BPC-A: Empowering Leadership Alliance (ELA)

2008-2009 Annual Evaluation Report

Presented to ELA Leadership Team

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ELA 2008-2009 Annual Evaluation Report

1 Background and Evaluation Goals

1.1 ELA Goals

The goal of the Empowering Leadership: Computing Scholars of Tomorrow Alliance (ELA) is to increase the number of students from groups with long-standing under representation that receive undergraduate and graduate degrees in the computing disciplines. A key focus for the ELA program is its emphasis on minority students at *majority schools*. ELA program leaders believe that minority students at majority schools (or predominantly white institutions) experience fundamentally different barriers to successful computing degree completion than do students at minority-serving schools, particularly a lack of a support group and feelings of isolation. Research literature on minority student persistence finds related risk factors; several of these are beyond the control of the ELA (e.g., academic preparedness upon entry in freshman year, which is considered the riskiest year; local conditions of prejudice and racism; student financial ability to remain in college). However, the ELA's theory of change is that they can ameliorate other factors, such as social integration into the academic community (by augmenting the local community) and providing encouragement and support. ELA is primarily focused on retention, but is also concerned with advancing undergraduates into graduate study, graduates into faculty careers, etc. In addition, the ELA is acutely aware that systemic reform of undergraduate departments and other aspects of the local academic climate is critical to sustaining long-term change.

To increase likelihood of retaining students, ELA creates opportunities for students to become co-involved with professionals and each other in activities that lead to a greater sense of membership and belonging in local and national communities:

- Student groups (research lunches, recruiting/outreach, REUs, community-based service projects, peer mentoring/tier mentoring, tutoring) with faculty involvement
- Mentoring
- Conference attendance (e.g., SC08, Tapia, Hopper, and local/regional conferences emerging out of local ELA efforts)
- Research experiences (matching individual students on short-term experiences)
- Social networking (on Facebook)
- Involvement with other BPC Alliance projects (STARS, Alliance for the Advancement of African American Researchers in Computing, Computing Alliance for Hispanic-Serving Institutions).

1.2 Purpose of the Evaluation

The ELA evaluation is designed to be both formative and summative, allowing feedback to inform ELA practice, while simultaneously providing rigorous results regarding program impact on students. Therefore, baseline data is collected from newly joined students to permit

comparison across time and potentially, to national data sets (e.g., Baccalaureate and Beyond; National Education Longitudinal Study; perhaps others as makes sense). Observation, interview, and survey data are collected from individual events and ongoing programs (e.g., mentoring) to provide feedback for improvement or to furnish project leaders with student perceptions and needs. In addition, interviews have been conducted to understand students' perceptions of what could help them to succeed in their academic programs and how the ELA might contribute. With respect to systemic reform of undergraduate departments and local conditions, no evaluation has been performed to date.

1.3 Evaluators' Involvement

The ELA evaluation is led by Dr. Lecia Barker. During the first eight months of 2008, Dr. Sarah Hug worked on this evaluation and made strong contributions. Dr. Barker moved to the University of Texas in August, 2008; grant transfers may be completed very soon and she is hopeful to hire another evaluator to support the project. Evaluators' 2008-2009 involvement has included:

- Both consultation and evaluation, since 1) we frequently access research on underrepresentation and practices related to overcoming it; 2) we are familiar to recommended practices for interventions undertaken by the Leadership Team, local initiatives; and 3) we are connected to lessons learned from other BPC projects and involved with development of BPC metrics.
- Evaluation of specific events, development of evaluation baseline, and evaluation of mentoring part of project. Specific events include the Tapia conference (2007 – report was not delivered until March, 2008), including a separate, smaller report on outcomes for ELA students only; and the ELA Texas Conference.
- Interviews with students to better understand their perceptions of what could help them to succeed in their academic programs and how the ELA could contribute to this.
- Participation in weekly evaluation team meetings/planning with Program Managers Cynthia Lanius and Ann Redelfs. Meet with ELA Leadership periodically and more often brief phone calls with PI Richard Tapia.
- Participation at regional, local, and national events. Periodically listen in on calls with ELA Student Advisory Board, Mentoring Team, and North Eastern Empowering Leadership Alliance.

1.4   Plan for Impact Evaluation

The evaluators' understanding of impact outcome goals and general evaluation mechanisms are shown in the table below.

Table 1: Goals and Mechanisms for Evaluating ELA's Long-Term Impact

Goals	Baseline	Comparison Groups	Follow-up
1. Increase retention of minority computing students at majority institutions through completion	Enrollments	Completions prior years Possible data sources: IPEDS, NELS, B&B, NELS, NPSAS	Completions (w same degree)
	# participate in ELA programs		#participate in ELA activities; major, department, level; institutional type
	student intention to complete		
	department, major, level; Current standing/time to degree; institution type		
2. Increase enrollment of minority computing undergraduates at majority institutions into graduate programs	# participating in ELA activities	B&B, IPEDS; Survey of Earned Doctorates; SESTAT?	Grad enrollment activities (e.g., take GRE, visit, apply)
	activities toward application/enrollment		#applications made, #admitted
	degree sought		department, major, level
	research skills, experience		type of institution
			research skills and experience
3. Enhance careers of minority computing students at majority institutions graduates	major in highest degree, highest degree attained, type of employer sought, position sought, participation in ELA activities	B&B, SESTAT?	Post-docs awarded, institution type, major, highest degree, position type, company
4. Change systems that minority computing students at majority institutions experience	UG: Student engagement practices, means of identifying potential "attriters" and relevant interventions; Grad.: shared offices, admissions practices, departmental tracking of milestones and self-assessment	Organization-level data	#people who receive ELA materials, perception of value, use; policy change: admissions practices, milestone tracking, shared offices, student perception of belonging/other conditions

1.5   What This Report Includes

This report includes the series of formal and informal written reports provided by the evaluation during the past year. This includes:

- Baseline data report
- Mentoring summary report
- Recommendations from student interviews summary
- Texas ELA Conference report
- Tapia Conference report, ELA members only
- Overall Tapia Conference report

2 Baseline Data Report

The Baseline Data survey is intended to serve as a comparison point for studying program impact. Given the short-term nature of NSF funding, it is not possible to follow students for the long term (as have the Baccalaureate and Beyond and National Educational Longitudinal Study, though these may serve as comparisons in the future). Survey categories include:

- Students' thoughts of leaving and their confidence of completing their degree
- Available support organizations in the local environment and students' participation (e.g., student chapters of national societies)
- Social integration in the local setting (feelings of encouragement, belonging, support from faculty and peers; participation in department-level events and involvement with students and faculty [graduates])
- Pursuit of graduate school, research careers (undergraduate)
- Gender, race/ethnicity, year in school

Highlights of these categories follow.

2.1 Profile of Sample

All students who had registered to become members were sent survey invitations totaling 241 students. Persistence in repeat messaging resulted in a response rate of 63%, or 151 students. Of these, 58% were graduate students and 42% undergraduates, at various levels, as shown in the Table below. The mean year of graduate school was three and the mean year in undergraduate degree program was junior. The gender proportion was even, with 50% of each gender presented; this suggests that ELA is doing a good job of reaching females, who are severely underrepresented in computing in all races/ethnicities.

Table 2: Student Level of Sample

What level student are you as of today?	N	%
Undergraduate	64	42.4
Freshman	6	10.5
Sophomore	12	21.1
Junior	16	28.1
Senior	17	29.8
Fifth-year senior	6	10.5
Graduate	87	57.6
This is my first year	8	11.3
Second year	20	28.2
Third year	10	14.1
Fourth year	14	19.7
Fifth or more years	19	26.9

Figure 1: Race/Ethnicity of Baseline Survey Respondents
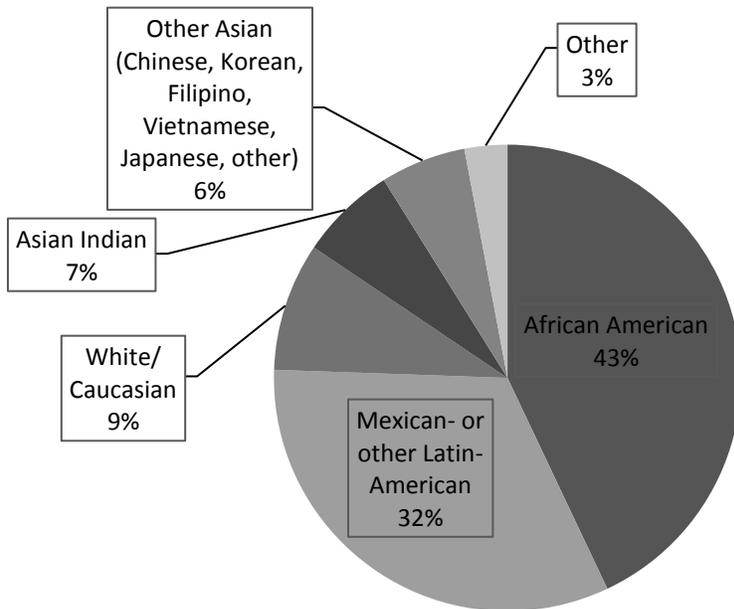
Participants were asked both "are you Hispanic" and to indicate one or more races/ethnicities. To the item "are you Hispanic?" 35% responded yes (N=138). The race/ethnicity breakdown of the second question on race/ethnicity is shown in the figure below. The largest group was African American, at 43%. The smallest group shown is "Other," which is actually even smaller, since

the anyone who responded in the categories American Indian/Alaskan Native, Hawaiian or Pacific Islander, or Other were placed here. The ELA may wish to consider reaching out more effectively to these groups.

2.2   Intention to Complete Degree

Both graduate and undergraduate students were asked about whether they had ever seriously considered dropping out (graduates) or dropping out or changing to another major (undergraduates) as well as their confidence that they would complete their computing degree. Nearly half of graduate students had considered dropping out, with 49% agreeing or agreeing strongly (N=75; no gender or race/ethnicity differences). Among undergraduates, 43% had considered dropping or switching majors (n=60; no gender or race/ethnicity differences).   In contrast, students showed strong confidence overall that they would complete their degree, as shown in the Table below (no gender, race/ethnicity, or student level differences).

Table 3: Confidence in Degree Completion

How confident are you that you will complete your computing-related degree?	N	%
Not at all confident	3	2.1
Slightly confident	13	9.3
Moderately confident	51	36.4
Very confident	73	52.1
Total	140	100.0

2.3   Social Integration in the Local Setting

2.3.1   Feelings of Belonging and Isolation; Involvement with Peers

Feelings of isolation and the contrast, feelings of belonging, are factors in a student's social integration in the academic community. Social integration is one predictor (though not the strongest) of persistence for undergraduates. Feelings of belonging and relationship with advisor are predictors of completion for graduate students.

The majority of graduate and undergraduate students perceived a sense of belonging in their departments: 61% of graduates agreed and 77% of undergraduates agreed (no difference between gender, race/ethnicity, level of undergraduate) that they felt a sense of belonging.   The percentage of undergraduates agreeing that they belong in this baseline survey is actually higher than those who agreed in a survey administered among a primarily white population of computer science majors at a majority institution where Barker has administered a survey with similar items (N=88).

We heard in interviews that graduate students felt isolated because of their nationality and we decided to test this finding for generalizability; about 60% of all computer science doctoral students were international students in 2006-7 (according to IPEDS). This set of survey respondents does not support wide generalizability for isolation, either because of nationality,

gender, or race, as shown in the Table below. However, women graduate students reported feeling significantly more isolated because of their gender (p=.000), but less isolated because of their nationality (p=.052).

