

NSF – CompTechS Annual Report

Activities and Findings

Research and Education Activities

EXECUTIVE SUMMARY – Year 1

Internships and Underrepresented Student Persistence in Technical Education

The CompTechS Program in the Occupational Training Institute at Foothill-De Anza Community College District was funded in June 2007 by the Advanced Technological Education Program of the National Science Foundation to study the impact of the program on student persistence in the IT field, especially for low income and underrepresented groups.

The CompTechS (Computer Technical Support) program provides about 50 students a year with paid internships in a computer refurbishing lab on the De Anza College campus and also places qualified interns in local industry. Through the hands on experience in the production environment of the lab, students gain valued hardware skills, clarify career goals, and are counseled about useful courses and certifications to meet their goals.

The computers that the interns refurbish in the lab are acquired through the solicitation of used computers from local companies and the community, providing a socially responsible means of retiring computer equipment. At the same time, the program bridges the “digital divide” by recycling these refurbished computers to disadvantaged students – financial aid recipients, Equal Opportunity Program and Services (EOPS) and CalWorks (public assistance) students.

Major Accomplishments

- 56 students have participated in a CompTechS internship from June 2007 to December 2007 and are in the student cohort for this first year report. Thirty-one (31) students were interns in the campus refurbishing lab, and 25 also had an industry internship. Seventy-five percent (75%) of the student cohort were from one of the groups we targeted (low income, women and underrepresented minorities). Ten students out of the 56 were women, 18%. Sixty-one percent (61%) of our cohort were receiving financial aid as compared to 20% in the rest of the De Anza College population.
- Approximately, 210 disadvantaged students received refurbished computers through the program in the past year.
- Seven companies in Silicon Valley took interns -- Fujitsu America, Photon Dynamics, Synopsys, Roche Pharmaceuticals, VMWare, Applied Biosystems and Flextronics-- providing students with valuable skills in information technology.
- During this time, 18 students completed and exited the program. The data was consistent across all completing interviewees that they increased their confidence, feelings of technical competence and readiness for the workplace. All of the

interviewees said that they would recommend the program, and had already recommended it, to friends.

- From June 2007 to January 2008, the persistence is 89% in coursework; many of these students were also employed. Additionally, one completer not represented in the 89% was working full-time in field to give us 91% persistence in computer and technical fields.
- Evaluators conducted a former student survey of those students who had completed the program before June 2007. Over 90% had taken courses in computer related content since finishing the program, with 75% having a degree as a goal. About 87% have career goals in computer related and technical fields.
- The CompTechS program provided a responsible recycling program for employers and the community and disposal of ewaste.
- Data was collected to answer the six research questions posed for year one and a findings report written. Findings are discussed below.

The activities proposed for the grant in Year One have been conducted as proposed, and the evaluators were able to verify their performance. Data from the institutional researcher demonstrates that the targets for the Year One outcomes are almost fully achieved. Through January 2008, fifty-six participants had been identified and tracked in the data, and additionally data from 32 past students was analyzed.

MAJOR FINDINGS

The research cohort for the year one study were those 56 students who were in the CompTechS program for any period of time between June 2007 and December 2007. The CompTechS program accepts students into the program throughout the year – and students complete the on-campus portion after 144 hours in the refurbishing lab. If they don't go into an industry internship, they then exit the program to make room for others. The 56 students had internships in the campus refurbishing lab or in industry, or both, during this period.

HOW DO STUDENTS ASSESS THE VALUE OF THE INTERNSHIPS AND LEARN-BY-DOING METHODOLOGY?

Students gave high ratings to their CompTechS experience and made overall very positive comments about the impact of the program on their professional goals.

Eighteen (18) students completed the program from June-December 2007, and did an exit survey and short interview with the program coordinator. The helpfulness of the campus refurbishing lab received the highest marks from almost all students at 5.5 on a scale of 6.

When asked what the best thing about the CompTechS program was in their exit survey, students reported gaining new skills and knowledge (12 responses – 67%) and gaining industry experience (4 responses - 22%), rather than getting paid (2 responses -11%). Though getting paid often attracts students to the program, by the end of the program

they felt that their learning was the best thing about it. The patterns in the responses also included building their resumes and gaining experience. Helping others gain access to computers and helping others in the lab were two additional responses.

