors (Koch and Kayworth, 2009), we hope to dispel the myths while expanding the knowledge base and understanding the counselors have of a major in IS. Current enrollment in the MIS major at the University includes 140 males (94 Caucasian, 25 minorities and 21 internationals) and 39 females (23 Caucasian, 12 minorities and 4 internationals). Two of the minority males that participated in the 2009 TAP are currently in the MIS program at the university.

During the program the participants receive a case study where they must solve a problem or opportunity using technology. The 2009 program participants were introduced to Terracycle, an upcycling company. As suggested by Merrill (2002), a real world problem was used to engage the students in problem solving in an area of concern for an existing company. Admittedly, TAP could be strengthened by including future case studies from the perspective of a minority owned business. (Thanks to an anonymous reviewer for this excellent suggestion.) Terracycle's owner, Tom Szaky, had previously visited and spoke at the College. At one point in his presentation, he said there was a need for company awareness and an increase in quality customer service. The charge of combining these needs with a solution using technology was posed before the teams of participants.

Because of the short program time over five days, social media was used to help the participants get to know each other and the faculty a month before they arrived on campus for the program. Short videos were made available before the program through a Facebook page to introduce the participants to the concepts of business processes, project management, and the system development life cycle. Facebook was used as the medium for distribution as most high school students would be familiar with Facebook, thus using existing knowledge as a basis for presenting new knowledge (Miller, 2002). The videos served as an introduction to new concepts for the students; these concepts were then applied to the solution the students developed while on campus. By incorporating these concept videos and opening discussion on Facebook between the faculty and the participants, much time was saved for the program and the program could hit the ground running on the first day. These three concepts were integrated in the participants' solutions, thus reinforcing the new knowledge by application of the concepts to the case study (Miller, 2002).

A variety of interactive learning methods were employed throughout the program. One session during the program schedule was devoted to a consultant roundtable where the participants could ask questions about the case study with industry representatives and College faculty. External validity of the project was very high as exhibited by industry representative input. This allowed the participants to gain a different perspective and to network with the information technology business community and College faculty. This was the first time this format had been used. See Appendix B for an abbreviated schedule of two days from the program. Another form of interactive learning included a session that allowed the participants to take a field research trip to investigate the Terracycle brand out in the market. The students were able to experience first-hand brand exposure or a lack of brand exposure as well as brand identity for the case study they were researching. The students were escorted to the local Home Depot and Walmart stores to locate the TerraCycle brands based on product placement information given by TerraCycle. Students looked for TerraCycle products and if products were discovered, product placement, product aesthetics, and product competition were observed and analyzed. One student commented that the product was not in the store in which TerraCycle said there were products available. Another student remarked the product availability was limited. The students' identification of limited visibility of Terracycle products led them to understand the importance of web pages and social media as a solution for brand/product awareness, thus exhibiting a demonstration of their new knowledge (Miller, 2002).

After five days of gathering information to formulate technological solutions and learning more about the University and College, the participants presented their team's solution with a presentation to the business community, industry consultants, and faculty and staff of the College. The students were able to demonstrate their new knowledge and experiences through the final presentation. Each team member was required to speak during the presentation, thus offering the opportunity to practice oral communication skills. They also used MS PowerPoint as a way to organize the presentation and package the recommended solution. In the past, students were allowed to incorporate a skit into their presentation as a creative form to illustrate what they had learned from the week.

Business Partners

An extremely critical aspect of TAP includes the sponsorship, participation and support of the business partners who donate time and money, provide guest speakers and company mentors/consultants as well as allow student tours of their organizations and facilities. Some of the companies that have participated recently include Arvest Bank, ConocoPhillips, DataTronics, Dillard's, J. B. Hunt Transport, Inc., and Tyson Foods, Inc.

College Student Counselors and Mentors

Another important aspect of TAP is the participation of existing college students in the program. The college students serve as mentors and counselors during the week. Many of the college student mentors and counselors are minorities; some were even TAP participants prior to attending the university. Each college student is assigned a group of the high school students for which to serve as counselor. The counselors stay with the students in the university dormitories during the week; some of them also serve as lab assistants when the high school students are working on the case study. The high school students have

many interaction opportunities with the counselors and mentors to promote the "collegiate" experience while on campus, thus integrating new knowledge of college life into the high school student's world (Miller, 2002). For the fall of 2010, one of the TAP participants from the summer of 2008 has received a full university scholarship to study engineering. He credits the 2008 TAP program for providing him the interest in technology and the desire to attend the university. One of the college student mentors stated, "The opportunity to work in teams, to learn about their strengths and weaknesses, to present in front of real executives, and to be guided through the process by real professors is a learning experience that I think these students will carry with them throughout their college careers." Both the Office of Diversity Programs and faculty from the IS department follow up with students by contacting them with letters, e-mail, and phone calls. Additionally, the Facebook connection used during the summer of 2009 is still available for interaction with the TAP participants. Furthermore, several scholarships have been offered to TAP participants to encourage enrollment in the IS major. However, there is room for improvement in the structure and organization of follow up activities with those high school TAP participants.