Table 4: Feelings of Isolation Among Grads

I feel isolated in my lab, classes, or work group because of my nationality. (grad)	N	%	I feel isolated in my lab, classes, or work group because of my gender. (grad)	N	%
Disagree strongly	21	28.4	Disagree strongly	21	27.3
Disagree	39	52.7	Disagree	34	44.2
Agree	11	14.9	Agree	20	26.0
Agree strongly	3	4.1	Agree strongly	2	2.6
Total	74	100.0	Total	77	100.0

I feel isolated in my department or lab, classes, or work group because of my race. (grad)	N	%
Disagree strongly	17	22.1
Disagree	39	50.6
Agree	15	19.5
Agree strongly	6	7.8
Total	77	100.0

2.3.2 Involvement with Peers and Faculty

2.3.2.1 Undergraduates

To further understand social integration, undergraduate students were asked a series of questions that would indicate the degree to which they spend both curricular and free time with their same-major peers. These questions (and response categories) include:

- How frequently do you spend non-school time (e.g., watching TV, playing games, etc.) with other students in your computing major/minor? (never through 2x week)
- With how many other students in your computing major/minor do you spend non-school time (e.g., watching TV, playing games, etc.)? (numbers)
- I join study groups for my computing major/minor classes. (frequency)
- Other students in my computing classes encourage me to continue in my major/minor. (strength of agreement)
- When I have a question about computing homework, I ask (Other students in the same class, The professor teaching my class, The teaching assistant, Another student who previously took the same class, A source not described above)

The findings were somewhat surprising. The undergraduates in this sample seemed to be quite socially integrated with their peers. For example, the table below shows response percentages to

the question "how frequently do you spend <u>non-school</u> time (e.g., watching TV, playing games, etc.) with other students in your computing major/minor?" The majority of students spent at least some time with other majors, and most spent much more time. Interestingly, there were no differences between male and female students. Likewise,

Table 5: Non-School Time

How frequently do you spend non-school time (e.g., going to movies, playing games, exercising, etc.) with other students who share your computing major/minor?				
Never	Once a month	Once every two weeks or so	Once a week	Two or more times per week
17.7%	19.4%	16.1%	17.7%	29.0%

Most students seemed to spend non-school time with more one or more peers. (What looks like a discrepancy in the "never" above and the "none" below are due to percentages; ten students responded both "no" and "never," but these are differently distributed percentage-wise.)

Table 6: Number of Students Spending Non-School Time

With how many other students who share your computing major/minor do you spend non-school time (e.g., going to movies, playing games, exercising, etc.)?			
None	1-2	3-5	More than 5
21.0%	43.5%	21.0%	14.5%

Sixty percent of the undergraduates found it easy to join study groups (no gender or race/ethnicity differences). The forty percent who find it difficult may need better strategies for seeking out study groups. Most undergraduates had been encouraged to continue in their major by their peers (77%).

With respect to faculty encouragement (positively related to retention), 19% of undergraduates said that none of their professors had encouraged them to continue in their major; 51% had been encouraged by one or two of their professors.

2.3.2.2   Graduates[1]

Graduate students were asked a series of questions related to their involvement in the intellectual community of their departments to further gauge social integration, including:

- How often do you attend your department's colloquia, speaker series, etc.? (all on 5-point scale from never through daily)
- How often do you speak about research projects and interests with other graduate students in your department other than those in your lab or classes?

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[1] The data for master's v. doctoral student needs to be added here to do thoughtful analysis. Knowing these data were available elsewhere, I opted to keep the survey short and merge later.

- How often do you speak about research projects and interests with faculty who are in your department other than your advisor or post-docs in your lab?
- How often do you speak about career choices with faculty in your department?
- How often does your department hold social events (e.g., picnic, birthday dinners, etc.)?
- How often do you attend your department's social events (e.g., picnic, birthday dinners, etc.)?
- How often do you participate in informal social events with fellow graduate students?

Only 13% of students never participate in their departments' social events (nine percent do not hold them). 17% never spend time socializing informally with other graduate students. About one-third of graduate students never talk to their faculty about career goals and choices and only 16% do so once a month or more. This is a good reason to supply graduate students with mentors from the ELA. While there were no differences between males and females in these questions, Mexican-Americans were significantly more likely than African-Americans to both participate in informal social events with fellow graduate students (p=.004) and to talk about career goals to faculty (p=.009).

2.4   Formal Local Support Organizations

Students were asked to respond about their participation in local organizations to the degree they knew they existed. The question was stated, "To your knowledge, which groups are available on your campus? With which do you participate?" Students varied widely in their participation with local groups, as shown in the table below.

Student Group	Not available on my campus	Available, but I do not participate	Available and I participate
Student chapter of NSBE, SHPE, ACM-W, other professional society group for underrepresented populations	20.4	46.7	32.8
Minorities in {computing, engineering, other similar} group	25.2	25.2	49.6
Women in {computing, engineering, other similar} group	15.3	52.6	32.1
Formal mentoring program	35.1	37.4	27.5
Regional or local ELA student group	60.3	9.9	29.8

Obviously, male student were relatively unlikely to participate in women's groups, though five males indicated that they are available and they participate. Similarly, Caucasian students were unlikely to participate in minority groups, though four of the eight Caucasians did participate. Clearly, the mentoring aspect of ELA can satisfy a need; a surprising number of students have no formal mentoring program on their campus and many do not participate in those that are available. Such programs may be too generic to be useful in a particular major, though mentoring is useful for everyone, regardless of the major.

2.5 Intentions and Knowledge of Graduate School, Research Careers (Undergraduates Only)

One goal of the ELA is to increase student participation in pursuing advanced degrees; the best outcome would be a Ph.D. with intention to remain in an academic setting. Therefore, students were asked a set of questions about their immediate post-graduation goals as well as their thoughts about graduate study. Asked about their likelihood of seeking a job in industry directly after graduation, 68% responded that they were moderately to very likely. However, 73% felt they were moderately to very likely to go to graduate school in the next five years. These were about equally split between intending to obtain a Ph.D. and a master's degree.

2.6 Conclusion

This survey was intended to provide a baseline comparison for later sampling. However, one strong recommendation is made here. ELA leadership should reach out to the minority populations not well represented here. This might be accomplished by seeking collaborations with BPC alliances of those groups.

3 Mentoring report

The Baseline Survey contained a branch for students who had "begun" a mentoring relationship with a mentor, which was defined in the survey as "you have had communications with this person beyond simply having been assigned a mentor." The purpose of this survey was to give formative feedback to the Director of the ELA Mentoring Program, Dr. Phoebe Lenear. For several reasons, the Mentoring Program got off to a slow start. Thus, this survey was an opportunity to gather students' perceptions of:

- understand the degree to which mentor/protégé matches had planned their relationships, used the tips and suggestions provided online by Dr. Lenear
- frequency of contact and mentor responsiveness
- format of mentoring (group v. dyad) and media of mentoring (e.g., telephone, online)
- mentoring topics, both actual and hoped-for; usefulness of same
- overall perceptions of value
- suggestions for the future

Only 22 students responded to these survey items and therefore, only a few general comments were made to the leadership about the results. A very informal email-based report was sent to Dr. Lenear, who was already revamping the Mentoring Program at that time. Comments and ideas included:

- It was not clear what it is about the formal mentoring program available on campuses that make students not participate; there is a good possibility that local mentoring is not specific to the student's field. It was interesting that so many of these students do participate in a formal mentoring program on their own campus, yet still seek an ELA mentor.

- It appeared that the mentoring relationships were working pretty well. The last item, "My ELA mentor is too busy" came out of two different interviews. A lot of students agreed; this might influence students' willingness to contact mentors.
- Either the mentors are not following the recommended guidelines about setting goals and timeframes for the relationship or the protégés are not remembering/perceiving that they have done this. Also, both mentors and protégés should be looking at the mentoring resources; there is plenty of advice for both sides of a mentoring relationship.
- Communication did not seem to be as frequent as it could have been to be helpful; Dr. Lenear had already been revamping the program to improve this issue. Perhaps mentors could let protégés know they can contact them anytime and also have some sort of email subject line code that lets the mentors know when a protégé needs immediate help (e.g., for a problem to solve or decision to make in the very near future, like that week).
- Time management and career decisions are the two biggest categories of help desired. Perhaps the ELA could point to some resources for supporting them on the ELA site somewhere. Those issues might be easier to deal with than others (relational issues, issues related to race/ethnicity). Is it worth interviewing mentors to find out what kinds of questions students ask them and how they know what to say? There may be some suggestions that mentors could share with each other -- also, perhaps a blog on difficult issues, or a threaded discussion.

A handful of students made open-ended recommendations. Below are the responses to the open-ended question, "How might we use a Facebook type of interface to improve the ELA mentoring program? What other ideas do you have for improving the ELA mentoring program?" and one mentoring-related response to the "any other comments" item at the end of the survey.

- Pair mentors by research area
- I would probably find joining a Facebook group useful even though I only occasionally use Facebook now.
- More events
- The virtual mentoring program does not work well with my personality. I need a more of a face-to-face relationship with my mentor.

4 Recommendations from Student Interviews

Below is a summary report of ELA student recommendations. Dr. Sarah Hug conducted fourteen interviews with students who had attended the Tapia conference. The purpose of the interviews was to gather students' perceptions about their own needs and how the ELA could help to support their satisfaction. The data were reported for internal use and planning only and contributed to some of the questions on the Baseline Survey and Mentoring Survey.

4.1 What can the ELA do to support underrepresented students in majority computing programs?

4.1.1 Support student research

Through:

- Funding research internships and funneling good ELA candidates into computing research
- Supporting dissemination of student research by funding student conference participation[2]
- Directing students to research opportunities on the ELA website
- Describing ELA network affiliations to facilitate personal contacts
- Facilitating conversations across the pipeline that are computing area-specific (e.g., databases, cognitive science, networks) and lead to collaboration

4.1.2   Increase student academic preparation

Through:

- Short courses supplied and sustained via online learning tools and discussion groups (mathematics topics, software training topics) [3] (also, consider borrowing from other BPC alliances, like the Virginia Tech research course, CAHSI talks, etc.)
- Online help forums for student members of ELA, supported by other students as well as by professors and industry representatives
- Enhancement of undergraduates' knowledge of diverse computing fields and letting them know what career paths are available
- Increasing the number of and the depth of technical talks at ELA events

4.1.3   Enhance opportunities for community development

By:

- Holding formal or informal semi-annual regional ELA events across the country. These could occur in conjunction with other conferences (e.g., TeraGrid, Grace Hopper) and could be organized by students, who are interested in this sort of activity
- Providing an online space to announce and celebrate student and faculty milestones (e.g. passing qualifying exams, graduation, job offers, publications, promotions, receiving fellowships)
- Extending student opportunities to mentor other students through structured tiered mentoring groups and less formally through discussion fora and listservs.[4]
- Expanding students' experiences in academic computing through student exchange visits to ELA partner campuses

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[2] Evaluators suggest asking conference scholarship committees to reserve slots for ELA members (based on feedback from NSFBPC site visit participant)

[3] Evaluators suggest use of open courseware, see MIT: http://ocw.mit.edu/OcwWeb/Electrical-Engineering-and-Computer-Science/index.htm

[4] ELA Texas Conference survey results as well as interview data suggest students have a great interest in mentoring and providing outreach to undergraduate students in computing

- Disseminating conference participant contact information following the conference, and encouraging one-on-one sharing of contact information[5]
- Holding online colloquia in conjunction with a local in-person social event, if possible, in an effort to promote academic and social goals of ELA

4.1.4 Support student advancement

By:

- Developing student-run workshops and discussion groups for ELA members aimed at specific points along the academic computing pipeline (e.g., early undergraduate, advanced undergraduate, transitioning students, early graduate, exam takers, ABD) to assist students in achieving milestones. Some examples provided by students include: "how to pass qualifying exams," "how to apply to graduate school," "how to write grant proposals," "how to organize K12 outreach," "how to get the most out of an advising relationship," and "how to interview for academic positions."
- Increasing industry representation, visibility, and involvement in the ELA
- Facilitating mentoring relationships with trained mentors who are "well-rounded" in their experiences with teaching, research, and industry work

5 Texas ELA Regional Conference Report

The first regional ELA Conference was held in Houston, TX at Rice University on April 11-12, 2008. Both Lecia Barker and Sarah Hug attended the conference. Barker rode the bus from Austin to Houston as a way of optimizing the time with participants, getting a feel for their sense of "groupness," and talking to them about their activities and on the ride home, perceptions of the conference. From the interviews with bus riders and existing surveys for regional conferences used by these evaluators, a survey was developed. The major findings, written by Dr. Sarah Hug, are presented below. The findings were intended to be used formatively.