The Past Student Survey

The thirty-two (32) surveys by former students, those that completed before June 2007, shed light on the student experience and the value of it to them. This survey confirms that the learning, confidence building and resume building were highly important to those who had completed. However, the predominant theme was the clarification of goals that students realized because of their experience in the CompTechS program. “Well, before working for CompTechS I was not really sure about my major but after working there and getting a hands on experience on refurbishing used computers I realized that this is what I wanted to do as a major and I decided on pursuing my bachelor's in computer engineering.”

These students were able to anecdotally report on positions they landed as a result of their experience or increased confidence. “After graduating from San Jose State University with a B.S. in Computer Science, I was jobless for nine months despite sending out resumes. I came across the CompTechS program in the school newspaper and enrolled. Susan quickly found an internship at a database company..... Now I work in the Information Systems department at a hospital. I am exactly where I want to be. The experience at the database company provided the needed work experience to obtain my current job. Susan and the CompTechS program helped me get that experience and I will be forever grateful.”

Evaluator Interviews with Completers

The project evaluators interviewed six completing students over the telephone to see if responses to outside evaluators would be different than to the project staff. No differences were found. The data was consistent across all interviewees that they increased their confidence, feelings of technical competence and readiness for the workplace. All of the interviewees said that they would recommend the program, and had already recommended it, to friends.

WHAT IS THE IMPACT OF THE INTERNSHIP EXPERIENCE ON SUCCESS, PERSISTENCE IN THE MAJOR AND PLANS FOR CAREERS OR TRANSFER?

A primary data source for retention is the institutional data on student enrollment and success within Foothill-De Anza CCD. In addition, the institutional researcher at De Anza College licensed a student tracking system that allowed for tracking enrollments of students who completed the program and their studies within FHDA, and transferred to four-year public institutions within California. The 56 students who had been in the program from June through December 2007 were the cohort for research for year one.

As well as their persistence in computer related courses and technical (STEM) courses, we realized that we need to look at the student's persistence from quarter to quarter in general education, because students on a degree or transfer track may have quarters

without technical courses. This is especially true of part-time students who take fewer units per quarter.

For the purpose of our research, we looked at the results we got for the overall cohort of 56, as well as target groups of low income, women and underrepresented minorities, including Hispanic, African American, Pacific Islander, Filipino based on historical difficulties of these groups documented in the literature. In addition, research on Asian subgroups has suggested that Southeast Asians (i.e., Vietnamese, Cambodian, Laotian) have more obstacles to success and are less prepared academically (Government Accountability Office, 2007 [www.gao.gov.new.item/07925.pdf](http://www.gao.gov/new.item/07925.pdf)) than Chinese, Japanese, Korean and Asian Indians. So we also looked at these Southeast Asian groups as part of our target for year one. Most of them were covered in the low income group, which we have defined as receiving financial aid. Because in California, the community colleges are relatively low cost at \$13/quarter unit, those qualifying for financial aid are categorized as low income here. Financial aid recipients included those receiving public assistance through CalWORKs, a Temporary Assistance to Needy Families program that provides financial support to parents/caregivers while helping them to find jobs. Also included were EOPS (Equal Opportunity Program and Services) students that receive college support services for low-income and educationally disadvantaged students, funded by the State of California. A composite group of unduplicated students in any of the target demographic groups was 75% of the 56 student cohort.

Persistence

Of the 56 students in the year one research cohort, 46 were enrolled in FHDA in Fall quarter and 6 were enrolled in four year universities. At the beginning of Winter quarter 43 were enrolled at FHDA and 6 in universities and one at City College of San Francisco. So from June 2007 to January 2008, the persistence is 50 out of 56 in coursework, 89%.

One other former student, not represented in the 89%, obtained full-time employment in the field as Senior Computer Support. Including the employed, we have 91% who have persisted in the field at this point.

Success

In computer related coursework, the CompTechS student success rate (a grade of C or better) was 69% as compared to 68% percent for other De Anza students not in CompTechS, virtually the same rate. However, the success rate in overall coursework approaches a significant difference, with 76% of the CompTechS student grades/coursework successful in Fall 2007 compared to 70% of De Anza students' coursework overall.

The success rate was highest in non-technical courses at 80%. Fifty-two percent (52%) of the courses taken were non-technical. Females in the program did slightly better in computer related coursework than their male counterparts. However, the number of courses was small for females. Southeast Asian students did significantly better than other student groups including Chinese and white students. The African American and Latino students had the lowest success rates. However, these two groups accounted for

only 4 students, so one needs to be cautious regarding conclusions with this first year data.

