BPC-AE: The STARS Alliance,
A Southeastern Partnership for Broadening Participation in Computing

2006-2010, Third Year, Annual Report

NSF Award No. 0739216

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The STARS Community of Practice
*Advancing innovation and discovery through **regional partnerships** to broaden participation*

STARS Leadership Corps
Tiered participation of students, professionals, & educators in research and civic engagement catalyzes regional partnerships

Research, Women's, & Minority Universities

Industry

K-12

Community Colleges

Community & Professional Organizations

Tiered Participation
The corps provides stair-step role models & mentors

Faculty, Industry
Graduate students
Undergraduates
K-12 students

STARS Celebration: Fosters national collaboration on STARS Leadership Corps, Mentoring, Pair Programming, Research Experiences, and other BPC initiatives.

STARS Central Values: Excellence, Leadership, Community, Service & Civic Engagement

GOALS: Recruiting, Bridging, and Retaining underrepresented people in computing, Advancing faculty, Sustaining and Disseminating BPC

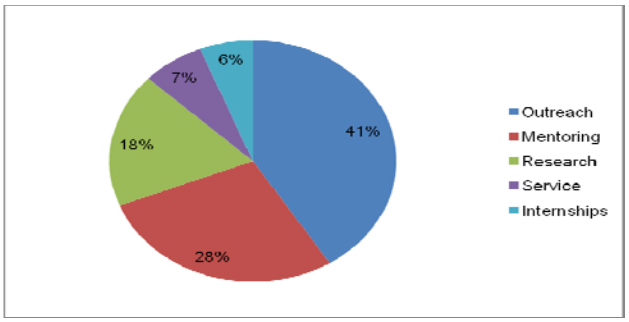
1. Highlights

1.1 Key Outcomes from 2009-2010

STARS Leadership Corps (SLC):

- 276 Students at 20 schools
- Increased **bridging & retention** leading indicators: Computing efficacy (mean = 5.5 to 6, 6 pt. scale); Computing commitment (mean = 4.7 to 5.0, 6pt scale)

Primary SLC Projects 2009-2010



1.2 Cumulative Outcomes from 2006-2010

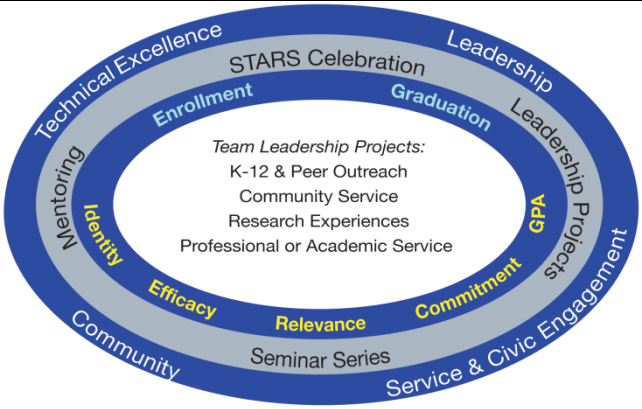
Table 1: STARS Alliance Impact Aug 2006–May 2010

STARS Leadership Corps (SLC) 762 SLC students at 23 schools 43% Black, 6% Hispanic; 50% women 70% applied, 40% accepted to **REUs** **28,000 K-12** Outreach attendees 7 new SLC courses, 5 student orgs. **Pair Programming** @ 12 schools, **43 classes** with over 2,450 students **Mentoring** @ 11 schools, **178 SLC** mentors & 475 mentees **Faculty**, **67 faculty** participants 5 tenured, 3 promoted to leadership **STARS Celebrations** – four held **775 attendees**	**SLC**: Increased **bridging & retention** leading indicators: Computing efficacy (mean = 4.76 to 5.18, 6 pt. scale) Computing commitment (mean = 3.4 to 3.87, 5 pt. scale) Computing social relevance (mean = 4.66-4.98, 6 pt. sc) GPA (mean = 3.32 to 3.54) 77% show increased interest in **graduate programs** UNCC controlled study → improved outcomes for SLC **Mentoring:** workshop increased **computing identity** (mean = 3.35 to 4.75, 6 pt. scale) **Changing cultures:** STARS builds community and earns recognition for computing depts. & colleges **Media:** 13 journal, 44 conference papers, 12 posters, 2 TV & 2 news stories
Enrollment and Graduation Trends: Dramatically **increased** STARS member **graduate enrollments** 2006-09 **(32**%); vs 2% nationally 11% increase in women's undergraduate degree completion	