5.1 Summary of Findings

Event inspired student leadership aspirations. Graduate and undergraduate students expressed greater interest in developing outreach activities for undergraduates and K12 students following the conference. The event enhanced students' feelings of belonging to computing communities; also, the ELA members felt more connected to the computing community and to the ELA community

Students valued informal advice from professors and peers. Graduate and undergraduate students most valued the opportunities the conference afforded for receiving informal advice. This occurred during meals, discussion led by Dr. Tapia, and during breaks between (and with) speakers.

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[5] ELA could provide students with a handful of "ELA member" business cards to hand out at the conference, created using registration information

ELA Conference supports retention and advancement, particularly for undergraduates. Students indicated greater interest in computing, academic careers, and graduate school as a result of attending the conference. Their feelings increased that "professor" was an attainable career goal. These advancements in interest were greater for undergraduates than for graduate students.

5.2 Participants

Fourteen undergraduate and 19 graduate students responded to the ELA Texas Conference survey following the Houston event in April of 2008. These students represent nearly two-thirds of all students registered for the April event. Eighty-five percent of the undergraduate students indicated they were Hispanic, while 42% of the graduate students indicated the same. The majority of graduate students responding to the ELA Texas Conference survey were African American (62%), while most of the undergraduates indicated they were of Mexican-American descent (60%). A smaller fraction of students indicated they were Caucasian (15% of graduate students, 20% of undergraduates). Most of the students were male (62% undergraduate students, 58% graduate students). These figures show that the ELA Texas event attracted a greater proportion of women than currently are enrolled in computer science programs across the United States. Student respondents attend Texas A&M University (4), Rice University (13), University of Texas at Austin (10) and University of Houston (3).[6]

5.3 Overall event satisfaction

> "(The best part of the conference was) realizing that I wasn't alone as being an underrepresented Hispanic computer scientist and that Grad School is an attainable goal for me. Also, that I have tons of resources and peers that will help me out if I need."

> "(I valued) the chance to talk to professors and organizers of the event, and to realize that as a graduate student (minority) I have the potential to motivate undergrads and share my experiences so that they can give grad school a chance in the future."

> "I learned a lot and met a lot of people, but the best part was the feeling that I had while I was there—the feeling that I could actually make a difference in education and in the world by participating in research. I would still like more information on what other options I would have if I were to go to graduate school."

Students responded to three items regarding their overall satisfaction with the ELA Texas Conference. Ninety percent of graduate and 100% of undergraduate student attendees would likely attend another Empowering Leadership Alliance regional conference. Similarly, 95% of graduate students and all of the undergraduates responding to the survey would recommend an ELA regional conference to another student.

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[6] The remaining three students could not be linked to a specific campus—neither through the students' email addresses provided or through campus student searches performed by evaluators.

According to 79% of graduate students, the ELA Regional Conference was better or much better than they expected, while the remaining students (21%) indicated that conference quality was about as expected. Undergraduates were more likely to state that the ELA Regional conference was better or much better than expected (93%)—only one undergraduate student mentioned the conference quality was about as expected.

5.4 Community Building

One of the defining features of the Empowering Leadership Alliance is the expressed goal to create community within the computing profession, particularly for underrepresented students in the field. The ELA Regional Conference participants were asked the extent to which the regional event contributed to students' feelings of belonging within the ELA and within a broader computing professional community.

Undergraduate survey respondents stated that following the ELA Texas Regional Conference: students felt as if they were part of a larger computing community (n=14; 100%; 71% strongly agree)[7]; felt as if they were a part of the ELA community (n=14; 100%, 57% strongly agree); knew their peers better (n=14; 100%; 29% strongly agree); and knew they had the support to succeed in computing (n=14; 100%; 50% strongly agree). In addition, 86% of undergraduates stated that the regional conference increased their interest in building a network of peers in their field of study (n=12 of 14; 50% reported great increase in interest); and nearly all of the undergraduates were more interested in developing a network of professionals in their field of study (13 of 14; 50% reported great increase in interest).

According to graduate student survey respondents, the ELA regional conference influenced their feeling a part of the Alliance community (18 of 19; 95%; 63% strongly agree), as well as their familiarity with peers (16 of 19; 84%; 37% strongly agree). Graduate students responding to the survey indicated increased motivation to build a network of peers (14 of 19; 74%; 58% strongly agree) and professionals (14 of 19; 74%; 58% strongly agree) in their field of study.

In some cases, graduate students reported slightly weaker feelings of community following the ELA regional conference when compared to undergraduates. In particular, graduate students were less likely to feel a part of a larger computing community (14 of 19; 74%; 26% strongly agree) and less likely to know they have the support they need to succeed in computing (13 of 19; 68%; 37% strongly agree) following their participation in the conference. The sample of survey respondents was not large enough to determine whether these differences in responses were statistically significant, meaning the differences between undergraduates and graduates could be due to chance alone.

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[7] Data are reported to show the number of respondents who agree or strongly agree to statements out of the total number of respondents who answered the item. Further description includes the percent of students who agree or strongly agree with statements, and the percent of those students who strongly agree.

5.5   Value of Conference Activities

A portion of student respondents commented about their favorite elements of the ELA Texas regional conference. See quotes below.

> "The best part (of the regional conference) was meeting other students and hearing their ideas and opinions on various topics."

> "I thought the interaction with the presenters during lunch was where I learned the most; it was a frank, practical discussion and exchange of ideas and I enjoyed that."

> "Having Dr. Tapia speak was the best part for me. I enjoyed his stories and how they relate to computing very much. The discussion with the whole group was probably the best part of this."

Additionally, students responded to Likert scale survey items regarding the value they placed on conference activities. Responses are reported for undergraduate and graduate students separately, to facilitate future event planning for the distinct audiences.

Undergraduates found the technical talks valuable (11 of 14; 79%; 43% very valuable) and found the student led tour to be important as well (11 of 14; 79%; 43% very valuable). According to undergraduate students, the large group discussions held at the ELA regional conference were valuable portions of the event (14 of 14; 100%; 50% very valuable). Similarly, nearly 4 out of 5 undergraduates found the industry chats helpful (11 of 14; 79%; 57% very valuable).

Undergraduates appreciated the student panel with somewhat greater intensity, meaning a greater number of undergraduates felt the panel was very valuable (13 of 14; 93%; 64% very valuable). According to undergraduates responding to the ELA regional conference survey, the informal advice provided by professors (13 of 14; 93%; 86% very valuable) and advice offered by students' peers (13 of 14; 93%; 93% very valuable) were the most important aspects of the ELA regional conference.

Similarly, graduate students found informal advice from professors (16 of 19; 84%; 74% very valuable) and from peers (15 of 19; 79%; 63% very valuable) the most beneficial aspects of the ELA Texas Regional Conference. Nearly three fourths of graduate students stated that the technical talks were useful (14 of 19; 74%; 37% very valuable), though fewer viewed the student panel activity as advantageous (12 of 17 who attended; 63%; 47% very valuable). This difference from undergraduate data may indicate that the panel was more appropriate for less academically experienced students. The same number of graduate students said the industry chats were valuable (12 of 15 who attended; 63%; 37% very valuable).

Two thirds of graduate student attendees valued the discussion sessions held by Richard Tapia during the ELA Regional Conference (13 of 16 who attended; 68%; 47% very valuable). Few graduate students attended the student led campus tour, perhaps because many of the graduate students attending the conference attended Rice University.

5.6   Aspirations

The Empowering Leadership Alliance seeks to retain students in computing as well as advance underrepresented computing scholars into graduate school and beyond. ELA Regional Conference attendees responded to survey items regarding the impact of the conference on their computer science career aspirations.

5.6.1   Knowledge of career/academic paths

Nearly all of the undergraduate respondents stated the ELA event informed them about computing careers (13 of 14; 93%) and about graduate school in computing (13 of 14; 93%). Similarly, nearly all of the graduate students who responded to the ELA survey stated they learned about computing careers at the ELA regional conference (15 of 19; 79%), while three students disagreed with this statement.

5.6.2   Retention

Eleven of 14 undergraduates were more excited about computing following the ELA Texas conference (79%; 43% strongly agree). Nearly three-fourths of students said the event increased their interest in continuing their current academic program (10 of 14; 72%) while three said the event did not change their interest in persevering in their current program. Ten undergraduates said the ELA event helped them to clarify or reaffirm their career goals (10 of 14; 72%).

The majority of undergraduate students indicated they were aware of concrete solutions for problems facing students who were underrepresented in computing fields (12 out of 14; 86%) while one student disagreed and another strongly disagreed with this statement. Further investigation will focus on what concrete solutions students learn about through ELA activities.

Nearly half of the graduate students responding to the ELA Texas regional conference survey stated that their conference participation increased their interest in continuing their graduate program (8 of 19; 42% greatly increased interest). The remaining students reported no change in interest (9 of 19; 47%) or "don't know/ not applicable" (2 of 19).

Six PhD students (6 of 15; 40%; 27% greatly increased interest) found that the regional conference increased their interest in continued computer science research involvement, while the remaining 9 PhD students reported no change in research interest (6 of 15; 40%), or "did not know" if they experienced a change in interest (3 of 15; 20%). Half of the Master's students (2 of 4) reported the ELA Texas Regional Conference greatly increased their interest in computer science research involvement, while one reported no change and another indicated "not applicable".

5.6.3   Advancement

Over half of the students responding to the survey reported the event increased their interest in pursuing a computing-related industry career (8 of 14; 57%) while five indicated no change in interest and one reported a decrease in industry interest. Further analysis indicates that the student with decreased interest in industry became more attracted to an academic career following the event, and may have viewed these as competing aspirations.

Over two thirds of undergraduate survey respondents stated they were more motivated to obtain graduate school information following the ELA regional conference (9 of 13; 69%) while five students (31% indicated no change in interest. Similarly, three fifths of undergraduate student respondents were increasingly motivated to apply to graduate school after attending the April event (10 of 14; 62%) though 23% expressed no change in graduate school application interest. More than three fourths of undergraduate attendees responding to the survey were attracted to research involvement following the ELA regional conference (10 of 13; 77%). Overall, none of the students indicated a decrease in motivation or interest in computing following the Texas conference.

All but one of the undergraduates reported the Regional conference influenced them to determine "professor" was a position they could attain (12 of 13; 86%; 36% strongly agree). For eight of the 14 undergraduate respondents, the event increased interest in pursuing an academic career in computing (8 of 14; 57%) while 43% of undergraduates indicated no change in interest.

Nearly half of the graduate students surveyed found the ELA Texas Conference increased interest in pursuing an academic career in computing (9 of 19; 47%; 42% greatly increased interest) while remaining students saw no change in interest (8 of 19; 42%) or reported "don't know/not applicable" (2 of 19). Just over half of the graduate students stated they were more interested in industry careers following the April Texas event (10 of 19; 53%; 32% greatly increased interest), while seven students describe no change in interest, 1 reports "don't know/not applicable", and one details a decrease in industry career interest. As in the case of the undergraduate, this student became more interested in academic careers following the conference.

5.7   Student interest in ELA related activities

The Texas Regional Conference survey asked students to indicate their interest in leading ELA related activities following their participation in the Houston event.