Plans for careers and transfer

Data and quotes from the 18 completing students and the past student survey provided insights into impact of the program on career plans and educational goals.

Six of the 18 completing students reported in their exit survey that they changed goals from the beginning of their time in the program. Interestingly, an additional two students who had come into the program with a goal of Computer Science as a major/career were doubting that choice by the time they finished the program, because others in the lab were “better” compared to them or hearing that computer science courses were “hard.” This is contrary to the consistent and substantial data about increased confidence as a result of the program, but consistent with clarification of goals. Other of the completers reported that they focused their goals more, or confirmed them.

Past students who completed before June 2007 reported their career goals -- 87% had a computer related or technical career as a goal.

WHAT ARE THE MOTIVATING FACTORS THAT IMPACT ATTRACTION, PERSISTENCE AND SUCCESS?

After the past student survey, we hypothesized about the factors or program features that attracted students, contributed to their success, and motivated them to continue in the program and the field. Since then we looked to exit surveys and exit interviews to confirm motivating factors.

Students made frequent comments about the appreciation they had for the supportive staff: the instructional lab coordinator and the CompTechS Coordinator. “The staff’s supportive efforts and attitude made it a pleasure to spend time at the lab.” As indicated earlier, learning and improving skills, relevant experience and resume building were important benefits reported by students, thus likely motivated students to continue. We believe that the paid internship is a feature that attracts students to the program, however, they don’t often cite that as a reason for their interest in the program in application interviews, understandably.

The following list of motivating factors was gleaned from student responses and observation:

- Supportive staff
- Resume building, industry experience and contacts
- Acquisition of new or improved skills
- Flexibility of work hours in the lab
- Convenient location (campus)
- Friendly environment, teamwork
- Helping students have access to computer
- Counseling regarding courses to take within district

- Paid internship

In addition, we have begun identifying best practices that will help others to be successful in replicating the program:

- Flagging the student in the SIS for preferential enrollment.
- A small group in the lab of 4-6 students at a time made it easier to talk with others

Four of six completers interviewed by the evaluators mentioned the learning that took place and the low key atmosphere as motivating them to continue – or what they liked best. “It improved my customer skills. It also improved my technical skills, like troubleshooting.” One person focused on the company positions that were available and the motivation to get a fulltime job. Another focused on the “incredible opportunity,” in terms of “giving me a great start on my career.” In response to the question: What helped motivate you to continue, an answer was, “The atmosphere in that lab, because everyone was eager to learn. It was like a home. It was very organized.”

Feelings of being comfortable in the environment, that they were learning and that the experience was worthwhile made students more engaged – contributing to their success and likely their persistence in the field.

DID STUDENTS’ ATTITUDES IMPROVE TOWARD COMPUTING FIELDS?

When looking at the question of whether students’ attitudes toward IT and computing fields improved, we looked at student responses and comments in completer interviews and past student surveys.

The most significant improvement reported by students was their feeling of confidence and competence. In interviews conducted by the evaluators, all of the interviewees said that their experience in the program increased their level of self confidence. As well, they felt more confident technically and more ready for the workplace. “Yes – it made me feel more confident, gave me the feel for my field and what it’s like.”

Comments on past student survey regarding confidence numbered four, such as “CompTechS boosted up my confidence, enhanced my skills.” However, the students’ perception about improved competence and appreciation for industry experience can be construed as having a bearing on level of confidence.

WHAT ARE THE DIFFERENCES IN THE IMPACTS OF THE INDUSTRY INTERNSHIP AS OPPOSED TO THE CAMPUS INTERNSHIP?

We saw no statistically significant differences on any of the variables. Thus, the results indicate that for this initial cohort of students that participation in the Campus Lab only versus both the Campus Lab and Industry Internship did not influence enrollment patterns or probability of success in coursework. Further, it did not influence the perception of the students on the value of the program in clarifying their goals or of the programmatic components.

This was an important question and has implications for the replication of the program at other institutions that do not have an employer base like Silicon Valley.

HOW DOES THE IMPACT OF THE METHODOLOGY (LEARN-BY-DOING AND INTERNSHIPS) VARY FOR DIFFERENT STUDENT POPULATIONS?

The results suggest participants in the program had very similar experiences regardless of their gender and ethnicity. While the participant's experiences may be unique to each individual, they are not shaped by their physical characteristics. The same was true of low income students, though there were some differences, such as better success rates in non-technical courses. Generally more data is needed to determine patterns in each of the specific ethnic groups.