2. Introduction to the STARS Alliance and Overview of this Report

The STARS Alliance is a vibrant community among academia, K-12 schools, professional and community groups with a mission to broaden participation in computing through regional partnerships that are catalyzed by the STARS Leadership Corps (SLC). The STARS Alliance was formed in 2006 with 10 initial member colleges and universities and has grown to include 20 members. Members implement their site specific SLC and participate in the STARS Mentoring and Pair Programming Demonstration Projects. The SLC is an innovative program that envelopes established regional programs for BPC (K-12 outreach, community service, research experiences) with common alliance-wide activities intended to develop students' Technical *Excellence*, *Leadership* skills, sense of responsibility to use computing in service to society through *Civic Engagement*, and sense of belonging to a Computing *Community*. The STARS Celebration is an annual conference to induct students and faculty into the STARS Community through participation in year-long team-based SLC leadership projects in concert with regional partners.

Leadership Projects involve new and existing regional BPC activities. The SLC envelopes disparate regional programs within a common framework to support an extended community and cohesive evaluation across programs & organizations



STARS Central Values (outer ring), SLC activities that advance these values (middle ring), and expected outcomes (inner ring), as measured by leading (bottom) and lagging (top) indicators

The STARS Leadership Corps Model

The STARS Alliance members, participation, and impact from August 2006 through May 2010 are summarized in Tables 1 and 2. These activities have been supported by two grants from the National Science Foundation (NSF) for the "STARS Initiation Project" and the "STARS Extension Project." The following sections of this report comprise the annual report for the STARS Project entitled *BPC-AE: The STARS Alliance: A Southeastern Partnership for Broadening Participation in Computing* (NSF award no. 0739216). As such, this report details activities and outcomes from all of the STARS institutions (original institutions are highlighted in yellow in Table 2a and listed later in Table 3). Because Landmark College does not have a computing program, we do not include their institutional data when comparing with national trends in this report. Although Johnson C. Smith University (J.C. Smith) joined the alliance in 2007, we include them as an "original" member since they were funded by the STARS Initiation grant.

Table 2a: STARS Members and Participation (2006-2009 Fall)
(**M**=Mentoring, **PP**=Pair Programming, **C**=SLC Course, **O**=SLC Student Organization)

STARS Members	Type	# SLC participants				Projects	SLC Highlights
		2006	2007	2008	2009		
Auburn	Doctoral	25	14	18	29	PP,M,C	K-6 Computer Clubs, 7 pubs
Florida A&M	HBCU-Doc	12	11	29	24	PP,M,C	SLC integrates w/ scholarship program for K-12 outreach
Florida State	Doctoral	15	15	15	14	C	X-Day series engages campus computing
Georgia Tech	Doctoral	10	14	22	26	M	SLC mentors freshmen
Landmark	2yr LD	7	10	6			Learning Disabilities, no computing major
Meredith	Women-UG	4	5	7	4	PP	Tutors intro CS classes, UG research
NC State	Doctoral	13	16	12	20	PP,M,O	Graduates mentor UG research, 21 pubs
Spelman	WHBCU-UG	2	4	4	3	O	Geek Week engages campus in computing
UNC Charlotte	Doctoral	22	16	19	33	PP,M,C	Integrates SLC with REU Site & GAANN, 19 pubs
USF Polytechnic	UG	4	13	8	9	M	Leads mentoring program
J.C. Smith	HBCU-UG		10	10	10		SLC fulfills volunteer hours required for CS degree

Table 2b: STARS Members and Participation (2006-2009 Fall)

STARS Members	Type	# SLC participants				Projects	SLC Highlights
		2006	2007	2008	2009		
CPCC	Comm. Coll				5	C	Creating 2+2 with UNC Charlotte
Georgia Southern	Doctoral			6	8	PP,C	Student-led workshop, Competitive software development
Hampton	HBCU-UG			14	17	PP,M,O	Conducts peer tutoring & mentoring
NC A&T	HBCU-UG			12	11	PP,M	Builds community through socials & outreach
Shaw	HBCU-UG			*	9	M	Participates in NC State SLC
St. Augustine	HBCU-UG			8	*		Partners with NC State for robotics outreach
U. New Orleans	Doctoral			9	8	PP,O	Conducts peer tutoring & outreach
USC-Columbia	Doctoral			11	6	PP	Conducts robotics outreach
UT-Knoxville	Doctoral			8	15	PP,M,O	Conducts mentoring & outreach
Virginia Tech	Doctoral			21	11	PP,M,C	Pools resources, Connects research & outreach