For undergraduate students, the ELA Regional Conference was most influential in expanding interest in developing local ELA groups on home campuses (11 of 14; 79%; 29% greatly increased interest). A slightly smaller portion of undergraduates was more interested in K12 computing outreach activities following Texas Regional Conference participation (9 of 14; 64%; 36% greatly increased interest).

Graduate students were most interested in leading outreach activities for undergraduates (15 of 19; 79%; 47% greatly increased interest) as well as outreach for K12 students (12 of 19; 63%; 26% greatly increased interest). This may have resulted from the opportunity for extended graduate/undergraduate student interaction at the ELA Texas Regional Conference. Graduate students were somewhat less interested in developing local ELA groups on campus (9 of 19; 47%; 26% greatly increased interest); a quarter of students had no change in interest, and 5 stated "don't know/not applicable" for this item. The latter group of students may perceive they already have a local ELA community.

5.8   Event logistics

Students were asked to comment of event logistics for the Texas Regional Conference. Twelve students expressed positive comments regarding food, accommodations, transportation, event facilities, and entertainment. One student recommended ensuring that the hotel provides free Internet access in the future.

5.9   Recommendations for future events

A major purpose of formative evaluation is to determine what improvements stakeholders would make to a program. The ELA evaluation team held face-to-face interviews with students during the event and on the Austin students' bus ride home from the ELA Regional Conference to determine what would enhance future regional conferences for computing scholars. Student suggestions were incorporated into the ELA Texas Regional Conference survey, and all respondents had the opportunity to indicate their agreement with student-proffered suggestions. Recommendations from students are as follows:

- Allow for student dialogue in small breakout discussion groups (11 of 19 grads; 5 of 13 undergrad)
- Start the event with icebreaker activities (6 of 19 grads; 5 of 13 undergrads)
- Share conference activities via video (5 of 19 grads; 6 of 13 undergrads)
- Provide professional development workshops (resume & grant writing, journal publishing, graduate application) (9 of 19 grads; 7 of 13 undergrads)
- Mix up students so they interact with peers at other schools (11 of 19 grads; 9 of 13 undergrads)
- Ensure that presenters interact informally with students (8 of 19 grads; 9 of 13 undergrads)
- Provide time for social activities, such as a campus tour (7 of 19 grads; 10 of 13 undergrads)

Students provided additional recommendations for ELA Regional Conference organizers in open-ended survey items.

"Let students help organize the event and make it a Regional Student Research Forum. This way, more students would get excited to come, and see the role-models in front of them presenting research papers."

"I would like more time for social activities, but I know that that is not as important as the discussions and talks given by professors, so 1 or 2 small optional social activities would be good. I would also keep the Industry Chats that we had during breakfast."

"I would cut out the technical talks. I think the participants are attending mostly to hear about ELA and what they can do to change the state of higher level education today, rather than hear computing talks (although they were interesting)."

"If I could ask for anything more, I would like more time discussing issues in the complete group. Dr. Tapia did a great job of moderating that time, but I would like more of it to hear more of other student attendees."

6 Tapia Conference Report, ELA Members Only

The first big event of the ELA was in sponsoring students to attend the Tapia Celebration Conference in Orlando, October 2007. To avoid double-surveying ELA participants, Barker and Hug administered the overall conference evaluation (see Section 7) with a special branch for ELA participants. Both Barker and Hug attended the conference, observing the ELA students and professional members. Observations, informal conversations, ELA goals, and prior Tapia Conference surveys informed these survey items. The evaluation report was written by Dr. Hug.

6.1 Introduction, Background, and Participants

The Empowering Leadership Alliance (ELA), funded by the National Science Foundation, began in the spring of 2007. Faculty from five elite higher education institutions joined to create a national community serving underrepresented students in computing. The ELA collaborated with organizers of the October 2007 Tapia Celebration to launch the alliance at the event. The ELA held a "Birds of a Feather" Session, a panel, and a reception during the Tapia Celebration. The ELA leadership team worked an information booth, providing resources for interested students and faculty about the alliance and its goals. This report documents data gathered from 53 Tapia Celebration participants who were also members of the Empowering Leadership Alliance.

The survey focused on student, faculty and industry partner expectations and goals for participation in the Alliance, behaviors indicating lasting effects of Tapia Celebration participation, the extent to which ELA members began to develop a social network of peers, and student attitudes towards computing careers and academic pursuits.

6.1.1 ELA Membership: Diverse in ethnicity, age, school affiliation

In the weeks following the October 2007 Tapia Celebration, 53 Empowering Leadership Alliance (ELA) members responded to an online survey. Twenty of the survey respondents are graduate student members of the ELA, eleven are undergraduate students, and eighteen indicated that they are faculty/industry members of the alliance[8]. Students and faculty responding to this survey represent over 18 higher education institutions.

One third of the ELA members responding to the survey are Hispanic/Latino/a (n=14), and a fifth of the ELA members indicated they are Caucasian (n=10). Forty-two percent of ELA survey respondents are African American (n=18). The remaining six ELA respondents are Pacific Islander (n=1), Middle Eastern (n=1), Native American (n=1), or marked "other" (n=3).

Forty two percent of the ELA members who responded to the Tapia survey are women (n=18) and 58% are men (n=25). Nearly half of the ELA members are between the ages of 25-35 (n=21). Over one-fifth of the members who completed the survey are 18-24 years old (n=10), while nineteen percent of Alliance respondents are 36-45 years old (n=8). One member is over 55.

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1 It is unclear if 4 of the student members were undergraduate or graduate students, as they did not complete the appropriate Tapia Celebration survey items.

6.2 Faculty & Industry Involvement Expanded through Leadership Team Connections and Tapia Celebration Participation

One third of the ELA faculty and industry members responding to the Tapia survey learned about the alliance through contact with a leadership team member (n=5), and nearly half were leadership team members themselves (n=7). One third of the respondents learned about ELA at the October Tapia Celebration (n=5).

6.2.1 Faculty and Industry Partners Serve Students, Recruit them into Graduate School

Faculty and industry members of the ELA expressed a desire to help students succeed in (often isolating) elite computing departments, through recruitment, encouragement, and outreach. They also aim to convince underrepresented minority students to continue their computing studies in graduate school. See quotes below.

> "I hope to mentor minority students and help them get involved with research, either my own or at their respective universities. I also would like to get involved with outreach programs developed to try to increase and retain minority involvement in computer science." --An ELA partner

> "I hope to improve the retention of students of color in my department, and to help make a more welcoming environment in my field." --An ELA partner

> "(I will benefit from ELA participation by) Meeting and mentoring more students. Hopefully, some may want to be graduate students or faculty at my institution." --An ELA partner

6.2.2 Tapia Celebration, Local Professors Recruit Students Into ELA

Many of the students learned about the ELA at the Tapia conference (39%, n=12), and an equal amount of students learned about the alliance from a professor at their home institutions (39%, n=12). Other means by which ELA students learned about the alliance include: student services announcement (n=2), a conversation with another student (n=2), an internet search (n=5), and an academic department announcement (n=5).

6.2.3 Faculty/Industry Commit Time to Mentor Students, Spread the ELA Message

In all, faculty and industry representatives responding to the Tapia Celebration survey pledged 458 hours per month to further Empowering Leadership Alliance goals.[9] The majority of faculty and industry ELA members plan to mentor students (85%) and spread the word about the Empowering Leadership Alliance (92%) at least 1-5 hours per month. More than half plan to spend time finding internships and other computing work for students (62%), discussing with

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[9] This figure was determined by calculating the average number of pledged hours per category and multiplying each amount by the number of responses in that numerical category. For example, 5 individuals said they would be willing to mentor a student for 1-5 hours per month. The number of individual responses, 5, was multiplied by the average number of hours pledged, 3, to average 15 hours per month. This was repeated for each time category and for each ELA task. Raw data is available upon request.

students via online chats and discussions (69%), and attending videoconferences (57%). Half of the respondents (50%) will present technical talks via videoconference to students, faculty, and industry partners, while slightly fewer said they would host local events on campuses (42%).

6.3 Student Outcomes

6.3.1 Networking Strongest for Students to Students, Students to Faculty

All of the ELA student members who attended the Tapia Celebration met at least one faculty member of the alliance, and 58% of them met 3 or more faculty members of the ELA at the event (n=18). Just over half of the students reported meeting 1 or 2 industry members of the alliance at the Tapia Celebration (55%, n=17), and nearly one fifth met 3 or more industry members of the alliance. However, 25% of ELA students responding to the Tapia survey did not meet any industry representatives of the alliance.

Students were successful in meeting other student members of the ELA. Two thirds of the students reported meeting 3 or more ELA student members at Tapia (n=21), and nineteen percent met 1 or 2 other ELA students at the conference. A fraction of the ELA students were unsure if they met other ELA members (13%, n= 4).[10]

6.3.2 More Than Half of ELA Students Feel Isolated in Computing Departments

Nineteen students responded that they often felt isolated in their home department (61%). This percentage differed from the 46% (n=24) of all Tapia Celebration student participants responding to this survey who often felt isolated in their home departments.[11] One interpretation of this difference is that students who felt isolated were more likely to seek participation in the Empowering Leadership Alliance.

6.3.3 ELA Students Confident, Dedicated to Computing After Tapia Celebration

All thirty-one ELA student respondents are confident that they will complete their degrees (100%, n=31). The majority of student respondents learned about computing careers at the Tapia conference (81%, n=25), and received valuable advice for getting through their academic programs (97%, n=30). The Tapia Celebration reaffirmed ELA students' beliefs that computing work is important (84%, n=31), and increased students' dedication to complete their degrees (90%, n=28).

6.3.4 Student Participants Expand Networks, Seek Academic and Professional Opportunities Following October Event

Nearly half of the ELA student respondents indicated that after the October event they had contacted a faculty member they first met at the Tapia Celebration (48%, n=15). Seventy-one percent of students contacted a fellow ELA student member after the Tapia Celebration (n=22).

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[10] The ELA provided ribbons members adhered to name tags that indicated membership, but students may have met one another outside of conference events, when nametags were removed.

[11] This difference approached statistical significance alpha=0.07

Over half of the students contacted an industry representative of ELA after the conference (55%, n=17). Twelve of the ELA student members searched for research articles written by Tapia Celebration presenters and speakers (43%).

Nearly a third of the students inquired about graduate school opportunities following their participation in the Tapia Celebration (32%, n=9), and three ELA students applied for graduate programs based on the information they received at the Tapia Celebration.

Forty percent of the student ELA respondents searched for corporate careers based on information received at the Tapia Celebration (n=12), and nearly one quarter of respondents applied for industry employment following Tapia participation (23%, n=7).

6.4   Past Tapia Involvement Increases Community, Mentoring Opportunities

Thirteen of the ELA survey respondents had participated in past Tapia Celebrations. Many participants reported ways in which Tapia participation led to professional, academic, and social benefits. Four participants conducted research with colleagues they first met at Tapia, while two published research articles with Tapia colleagues. Three ELA participants co-authored a grant proposal with someone they first met at Tapia.

Tapia colleagues contacted one another about educational opportunities (n=6), and job opportunities (n=5) as well. ELA members who attended Tapia Celebrations also contacted one another about academic employment opportunities (n=5).

Most of the ELA participants with former Tapia Celebration experience asked for or gave Tapia colleagues career or academic advice (n=10). Another large majority of Tapia colleagues connected with one another at other conferences, and felt they knew someone there (n=11).

6.5   Student Expectations

6.5.1   ELA to Provide Infrastructure for Underrepresented Computing Professionals' and Students' Networking and Development

Students hope that ELA will assist them in their academic and professional pursuits. In particular, students hope the ELA will provide support, structure, and venues for networking (39%, n=7), mentoring (39%, n=7), and providing information sessions (33%, n=6) for underrepresented students. Students also hope to learn about scholarship opportunities (17%, n=3) and employment prospects (11%, n=2) in computing through their participation in ELA.