CONCLUSIONS

Student perceptions of the benefits of their experience in the CompTechS program were very positive, whether they were only in the campus based internships in the refurbishing lab, or also in an industry internship. Feelings of being comfortable in the environment, that they were learning technical skills and that the experience was worthwhile made students more engaged – contributing to their success and likely their persistence in the field.

Student persistence in coursework and the field is high at 91%, but this is an early measure that needs to be tracked over the duration of the project. CompTechS students' rate of success in coursework is as good, or better, than the rest of the De Anza College population. Past students seem to be persisting in technical fields at a self reported rate of 87%. Feelings of confidence and increased competence for students coming out of the program may be contributing factors to persistence.

Since we found no significant differences in the impacts of the industry internship as opposed to the campus internship, there are implications for replication of the program. The on-campus computer refurbishing lab and computer scholarship program are replicable at any campus regardless of the surrounding employer base. That is, even rural campuses can provide the benefits of tech support internships to their students.

Generally the results are the same for the students regardless of their characteristics of gender, ethnicity and only minor differences for those receiving financial aid. Larger numbers in specific ethnic groups will determine patterns in success and persistence that data suggests at this time. For the few African American and Latino students, their involvement in the program has not positively impacted their success rate in coursework, per this preliminary data. The composite of all target underrepresented groups had better success in non-technical coursework as compared to the rest of the CompTechS students (largely white and Chinese males), who had greater success in computer related courses.

The program has been effective in equipping students with technical skills and also increasing self confidence. Underrepresented groups in the computing fields are persisting, though more data is needed for specific ethnicities. The issues going forward will be to understand and document the practices that make this program effective. There is merit in developing a model that identifies those factors that allow the program to be scaled to other environments.

TRAINING AND DEVELOPMENT (of faculty)

This ATE project did not provide training and development for college faculty and secondary teachers.

OUTREACH ACTIVITIES

The most effective recruitment activity for the CompTechS program in the past has been presentations in the classrooms where students are taking computer related courses. This was done on both the De Anza and Foothill College campuses in Fall 2007. A brochure was developed for these presentations and for relevant events such as career fairs. In addition, the program is highlighted in the schedule of classes each quarter.

This year word of mouth yielded the most inquiries about the CompTechS internships. As well, an article in early Fall 2007 in the De Anza student newspaper, La Voz, highlighted advantages of the internships to students and the computer scholarship component of the CompTechS program.

A new outreach initiative aimed at welfare recipients in CalWORKs was implemented in Winter 2008. CalWORKs is a Temporary Assistance to Needy Families program that provides financial support to parents/caregivers while helping them to find jobs. This population is proportionately high in numbers of single mothers, with many not having high school diplomas. This initiative required careful planning since this group needs extra academic support, counseling and services when they arrive at the campus. A presentation to the assessment counselor's for the County of Santa Clara was conducted in January 2008. The plan is that students will begin coursework in Spring quarter 2008 toward a certificate in Windows Technical Support. After Spring and Summer, students will concurrently continue coursework Fall 2008 and go into the CompTechS refurbishing lab as paid interns for a hands-on portion of the program..

Outreach to industry has been consistent to ensure that internship opportunities are maintained and new positions are developed.

PART III Publications and Products

The program website for student information:
<http://oti.fhda.edu/comptechs.html>

The website geared to the computer donation component of the program:
http://oti.fhda.edu/computer_donation.html

PART IV Contributions

This program/project is unique in that it provides a technical internship model that can be replicated at every campus regardless of the employer base in the geographic area. The on-campus refurbishing lab provides students the hardware and upgrade experience they need for technical support technician level work. Early data collected through this project suggests that CompTechS program has potential to meet goals of attracting and retaining diverse student groups in computing related fields. Also it is effectively meeting workforce development goals, in that local employers get a cost-effective entry-level labor force and students are provided access to high wage, high-demand careers.

Using the hands-on characteristics of a technical career path curriculum to encourage participation and retention of underrepresented students is an innovative approach. The traditional CS pipeline only produces some of the successful IT workers, many of whom are self trained or pursue nontraditional educational paths. It is worth understanding nontraditional programs and ways that they can be adapted to integrate and support traditional educational programs.

As well, the program provides needy students computers which have been donated by industry and the community, and refurbished by student interns. Thus the program can serve as a model for other community colleges to close the digital divide and to retire computers in a socially responsible way.