The remainder of this report is organized as follows: We compare enrollment and graduation for STARS Alliance institutions with national trends, showing that sites participating in STARS since 2006 have outperformed national PhD granting institutions by dramatically increasing graduate enrollments and significantly mitigating the decline in undergraduate enrollments. Our success is based on: engaging college students through the STARS Leadership Corps (SLC); mentoring them to build identity, performance, and commitment; improving curricula through Pair Programming; inspiring and training faculty to carry out the STARS mission locally; building partnerships regionally; and bringing the BPC community together through the STARS Celebration. We present results that show how the SLC, Mentoring, and Pair Programming have improved computing commitment and community, and how STARS raised these indicators even compared to a control group at UNC Charlotte. We then discuss the STARS Celebration, a central component of STARS that has contributed to the national BPC community and has been instrumental in engaging students and faculty in our BPC mission. The impact of STARS on Alliance faculty members is presented from most recent survey and questionnaire feedback. We conclude the report with a brief summary of how each STARS Alliance institution has performed over the project.

3. Comparison to National Trends

The STARS Alliance is outperforming national trends in undergraduate and graduate enrollments and degree obtainment. In this section, we highlight enrollment and graduation trends among the PhD granting STARS original institutions listed in Table 3 denoted with a (G), referred to herein as "Alliance PhD-granting." According to the NSF Science & Engineering Indicators 2010 (http://www.nsf.gov/statistics/seind10), which provides a comprehensive overview of trends in these disciplines (up to 2007), key indicators suggest that undergraduate enrollment and graduation (degree obtainment) is expected to continue rising due to the increasing number of the college-aged population in the U.S. However, the NSF also points out that these key indicators have declined in computer science disciplines. While the NSF indicators show overall trends, they do not provide an annual source for trend comparisons. Therefore, herein we compare the enrollment and graduation trends of the Alliance PhD-granting institutions to the national trends in two ways. First, we compare trends for the original 10

STARS PhD-granting institutions to trends for newer STARS institutions. Second, we compare trends for original STARS institutions to national trends reported by the Computing Research Association's annual Taulbee Reports (http://www.cra.org/resources/taulbee) for the four-year period from 2005-2006 to 2008-2009. (National Taulbee graduation data for 2009-2010 is not yet available at the time of this writing.)

3.1 Positive Alliance Trends in Overall Enrollment and Graduation

First, we compare against trends for older STARS institutions compared to newer STARS institutions. Table 3 a and b show the total CS enrollments and graduations (undergraduate and graduate) for all STARS schools from 2005-2009. Original STARS institutions show a more dramatic departure from the national trends. Figure 1 shows the total CS enrollments (UG and graduate) at the 10 original STARS schools as compared with the total CS enrollments at the 10 new STARS schools for the same years. New STARS institutions mirror national trends, but are expected to depart from national declines during their third year of Alliance participation (in 2010-2011) as did the original schools. It should be noted that six schools did not report all data in time for this report. However, five of these schools are small private colleges that are not likely to negatively impact the totals and trends; the one large research school with missing data was from one year (2009-2010) and is not expected to have a negative impact on our overall trends.

Table 3a: Total Alliance CS enrollment and degree completion for STARS 2006-2009 schools

	Enrollment					Graduation			
STARS original institutions	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2005-2006	2006-2007	2007-2008	2008-2009
Auburn University (G)	136	136	146	180	180	24	25	10	16
FAMU	294	238	206	202	225	57	41	14	38
Florida State University(G)	804	751	730	725	*	280	207	186	186
Georgia Tech (G)	1347	1341	1459	1431	1465	409	376	378	500
J.C. Smith U. (2007 start)	188	178	187	203	115	31	25	22	24
USF Poly (Lakeland)	90	88	93	106	109	18	13	16	18
Meredith College	8	6	4	7	*	4	2	3	1
NC State University (G)	1101	1116	1195	1201	1200	247	224	280	289
Spelman College	27	18	14	39	*	14	7	4	5
UNC Charlotte (G)	737	760	808	923	1094	172	164	198	186
Subtotal	4732	4632	4842	5017	4388+	1256	1084	1111	1263