The Empowering Leadership Alliance may serve as an impetus for some students to socialize with others in their field across institutions. See quote below.

> "(ELA can assist me) by pulling me out of the books and getting me comfortable with others who have similar interests and goals." –ELA student

6.5.2   Students Hope to Network, Get Advice, and Provide Service in ELA

Half of the students surveyed hoped to network with industry and faculty professionals through their participation in the ELA (50%, n=12).[12] Often this goal was paired with a desire to receive advice and mentoring through the Alliance (29%, n=7). See quote below, from a student member of the ELA.

> "I hope to gain more of an opportunity to meet people (who) will shape and inspire my career direction, through networking and mentoring, (and through) listening to my thoughts, perspectives, and ideas."   -Student member of ELA

Another common goal for student members of the ELA was to have the opportunity to provide service to other students who are members of underrepresented groups in computing (25%, n=6). Sample service responses from students include: "I want to help others", "an opportunity for service", and "help the minority community in computer science".

Students reported additional expected gains from their participation in the ELA. Specifically, students hoped to understand under-representation in computing, and how to address the issue (8%, n=2); to gain knowledge of and experience with research (8%, n=2); and to become privy to the "inside scoop" from successful academics in computing on how to structure their academic and professional careers. (16%, n=4).

6.6   Conclusions and Recommendations

The Tapia Celebration served to introduce the Empowering Leadership Alliance to a diverse group of computing students, faculty, and industry partners. Students met other ELA members, became acquainted with the goals of the Alliance, and reported what they need in order to succeed in their academic and career endeavors. Survey results indicate that the benefits of participating in the Tapia Celebration can extend beyond the event, and can lead to social, academic, and employment opportunities for students, faculty, and industry partners. This suggests that the Tapia Celebration should remain an important aspect of Empowering Leadership Alliance participation. Recommendations for improving the ELA, based on survey responses, include the following:

- Provide industry partners a higher profile in the Empowering Leadership Alliance. Students were less likely to meet (or to know when they had met) industry representatives aligned with ELA.
- Continue and augment plans to develop a student leadership committee for the ELA that can serve as a leadership platform for motivated ELA student members interested in serving underrepresented students in computing.
- Expand plans to hold local and national events that inform students about computing research, internships and scholarships, and navigating through computing education,

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[12] Twenty-four students answered this open-ended survey item. Responses were coded iteratively as themes emerged from the data. Coding scheme and item responses will be made available upon request.

particularly for those interested in academia. Students were particularly interested in local and national face-to-face events.

7 Richard Tapia Celebration of Diversity in Computing Conference, 2007[13]

7.1 Background

7.1.1 Introduction

This evaluation report provides information to the Richard Tapia Celebration of Diversity in Computing Conference organizers that will help them to understand the value of the conference as perceived and experienced by participants and to plan for future events. The analysis is based on survey results and observation of conference events. Presented below are a description of the conference; the methods by which the evaluation data were elicited, compiled, and analyzed; demographic profile of the participants; presentation of responses to survey items as well as differences across groups; and conclusions and recommendations for future action. Appendices include a list of Tapia Celebration supporters and sponsors and open-ended responses.

7.1.2 Purpose of Conference

The purpose of the 2007 Richard Tapia Celebration of Diversity in Computing Conference was to bring together computing and computing-related university faculty, graduate and undergraduate students, and representatives of government and industry to celebrate the value and benefits of diversity in these fields. The conference brought attention to creative, original research and applications of computing by members of diverse groups. In addition, the conference supported formal and informal meetings and networking opportunities with diverse members of computing-related fields. These permitted participants to learn more about career and academic opportunities, share interests and research, and discuss issues related to graduate school and academic careers in general and as members of under-represented groups. Ultimately, these activities were expected to increase graduate students' motivation to complete their degrees and to encourage undergraduates' to enter graduate programs in computing. They were also expected to encourage development of social and professional networks for students and professionals in computing. Conference events included:

Pre-conference doctoral consortium, to provide opportunities for presenting research in a safe environment as well as networking with other graduate students and faculty;

Advice and informational sessions to inform and support students and faculty on non-technical issues related to graduate school and career success;

Technical sessions on current research topics;

Poster session during which students and faculty conversed about their research;

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[13] This report was written by Dr. Sarah Hug of the University of Colorado under the supervision of Dr. Lecia Barker.

Keynote and plenary presentations on career, diversity, and cutting-edge issues surrounding computing;

Robotics competition that drew interest across the conference and related to one of the plenary talks (Manuela Veloso of Carnegie Mellon University);

Formal and informal networking opportunities (e.g., meals/banquet/receptions; birds-of-a-feather; between-session mingling; at exhibits for national laboratories, recruiters, government agencies, and professional societies—see Appendix A); and

Town Hall meeting for discussing what went well, what did not, and ideas for the 2009 conference.

7.1.3 Purpose of Evaluation

The conference evaluation, conducted by Dr. Sarah Hug of the University of Colorado at Boulder, serves four overarching goals. First, the evaluation provides documentation of participants' experiences and beliefs about the conference's outcomes for them. Second, the evaluation explores participants' conference-related actions in the two weeks following the event in an effort to measure the impact of networking with a diverse group of computing professionals in a variety of career stages (e.g., undergraduate students, graduate students, professors, industry). Third, the evaluation documents the outcomes of repeated attendance at the Tapia conferences. Lastly, the evaluation feedback will assist in planning the 2009 conference.

7.2 Evaluation Procedures: Data Gathered and Analytical Methods

7.2.1 Survey

All participants received an email invitation to participate in the 2007 Tapia Celebration Survey two weeks after the conclusion of the conference. The purpose of this delayed dispersal was to allow for participant follow-through after the conference. All participants received 4 reminder emails sent on a biweekly to weekly basis. Two hundred twenty three participants responded to the survey, out of 413 registrants (54%). Figure 1 shows the breakdown of survey responses by attendee category, when attendee information was available.

Figure 7: Survey Responses by Category

Category	N	Percent
Undergraduate	61	31%
Graduate	82	41%
Professional	55	28%
Total	198	100%

The survey was designed for students, industry professionals, and academic faculty and staff in mind. As respondents answered items on the screen, the survey logic directed each individual to relevant survey items. Questions common to all attendee categories included:

Favorite sessions;

Perceived value and outcomes of the conference;

Actions engaged in after the conference to expand professional networks;

Impact of repeated Tapia attendance for building social and professional networks;

Demographic questions; and

Suggestions for improving the conference.

Some of these questions asked about perceived benefits of the conference. Others asked participants to describe ways in which they used or built upon the information received at the conference. Categories in the attendee-specific surveys included:

Students: motivation and intention to attend or remain in graduate or undergraduate programs; issues related to attending graduate school; interest and concerns with respect to studying computing and applying it in careers; orientation effectiveness for planning conference participation; peers' perceptions of diversity events and conferences; and the most useful aspects of the conference.

Professionals: issues related to work environment and career; colleagues' perceptions of diversity events and conferences;

The survey data were entered into a Microsoft Excel spreadsheet. The quantitative data were exported into an SPSS data file. The open-ended questions were coded according to response patterns, and subsequently entered into the SPSS data file by record number. Analyses of survey data using SPSS included frequencies, measures of central tendency, analysis of variance across groups, cross-tabulation, and correlation analysis. (All data and output files can be made available upon request.)

7.2.2   Observation Notes

Dr. Hug was a participant observer during the entire Tapia Celebration. She took extensive notes on all activities of the conference, and held informal interviews with participants. In addition, she was a table leader during the orientation and served as Empowering Leadership Alliance ambassador during open booth hours. Observation offers supporting documentation of the events as they happened during the conference and can be triangulated with other forms of data to create a clear picture of the Tapia Celebration as a whole. Observation notes describe:

The student orientation;

Empowering Leadership Alliance reception;

Conversations with participants during meals as well as during and between other informal and formal events, including conversations with exhibitors about their programs and purposes;

Sessions (estimated attendance, main themes, types of questions asked and who asked them):

All plenary sessions;

Sessions on advice, career and social support, and diversity ;

Conversations with presenters at and description of the poster session; and

The Town Hall Meeting.

7.3   Profile of Conference Participants

### 7.3.1   Race/Ethnicity of All Respondents

Over 400 persons registered for the conference and 223 conference participants completed surveys.   Categories for race/ethnicity are based on those used by the 2000 U.S. Census; participants were asked to "check all that apply."   However, only one indicated more than one category (African-American and American Indian).   Table 2 shows the survey respondents according to their race/ethnicity and their attendee categories.   Conference participants were predominantly African-American, as shown in Figures 2 and 3.

Table 8: Survey Respondents by Attendee Category and Race/Ethnicity

Attendee Category	African American	Hispanic/ Latino	Asian Indian	Other Asian	American Indian/ Alaskan Native	White	Other	Total
Undergraduate	18	11	1	7	2	15	7	61
Graduate	43	18	3	5	1	10	2	82
Professional	20	5	1	4	0	25	0	55
Total	81	34	5	16	3	50	9	198

**Figure 3: Distribution of Participants by Race/Ethnicity and Category**
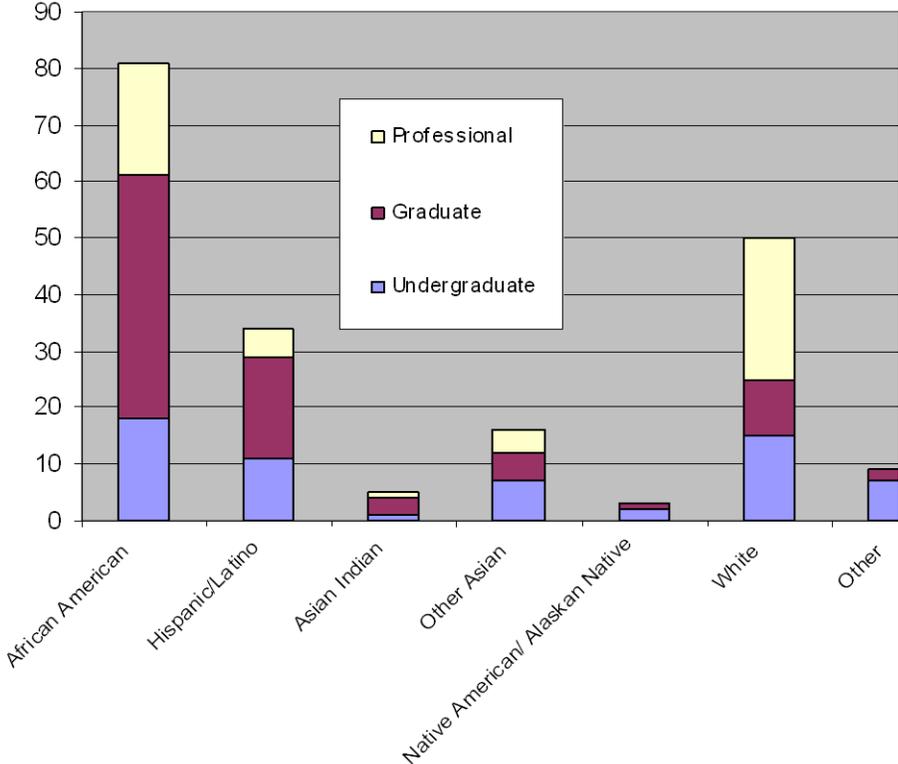
Figure 4: Distribution of Participants by Race/Ethnicity
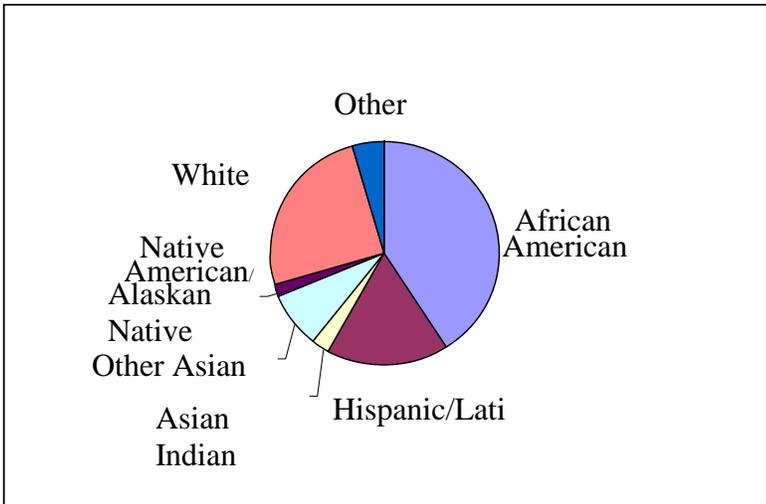
7.3.2   Profile of Professional Participants

Sixty percent of professionals responding to the survey were attending Tapia for the first time (35 of 58 respondents). More than half were under 45 years of age (34 of 58 reporting age), and 58% of professional attendees were female (32 of 55). As is to be expected, the majority of professionals work in academic institutions (Table 3). More than half of academic faculty and staff attended Tapia 2007 with students from their institutions (21 of 40).