Program Feedback

Another indication of how the TAP experience influenced one of the students is illustrated in the following statement, "I think [school] this next year will be easier because I have a solid base of knowledge I can use in my senior year." (TAP participant from Hot Springs, AR) Another student commented, "I had a lot of fun this week. I made a lot of good friends and learned a ton about technology." (TAP participant from Bartlesville, OK). For those TAP participants who had prior desires to enter the IS field, the goal of the program was to reinforce and solidify the desire to study IS. TAP participants were surveyed at the end of the program. The participants were asked if they would consider attending the University after completion of TAP and 96.5% said yes. They were also asked if the TAP participants would encourage others to participate in TAP and 96.5% of the participants said they would encourage others. TAP participants were then asked whether they would consider information systems as a major and 81% said yes. One participant commented, "This program will help so much and I appreciate everyone who has helped us students become successful." Recently, the Conference Coordinator for Housing Conferences relayed that a TAP participant stated that TAP had a significant impact on the participant and is a large part of why the student desperately wants to attend the University now. In order to improve feedback and continual follow up, a database is being constructed to better track the college and major choices of the TAP participants as they graduate high school and continue their education.

CONCLUSION

As universities continue to face enrollment issues and strive to increase the number of IS majors, a variety of initiatives have been undertaken. This paper reports the details of a particular initiative to reach minority students and females that are in high school by bringing them to the university campus for a five day program. The participants stay in the university dorms and eat in the campus cafeterias. The program includes college mentors and counselors to expose the high school students to potential college peers and enhance their exposure to the collegiate experience. Based on the feedback received from the participants, the program has been successful in completing its goals by enhancing the student exposure to IS and increasing the chances that a student will major in IS.

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APPENDIX A

2009 Project Details

Team Assignment

- Research TerraCycle, including the history, business model, successes, and current challenges
- Identify 2-5 business problems facing TerraCycle
- Select one business problem to address
- Propose a solution the problem you selected (Note: your proposed solution must incorporate some IT component)
- Prepare a presentation (using PowerPoint and all members of the team) to demonstrate your understanding and application of project management, technology development, and business processes in both the problem selection and the proposed solution.
- Deliver your presentation to a panel of business people and educators.

Resources available to you

- Education sessions
- Understanding the role(s) of IT in businesses
- Using project management skills
- Using the technology system development life cycle
- Recognizing and understanding business processes
- Making good presentations
- Conducting research
- Working as part of a team
- Video presentation by Tom Szaky, CEO of TerraCycle
- Computers and printers
- Access to online research engines /software
- Content experts (faculty and industry)
- Presentation software and template
- Coaching, support, and feedback

How you will work together

- Team assignments will be made prior to arrival and you will be expected to work as a team
- Each person on the team will be assigned a business process to represent during the week
- Collaborative work is expected in all areas of your task:
    - Conducting research
    - Generating ideas
    - Planning your work (Determining the approach)
    - Selecting the business problem and solution to present
    - Contributing content to the presentation
    - Practicing and delivering the presentation

Presentation template should include

- Company Overview (industry, key facts, brief history)
- Business challenges/opportunities
- Opportunity selected and why
- Proposed Solution
- Benefit to company
- High-level plan (demonstrating sound project planning and SDLC
- Your Team Dynamics
    - How decisions and responsibilities were handled?
    - What we did well and what we could have done better?
    - What we would tell future TAP teams?

Overview of TerraCycle

In 2001, Tom Szaky, a Princeton University Freshman, founded TerraCycle in hopes of building an ecocapitalist company built on waste. After winning countless business plan contests, Tom dropped Out of Princeton to pursue his dream of founding the world's most environmentally friendly company. Seven years later, TerraCycle's eco-friendly products have received a myriad of social and environmental accolades and are sold at major retailers like The Home Depot, Target, Walmart and Whole Foods Markets. TerraCycle's business plan and products made from waste received a Zerofootprint Seal of Approval, won The Home Depot's Environmental Stewardship Award twice and recently won the 2007 Social Venture Network Innovation Award. Please visit us at www.terracycle.net to learn more.

APPENDIX B

Abbreviated Schedule for 2 days of the Program

Sunday, July 12

8:45 a.m. - 10:15 a.m.	Topic: Project Overview and Team Building
10:15 a.m. – 10:30a.m.	Break
10:30 a.m. – 11:45 a.m.	Terracycle Video and Conducting Research
12:00 p.m.- 1:00 p.m.	Lunch
1:15 p.m. - 3:15 p.m.	Topic: Understanding Business Processes and Using Project Management
3:15 p.m. – 3:30 p.m.	Break
3:30 p.m. - 4:30 p.m.	Topic: Using the Systems Development Life Cycle
5:00 p.m. – 6:00 p.m.	Dinner
6:15 p.m. - 7:45 p.m.	Work on project
	Problems/Solutions, Business Processes, Project Planning, & Questions for Industry and College Faculty Consultants

Monday, July 13

	Breakfast and Group Picture
9:00 a.m. – 10:00 a.m.	Academic Programs-Admissions-- Guest Speaker
10:00 a.m. – 10:10 a.m.	Break
10:10 a.m. – 11:00 a.m.	Presentation Skills – Making Good Presentations
11:00 a.m. – 11:45 a.m.	Work on project
	Lunch
1:15 p.m. – 2:15 p.m.	Consultant Roundtable
	Participants from Arvest Bank, DataTronics, J. B. Hunt Transport, Inc. College Business Faculty, Tyson Foods, Inc.
2:15 p.m. – 5:30 p.m.	Work on project
5:40 p.m. - 6:40 p.m.	Dinner
6:55 p.m. – 8:15 p.m.	Work on project