Note: G denotes PhD granting, * denotes unreported data from the institution, + denotes that these totals have missing data and the actual totals will be higher

Table 3b: Total Alliance CS enrollment and degree completion for STARS 2006-2009 schools

	Enrollment					Graduation			
STARS extension institutions	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2005-2006	2006-2007	2007-2008	2008-2009
Georgia Southern (G)	551	543	512	533	547	83	87	93	49
Hampton	176	141	121	99	95	28	22	10	10
NC A & T (G)	292	272	213	268	263	290	270	212	64
Shaw	140	120	127	117	106	*	*	11	17
St. Augustine	91	60	47	51	*	16	13	13	7
University of New Orleans (G)	324	341	278	301	316	41	50	26	34
USC (G)	478	381	421	458	*	94	99	61	73
UTK (G)	278	269	233	203	210	44	49	42	47
Virginia Tech (G)	1081	927	905	819	820	343	337	318	247
Subtotal	3411	3054	2857	2849	2357	939	927	786	548
TOTAL	8143	7686	7699	7866	6745+	2195+	2011+	1897	1811

Note: G denotes PhD granting, * denotes unreported data from the institution, + denotes that these totals have missing data and the actual totals will be higher

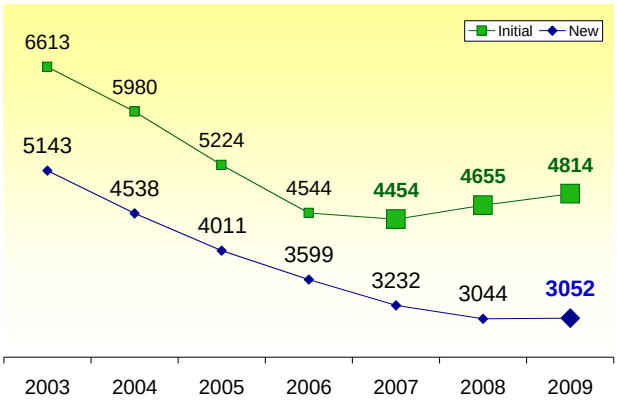


Figure 1: Total CS UG & Graduate enrollments at initial compared to new STARS schools from 2002-2003 (denoted 2003) to 2008-2009 (denoted 2009); new STARS started in 2008-2009 (missing data from six schools).

The number of years of STARS participation is indicated in Figure 1 by larger data points, with original schools starting STARS in 2006-2007 (except JCSU, who started in 2007-2008) and new schools starting in 2008-2009. Despite the fact that six schools did not report some data in time for this report, the

comparison is very similar to the results of our comparison with Taulbee schools (discussed below) showing that the overall trend for STARS schools in enrollments is better than the trend for enrollments for comparable CS programs. In the remainder of this section, we compare against national Taulbee trends to show that STARS Alliance institutions have made several notable departures from the national trends in computer science enrollment. Table 4 compares enrollments in the original Alliance PhD-granting universities to national enrollments as tracked by the Taulbee Survey. No institutional data is missing from the Taulbee comparison tables.

Table 4: Enrollments for STARS & Taulbee in Undergraduate (UG), Graduate (G) CS programs. Alliance PhD-granting schools: Auburn, Georgia Tech, FSU, NCSU, and UNCC

CS Enrollments, Alliance PhD-Granting Schools					CS Enrollments, Reported Nationally by Taulbee				
	2005-2006	2006-2007	2007-2008	2008-2009		2005-2006	2006-2007	2007-2008	2008-2009
STARS UG Enrollment	2871	2749	2671	2809	Taulbee UG Enrollment	34984	29011	31003	32706
Annual % change		-4%	-3%	5%	Annual % change		-17%	7%	6%
% change since 2005			-7%	-2%	% change since 2005			-11%	-7%
STARS Grad Enrollment	1254	1355	1667	1651	Taulbee Grad Enrollment	25325	24001	24769	25738
Annual % change		8%	23%	-1%	Annual % change		-5%	3%	4%
% change since 2005			33%	32%	% change since 2005			-2%	2%

As shown in Table 4, over a three-year period, original Alliance institutions have reversed the national graduate enrollment decline and have greatly reduced the national undergraduate enrollment decline. For example:

- For the year from 2005-2006 to 2006-2007, original Alliance PhD-granting universities mitigated the national undergraduate enrollment decline (4% decrease Alliance; 17% decrease national) and reversed the national graduate enrollment decline (8% increase Alliance; 5% decrease national).
- Over the two-year period from 2005-2006 to 2007-2008, original Alliance PhD-granting universities continued to mitigate the national undergraduate enrollment decline (7% decline Alliance; 11% decline national) and continued increasing graduate enrollment while national graduate enrollments were still declining (33% increase Alliance; 2% decrease national).
- Over the three-year period from 2005-2006 to 2008-2009, original Alliance PhD-granting universities greatly improved upon the national undergraduate enrollment decline (2% decline Alliance; 7% decline national) and dramatically enhanced graduate enrollments (32% increase Alliance; 2% increase national).

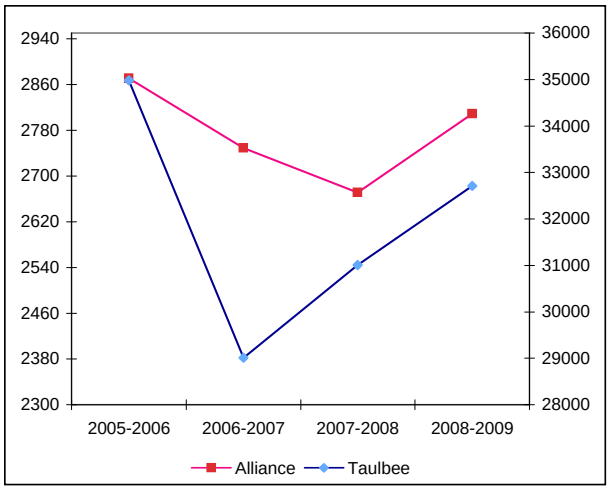


Figure 3: Comparison of Alliance & Taulbee CS undergraduate enrollments

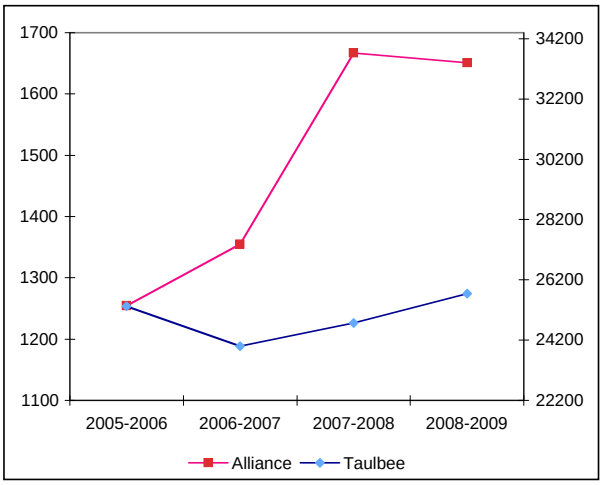


Figure 4: Comparison of Alliance and Taulbee CS graduate enrollments

Figures 3-4 further demonstrate this comparison between STARS Alliance original schools' enrollments and PhD-granting institutions in the Taulbee survey. In Figures 3-4, the left vertical scale is for original Alliance schools' enrollments and the right is for national enrollments as measured by the Taulbee survey of PhD-granting computer science departments. Nationally, undergraduate enrollments dropped sharply in 2006-2007 while original Alliance institutions avoided this sharp drop and were able to recover more quickly and fully than the average. Graduate enrollments declined nationally in 2006-2007 and rebounded by 2008-2009, while the STARS original institutions saw a tremendous increase in graduate enrollments during this timeframe. We believe this is due to our engagement of undergraduates in meaningful projects, paired with mentoring by graduate students and faculty, and our emphasis on informing and preparing undergraduates for research and graduate opportunities.

Table 5: Degree Completion for Alliance & Taulbee for UG, Graduate CS Students

CS Graduation for STARS					CS Graduation reported by Taulbee				
	2005-2006	2006-2007	2007-2008	2008-2009		2005-2006	2006-2007	2007-2008	2008-2009
STARS UG	716	576	538	484	Taulbee UG	12154	9941	9000	7923
Annual % change		-20%	-7%	-10%	Annual % change		-18%	-9%	-12%
% since 2005			-25%	-32%	% since 2005			-26%	-35%
STARS Grad	416	420	514	693	Taulbee Grad	8251	8731	8645	8307
Annual % change		1%	22%	35%	Annual % change		6%	-1%	-4%
% since 2005			24%	67%	% since 2005			5%	.68%