Figure 5: Occupation of Professionals

Employment	Total
Non-profit organization	4
Company or corporation	12
Academic faculty and staff (e.g., professor, instructor, department chair, diversity coordinator)	43
Other	2
Total	61

Figure 6: Demographic Profile of Graduate Students

Gender		Gender	
Male	33	Male	43%
Female	44	Female	57%
Total	77	Total	100%

| Age		Age	
< 25 years	18	< 25 years	23%
25-35 years	49	25-35 years	63%
36-45 years	9	36-45 years	12%
46-55 years	2	46-55 years	3%
total	78	total	100

7.3.3   Graduate Student Profile

Graduate students made up the largest single group of survey respondents (N=82, 41%). The majority of graduate students were between 25 and 35 years of age. As opposed to national averages of male and female participation in computing, the Tapia conference had a larger female attendance than male attendance (57 and 43% respectively). Black/African-American graduate students predominated, making up more than half of all graduate students. Figure 7

compares U.S. Department of Education National Center for Education Statistics (NCES) graduate enrollment for minority students with graduate attendance at the 2007 Tapia conference (NCES collapses all Asians and Pacific Islanders into one category). The comparison shows that Black/African-American graduate students were over-represented, as were Hispanic graduate students at the conference. This demonstrates an increase in Hispanic/Latino graduate student attendance from previous conferences; for example, in 2003 Hispanic/Latino graduate students were underrepresented at the Tapia conference.

Figure 7: Graduate Demographic Profile
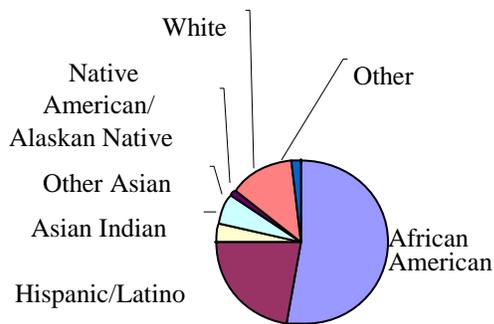
Tapia 2007 Celebration Graduate Student Race/Ethnicity
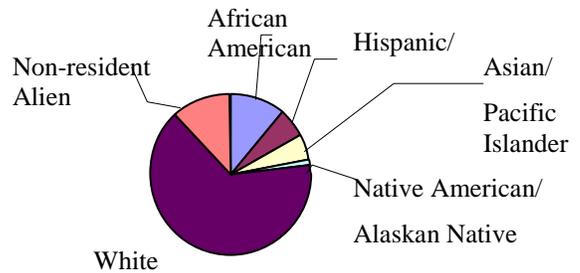
US 2005 Graduate Student Enrollment by Race/Ethnicity

7.3.4 Undergraduate Student Profile

Forty eight undergraduate students completed the survey. As would be expected, the majority of undergraduates are under 23 years old (see Figure 8). Unlike the gender representation of graduate students, male and female representation of undergraduates was about evenly distributed (23 males, 25 females). However, undergraduate females were over-represented relative to their presence in computer science and electrical/computer engineering nationally. Similar to the graduate profile, African American students were over-represented at Tapia relative to NCES enrollment data, as shown in Figure 10.

Figure 9: Undergraduate Demographic Profile

Gender		Gender	
Male	23	Male	48%
Female	25	Female	52%
Age		Age	
< 23 years	42	< 23 years	86%
23-30 years	5	23-30 years	10%
31-40 years	2	31-40 years	4%
41-60 years	0	41-60 years	0%

Figure 10: Undergraduate Race/Ethnicity

Race/Ethnicity	N
Latino/a or Hispanic	11
Black/African-American	18
Asian	8
White	15
Native American/ Alaskan Native	2
Other	7
Total*(12 individuals checked more than one race/ethnicity)	61

Figure 10: Comparison of U.S. Minority Undergraduate Enrollment[14] and Tapia Attendees

US Undergraduate Enrollment 2005

African American
13%

non resident
3%

Hispanic/ Latino
11%

Asian/ Pacific
Islander
6%

Caucasian
66%

Native American
1%

Tapia 2007 Undergraduate Attendance

other
11%

African
American
30%

Caucasian
25%

Native
American
3%

Asian/Pacific
Islander
13%

Hispanic
/Latino
18%
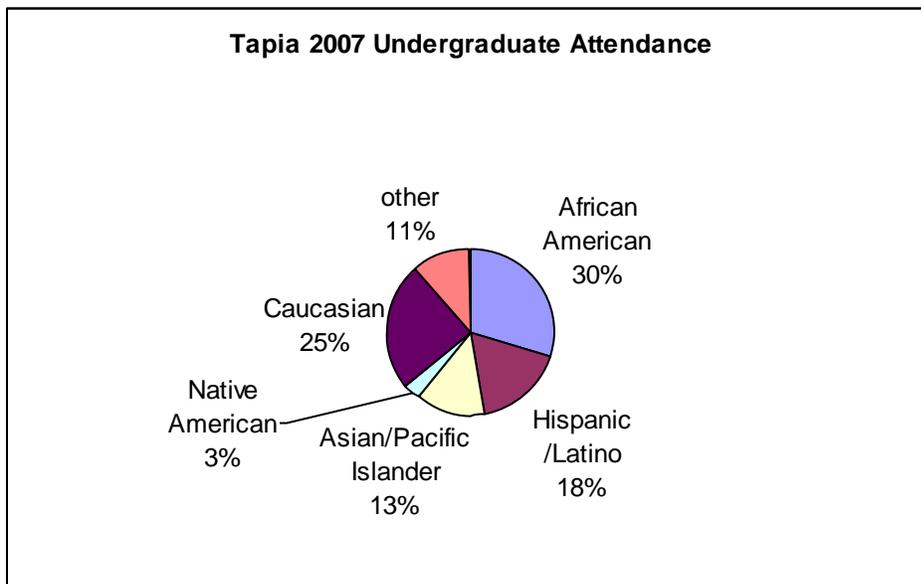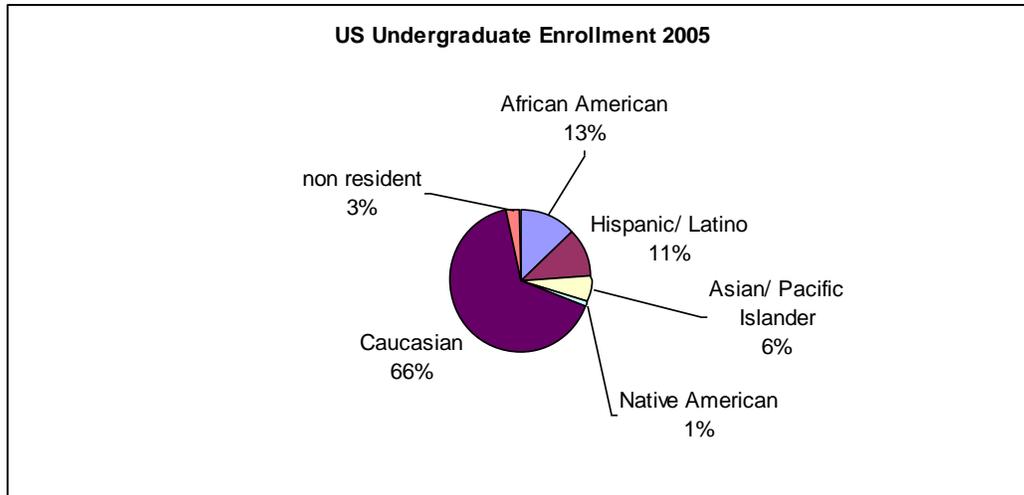
7.4 Conference Sessions

7.4.1 Favorite sessions

Participants were asked to list their favorite sessions at the Tapia conference. Due to the delayed nature of the survey, evaluators chose to ask for participants' favorite sessions rather than ask

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[14] Source: U.S. Department of Education, NCES. (2003). *Digest of Education Statistics 2002* (NCES 2003–060), Table 207. Data from Integrated Postsecondary Education Data System (IPEDS), "Fall Enrollment" surveys.

them to rate each session they attended. One hundred thirty eight participants responded to this item, and a few made multiple responses to this survey item. See figure 11 for results.

Figure 11: Tapia Participants' Favorite Sessions

Name of Talk/Panel/Session	N	Percent
Multi-Robot Intelligence	41	**30%**
Resume Workshop	14	**10%**
Diversity: A Weapon of Mass Construction	11	**7%**
Appreciating mathematical computation through applications to very cool activities	9	**7%**
It's not Just about the machine!	8	**6%**
NA/session not determined	8	**6%**
If Universities care so much about diversity, why do computing departments fail at retaining their underrepresented students?	7	**5%**
Kuhl-er-blahynd	7	**5%**
Are they really listening? Effective presentations in science settings	4	**3%**
All/many talks were considered favorites	4	**3%**
Poster Session	3	**2%**
Diversity is the key to IT security at Disney	3	2%

7.4.2   Suggested sessions

Fifty seven participants responded to this survey item. Tapia Celebration organizers are encouraged to read the comments verbatim from the appendices. Individuals who received multiple nominations include:

Juan Meza	Tiffany Williams	Richard Tapia
Juan Gilbert	William Massey	
Valerie Taylor	Arlie Peters	

Participants also suggested the kinds of sessions they would like to see at Tapia 2009. They include: bioinformatics topics, ethics in information technology, interviewing for academic positions, music and technology applications, and tips for writing grant proposals.

7.4.3   Orientation

Leadership team members of the Empowering Leadership Alliance collaborated with the Tapia Celebration committee to develop the 2007 student orientation for the Tapia Celebration. The orientation included an opportunity to meet other students and faculty at the conference, and to hear about the upcoming sessions and events during the Tapia Celebration. Sixty-five students indicated that the orientation helped them plan for their conference participation, and 52 students attending the orientation reportedly made plans to attend sessions with students they had met at the orientation.

7.4.4   Bridge Day Activities

Fifty three individuals responded to the survey items focused on bridge day activities. According to survey results, two-thirds of the participants surveyed found Bridge day supportive for networking with other students, and 39% found the Bridge day beneficial for networking with faculty, university staff, and industry professionals. This relatively small response could be due

to the fact that the activities were mostly attended by students; only 15 of the 53 respondents were professionals.

Participants were motivated to attend Bridge Day for the following reasons: to meet more people (33 individuals or 52%), to attend all or part of Grace Hopper (30, or 48%), to attend sessions (14, or 22%) and to take advantage of being in the Orlando region (25, or 40%). General comments were relatively positive (e.g., great, a lot of fun) while a few found them to be boring. Responses also revealed that graduate student felt the talks were geared toward undergraduates, and that the presentations were not always applicable to the advanced computer professionals attending the sessions.

7.4.5 Benefits of Tapia Celebration Corporate Sponsorship

Nine corporate and non-profit partners responded to items regarding their satisfaction with the Tapia Celebration. Eight respondents agreed that their organization's goals were met at the Tapia Celebration, while one respondent was unsure whether goals were reached. While two-thirds of the survey respondents felt their organization's sponsorship of Tapia was valued by students, five agreed that professors and organizers valued their organizations' support. Nearly all corporate and non-profit sponsors will encourage participation in future Tapia Celebrations (7 of 9), while two were unsure.

Sponsors' greatest accomplishments were identifying talented minority students, interacting with students, exposing students to internship and career opportunities of which they were unfamiliar. One sponsor noted:

> "My greatest accomplishment (at the Tapia Celebration) was when multiple students told me that they never thought of working at a National lab, but it is now something that they are interested in (pursuing)."

7.5 Evaluation of Conference Goals

The goals of the conference were

- To increase awareness of creative, original research and applications of computing by members of diverse groups, and to provide opportunities for learning about computing research, careers, and diversity issues related to these;
- To motivate graduate students to complete their degrees and encourage undergraduates to enter graduate school; and
- To provide formal and informal meetings and networking opportunities among diverse members of computing-related fields.

In the following sections, the survey and qualitative results for these goals and other outcomes are presented.

7.5.1 Awareness and Learning about Research, Careers, and Issues of Diversity

As was the case with past Tapia Celebrations, participants were generally satisfied with the conference. Most students said they learned about computing careers at Tapia (81% of undergraduates, 73% of graduate students), and the majority found that Tapia reaffirmed their

beliefs that computing work is important (87% of undergraduate students and 89% of graduate students). Nearly all participants found the technical talks easy to understand (83% of undergraduate students, and 84% of graduate students).

Tapia Celebration attendees were asked to describe how their peers perceive diversity conferences such as Tapia. The measure was an attempt to measure support for diversity at individuals' home institutions. While most graduate students said they had support to attend, many had the impression that their peers saw such conferences as a "waste of time", or as less desirable than participating in more research-focused conferences. A few participants mentioned that their peers were ill informed, but supportive. Academic professionals stated that conferences focused on diversity were considered service rather than research accomplishments. The following quotes represent the variety of responses to this survey item.

> "They have a huge admiration towards such conferences, and they are always encouraging the members of my Research group to go and collaborate with other peers from other universities. This is a great opportunity to network with a large variety of brilliant people."

> "One of my advisors is very supportive and very understanding. My other advisor and majority peers sometimes do not understand the importance and need for conferences geared towards minorities."

> "I'm not sure. Some of them are not that supportive but they don't say it. You just see it in their reaction when you tell them you are going on a conference celebrating minorities in computing. Typically, I try to avoid the question about what conference I'm attending."

> "My boss thinks it's a waste of my time."

> "Very upbeat and looking for novel ways to retain underrepresented minorities"

> "I suspect that they don't find it to be academically beneficial but consider it to be basically service-based."

Overall, 96% of Tapia survey respondents were somewhat to very satisfied with the Tapia Celebration. Nearly all (95%) will recommend the Tapia Celebration to colleagues in the future, and 89% are likely to attend in 2009. In order to determine what factors led to high satisfaction with the Tapia Celebration among students, evaluators ran regression analyses. It was hypothesized that the following factors would correlate with greater satisfaction in the conference:

- Underrepresented minority in computing status,
- Feeling isolated in one's home department,
- Networking goals for the conference,
- Engagement in "networking actions" described in section 5.3

These independent variables were compared with the dependent variable "overall satisfaction index," a combined variable including three measures of satisfaction with Tapia 2007. None of

the results were statistically significant, possibly because of a ceiling effect on satisfaction variables—a large majority of participants were satisfied with the conference.

7.5.2   Motivating Students

7.5.2.1   Encouraging Undergraduates and Graduates to Persevere in their Programs

Students said that they received valuable information regarding completing their academic programs at the conference. Students were divided regarding isolation at their home institutions: the average score in this category corresponded with "not sure", and a study of individual respondents indicate that 49 % felt isolated, while 51% did not, with a nearly even split among undergraduate and graduate students in each category. Students stated that the Celebration increased their intentions to complete their degrees; almost all of the students were confident they would complete their degrees, though two students were unsure.

Figure 12: Descriptive Statistics of Survey Items – Undergraduate Students

Survey Item	Min	Max	Mean	Std Dev
I am confident that I will complete my degree.	3	5	4.75	0.51
The technical talks at Tapia 2007 were easy for me to understand.	2	5	4.31	0.71
I received valuable advice at Tapia for getting through my educational program.	1	5	4.12	0.91
I learned about computing career paths at the Tapia Celebration.	1	5	3.93	1.05
I often feel isolated in my academic department.	1	5	3.08	1.42
Attending the conference increased my dedication to complete my degree.	1	5	4.11	0.99
Tapia reaffirmed my belief that computing work is important.	2	5	4.23	0.78

Scale: 1 = Strongly Disagree, 4 = Disagree, 3 = Not sure, 4 = Agree, 5 = Strongly Agree

Figure 13: Descriptive Statistics of Survey Items – Graduate Students

Survey Item	Min	Max	Mean	Std Dev
I am confident that I will complete my degree.	4	5	4.96	0.14
The technical talks at Tapia 2007 were easy for me to understand.	2	5	4.22	0.92
I received valuable advice at Tapia for getting through my educational program.	2	5	4.10	0.75
I learned about computing career paths at the Tapia Celebration.	1	5	4.02	0.91

I often feel isolated in my academic department.	1	5	2.96	1.36
Attending the conference increased my dedication to complete my degree.	1	5	3.92	1.16
Tapia reaffirmed my belief that computing work is important.	2	5	4.29	0.86

Scale: 1 = Strongly Disagree, 4 = Disagree, 3 = Not sure, 4 = Agree, 5 = Strongly Agree

7.5.3   Networking

7.5.3.1   Student Actions Following Tapia Celebration Attendance

Over half of the students surveyed indicated they attended the Tapia conference to network, meet like-minded students, and to meet other minorities in computing fields. Previous evaluations sought to describe the intentions of participants to interact with other Tapia participants following their experience at the Tapia Celebration. This year, the online survey developed for participants facilitated a delayed response, allowing participants to make good on their intentions. The survey, which was sent to participants over two weeks after the conference ended, asked participants to report the actual actions attendees engaged in with other Tapia participants.

Undergraduate and graduate students were asked to describe the networking and career related actions in which they engaged following their attendance at the 2007 Tapia Celebration. The list of actions was developed with the concept of community of practice in mind, which is defined as "a group of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly" (Wenger, 1998). A community of practice is developed around a certain domain (in this case, computing and computer education), and involves individuals engaged in joint activity. The survey items describe ways in which Tapia Celebration attendees extend the benefits of the conference through continued action and interaction. See figure 14.

Figure 14: Student Actions Following Tapia Celebration, by specific activity
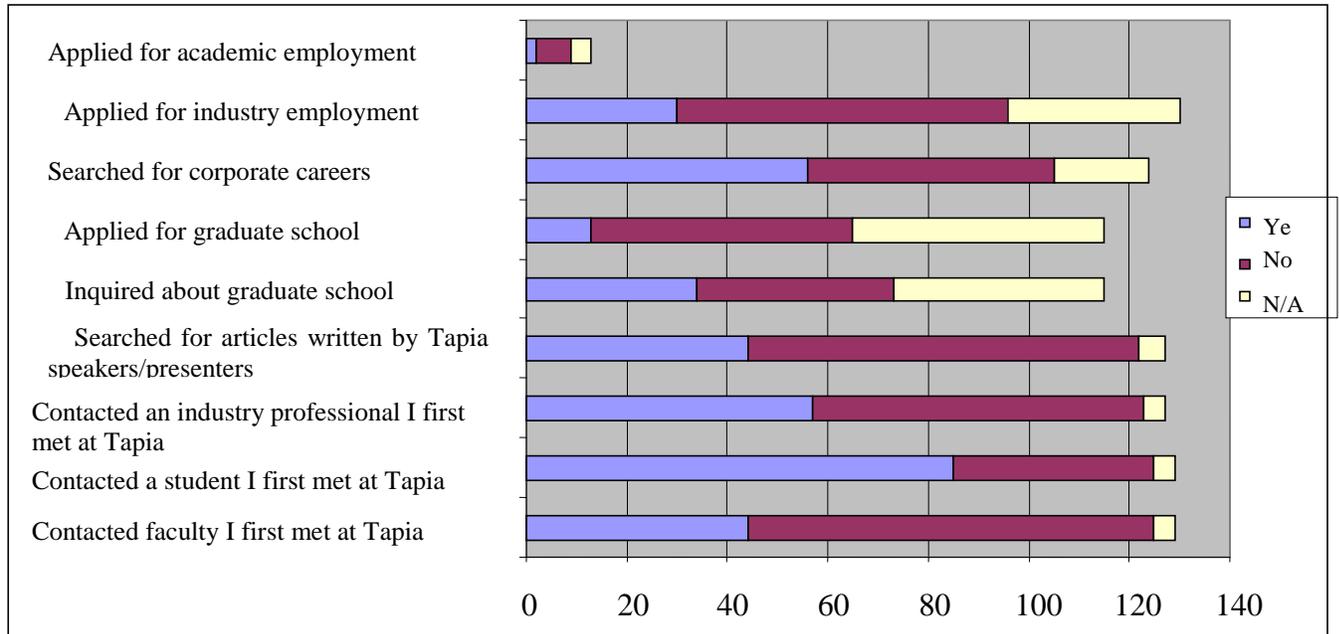
Students were most likely to contact other students they met at Tapia following conference attendance—over 80 students subsequently reached out to other Tapia students. Nearly half of Tapia student participants also contacted industry professionals they met at Tapia, searched for corporate careers, and inquired about graduate school (when applicable). Approximately one third of students applied for industry employment following their Tapia Celebration participation, and a similar portion of students searched for research articles written by Tapia speakers and presenters. A small number of Tapia students applied for academic employment, which is most likely due to the small portion of students who were doctoral candidates attending Tapia.

7.5.3.2   Professionals' Actions Following Tapia Celebration Attendance

Professionals who attended Tapia also did their part to increase their social and professional networks, according to survey data. Nearly all of the professionals spoke with colleagues about their involvement in the October 2007 Celebration. Over half of the professors, staff, and industry representatives at Tapia contacted students they met at Tapia after the conference, in particular to discuss internship and graduate program opportunities. Over half of the professionals at Tapia also contacted one another. Smaller numbers of professionals helped Tapia students apply for graduate school and for scholarships, and slightly more than one fifth invited students they met at Tapia to participate in research opportunities. See figure 15.

Figure 15: Professionals' Actions Following Tapia Celebration, by specific activity
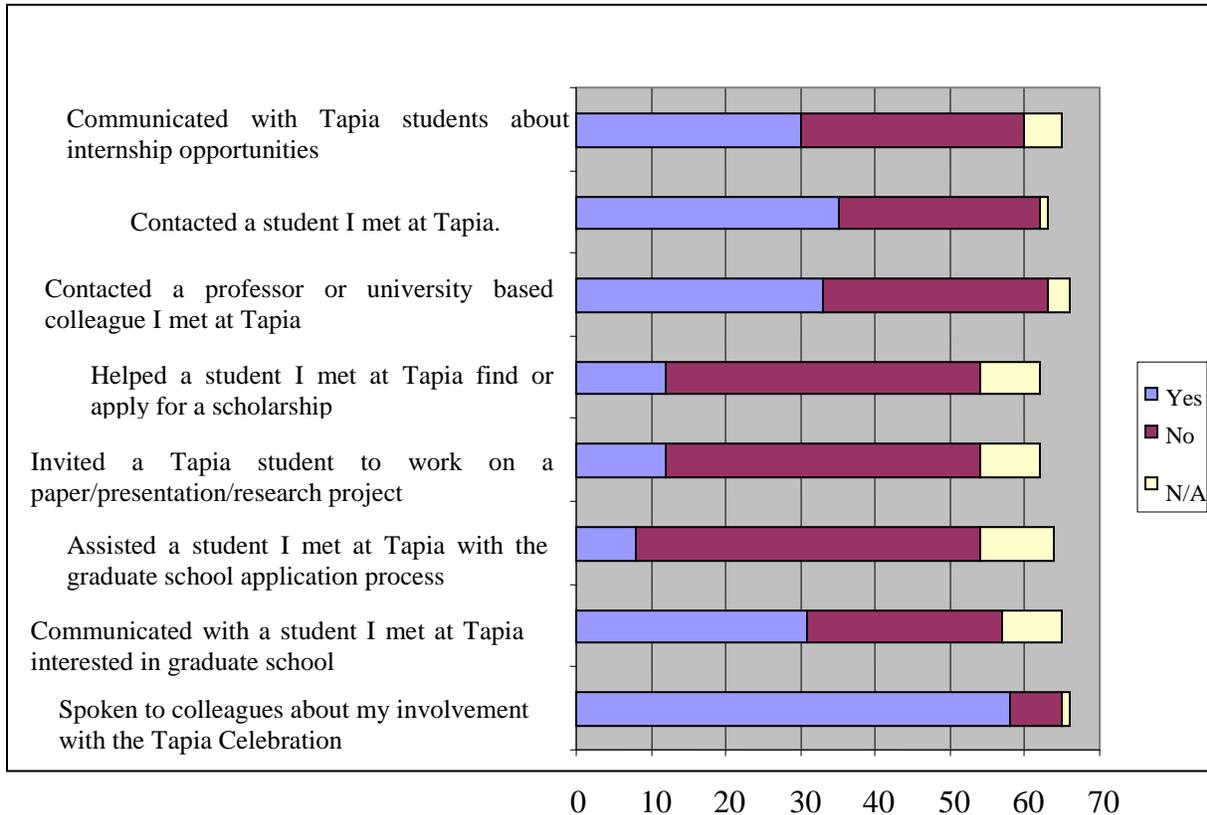
7.5.3.3   Building Social and Professional Networks Through Repeat Attendance

Researchers determined from observation and anecdotal evidence that a large cohort of Tapia Celebration participants have attended the conference since its inception. According to survey data, 78 survey respondents had attended a previous Tapia conference. Through the survey instrument, evaluators set out to determine the extent to which their Tapia Celebration involvement resulted in professional collaborations and social support. Again, researchers used the community of practice framework to develop questions regarding repeat Tapia attendees' professional relationships which stemmed from Tapia acquaintances. The data suggests that the majority of repeat Tapia attendees develop professional relationships that enhance their development in the computing field.

While small numbers of Tapia Celebration veterans collaborated through research, publication, or grant writing, more than half asked one another advice about careers and educational opportunities, connected with one another at other conferences, and made social plans together. Slightly less than half contacted one another about academic and industry employment opportunities. See figure 16.

**Figure 16: Past Tapia Participants' Networking Outcomes, by specific activity**

Past Tapia participants' networking outcomes, by specific activity
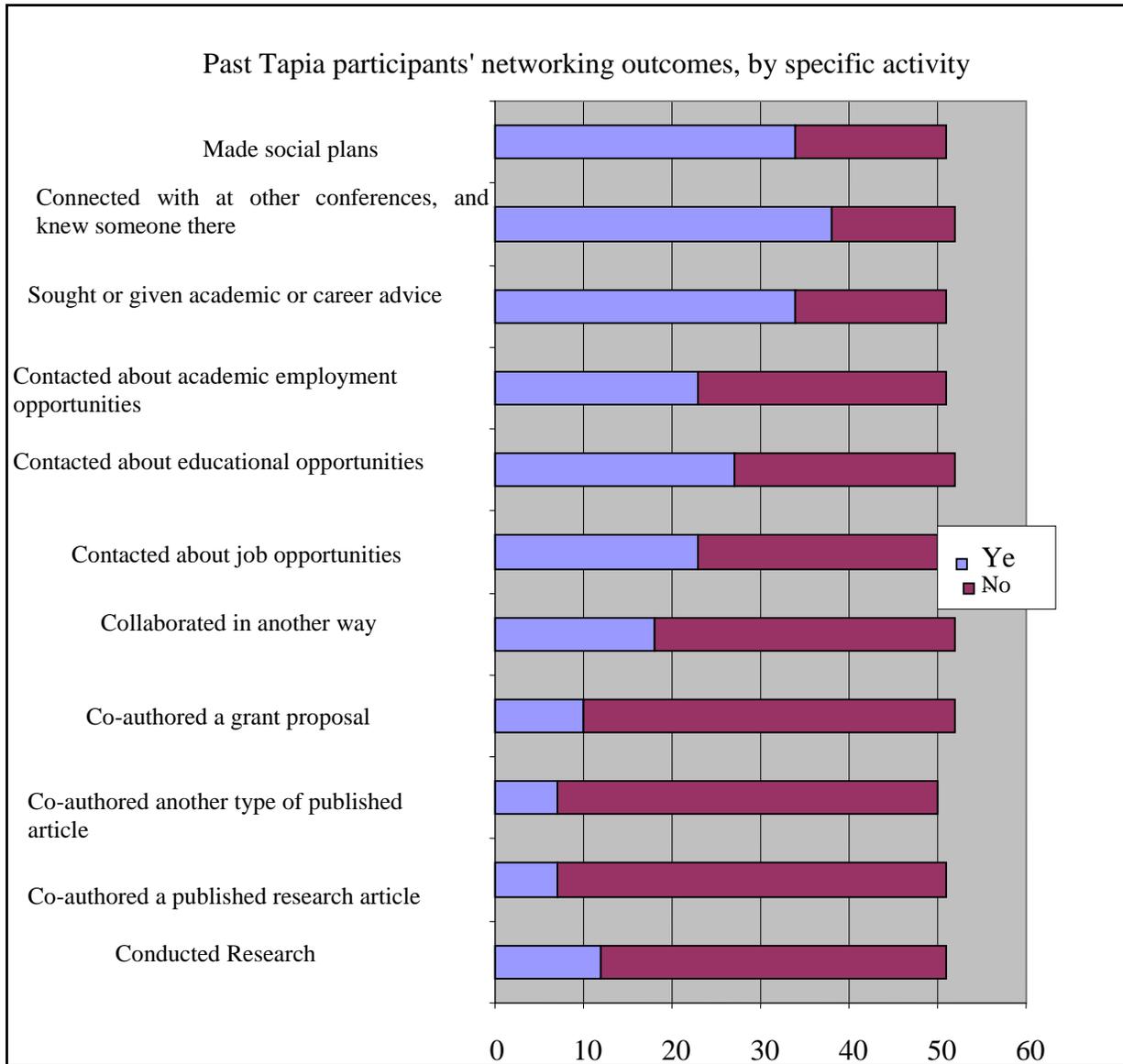
7.6   Conclusions and Recommendations

7.6.1   Summary

The 2007 Richard Tapia Celebration of Diversity in Computing Conference was successful in reaching its goals of increasing awareness of and knowledge about computing research and careers; motivating students to persevere in their post-secondary academic programs and providing network opportunities. The conference was attended by a diverse group of persons, of whom, the vast majority made steps to continue relationships and acquaintances in the two weeks following the Tapia Celebration. Benefits of repeat Tapia Celebration attendance were

also discovered' participants create social and professional allegiances at the Tapia Celebrations, according to survey data. Recommendations for the 2009 conference and for the 2009 conference survey are presented below.

7.6.2   Recommendations for the 2009 Conference

Participants made several types of suggestions; it is strongly recommended that organizers read through their verbatim comments, which are presented in Appendix B. Suggestions range from logistical concerns to conference content and thematic changes. The categories that received the most attention are categorized below.

7.6.2.1   Sessions and Improving Participation in Sessions

Include sessions for career and mid career preparation and professional development, as well as sessions on diversity issues describing concrete solutions for increasing diversity in academia and in the workplace. Also include more technical talks to showcase what diverse professionals are doing to improve and advance computing.

Unlike typical professional conferences, this attracts an audience made up of the range of educational levels and subject areas, including interdisciplinary scientific research, social science, and computer science. Also, participants range in career aspirations—not all graduate students are planning academic careers. Participants suggested tracks for different types of involvement in the Tapia Celebration.

Provide more opportunities for undergraduates to participate in leadership roles, through presentations and poster sessions.

7.6.2.2   Networking Support During the Conference

Ensure that conference hotel or site includes internet access, and that all conference events are in one central location

Increase the font size on nametags

Assign students to groups with advisors or mentors to support networking, and attend sessions and meals together.

Include social, site-seeing excursions to see cities in which conferences are located. These are excellent ways to develop longer-lasting acquaintances among students, professors, academic staff and industry professionals.

7.6.2.3   Conference Management

Increase vigilance over speaker time, particularly during banquets. Perhaps use a moderator format. Get speakers to understand the importance of staying within time limits, and providing opportunities for dialogue.

Schedule talks to increase participation in all sessions; do not schedule parallel technical talks with student professional development workshops, such as resume writing sessions for students.

Empowering Leadership: Computing Scholars of Tomorrow Alliance
http://www.empoweringleadership.org

7.6.3 Recommendations for 2009 Conference Survey

- Add specific questions for invited speakers
- Ask professors about their contact with graduate students

8 APPENDIX: Recruiters and Professional Organizations Present at the Conference and Web Sites

Organized by
The Coalition to Diversify Computing (CDC)
http:// www.cdc-computing.org/

Sponsoring Organizations

The Association for Computing Machinery (ACM)
http://www.acm.org

The IEEE Computer Society
http://www.computer.org

In Cooperation with
The Computing Research Association (CRA)
http://www.cra.org

Platinum Supporter
National Science Foundation (NSF)
http:/ www.nsf.gov

Gold Supporters

AMD (Advanced Micro Devices)
http://www.amd.com
The Empowering Leadership Alliance:
Computing Scholars of Tomorrow
http://empoweringleadership.org/
Google
www.google.com/jobs/tapia
Microsoft
http://www.microsoft.com
National Center for Supercomputing

Applications
http://www.ncsa.uiuc.edu
Princeton University
www.princeton.edu
Rice-Houston Alliance for Graduate Education
and the Professoriate
http://rgs.rice.edu/grad/agep/
Rice University
http://www.rice.edu

Silver Supporters

College of Computing, Georgia Institute of
Technology
http://www.coc.gatech.edu
Hewlett Packard (HP)
http://www.hp.com
Lawrence Livermore National Laboratory
http://www.llnl.gov
Oak Ridge National Laboratory (ORNL)
http://computing.ornl.gov/
Department of Computer Science at Texas A&M

University
http://www.cs.tamu.edu
University of California, Berkeley Department of
Electrical Engineering and Computer Sciences
http://www.eecs.berkeley.edu
University of Wisconsin
http://www.wisc.edu/
USENIX Association
http://www.usenix.org

Bronze Supporters
Anita Borg Institute for Women and Technology
http://www.anitaborg.org/
Auburn University
http://www.auburn.edu/
Department of Computer Science, Georgetown University
http://www.cs.georgetown.edu/
Harvey Mudd College
http://www.hmc.edu/
Indiana University
http://www.researchtechnologies.uits.iu.edu
Lawrence Berkeley National Laboratory

http:// www.lbl.gov
National Center for Women and Information Technology
http://www.ncwit.org/
Renssalear Polytechnic Institute
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Xilinx
http://www.xilinx.com/

Note: Open-Ended Responses were removed from this online version. Please contact José Cossa at jcossa@ischool.utexas.edu if you would like more detail.