STARS Alliance original institution trends in degree completion are better for undergraduates and dramatically better for graduate students as shown in Table 5. Undergraduate degree completion has been declining nationally (35%), however, the declines are less among STARS Alliance institutions

(overall decline of 32%). Graduate student degree completions have increased within the STARS Alliance yet have been declining nationally. PhD-granting STARS Alliance original institution graduate student graduations increased by 67% between 2005-2006 and 2008-2009, while national degree completion remained nearly the same over that period. Because graduations are a lagging indicator, we expect that STARS will continue to increase its performance as compared to national indicators over the next several years.

3.1.1 Women

NSF key indicators show that the number of bachelor's degrees awarded to women in the sciences and engineering has continued to increase over the last decade. However, the number of women obtaining bachelors degrees in computer science, math and engineering has been declining, and graduate enrollments in computer science and engineering have been declining as well (with the exception of 2005-2006). Table 6 compares Taulbee and original Alliance institution female graduation rates. Like the national trends, undergraduate female graduation in STARS institutions has declined. However, this trend appears to be reversing for STARS PhD-granting institutions, with an 11% increase in women's UG degree completions in 2008-2009. Furthermore, graduation of women graduate students in CS at STARS schools has increased **dramatically, by 65%** since 2005-2006, while nationally these rates are unchanged. Note that Taulbee reports do not reflect enrollment data for females explicitly, therefore, no comparisons are available to national trends aside from the general trend statements from NSF key indicators. Enrollments at STARS PhD-granting institutions have been increasing steadily since 2007-2008 for undergraduate women. However, graduate women enrollments have been inconsistent among Alliance PhD-granting institutions.

Table 6: Degree Completion for Women UG, Graduate CS Students at STARS & Taulbee schools

Graduating Women in Computer Science at STARS Alliance PhD-Granting Institutions					Graduating Women in Computer Science Nationally by Taulbee				
	2005-2006	2006-2007	2007-2008	2008-2009		2005-2006	2006-2007	2007-2008	2008-2009
STARS UG Graduation	112	68	62	69	Taulbee UG Graduation	1725	1208	1061	892
Annual % change		-39%	-9%	11%	Annual % change		-30%	-12%	-16%
% change since 2005		-39%	-45%	-39%	% change since 2005		-30%	-38%	-48%
STARS Grad Graduation	99	99	114	163	Taulbee Grad Graduation	1830	1926	1825	1817
Annual % change		0	15%	43%	Annual % change		5%	-5%	-.4%
% change since 2005		0	15%	65%	% change since 2005		5%	-.3%	-.7%

3.1.2 Underrepresented Minority Trends

Underrepresented minorities (URM) in computing are African American, Alaskan Native/American Indian, Asian/Pacific Islander, and Hispanic. Table 7 shows that STARS Alliance original institution enrollments and graduations by URM students in undergraduate and graduate programs have made gains in 2008-

2009, following years of decline. Undergraduate URM graduation has been steadily increasing since 2005 baseline year, showing the first gain (17%) in 2008-2009. Graduate student graduations among underrepresented minority students have continued to fluctuate, with less of a decrease in 2008-2009. National data regarding underrepresented minority students in computing are not comparable to STARS data, because Taulbee only reports ethnicity of degree recipients, and combines US and Canada. Nevertheless, Tables 7-8 show the graduation rate of undergraduate underrepresented minority students **increased 17%** for PhD-granting Alliance schools in 2008-2009, while national rates saw a 20% decline.

Table 7: Underrepresented minority enrollment and degree completion for all Alliance institutions

Underrepresented Minority CS **Enrollment**					Underrepresented Minority CS **Graduation**				
	2005-2006	2006-2007	2007-2008	2008-2009		2005-2006	2006-2007	2007-2008	2008-2009
Undergraduate Enrollment	1205	1137	1115	1152	Undergraduate Graduation	265	208	175	204
Annual % change		-6%	-2%	3%	Annual % change		-22%	-16%	17%
% change since 2005		-6%	-7%	-4%	% change since 2005		-22%	-34%	-23%
Graduate Enrollment	189	168	153	168	Graduate Graduation	64	78	48	38
Annual % change		-11%	-9%	10%	Annual % change		22%	-38%	-21%
% change since 2005		-11%	-19%	-11%	% change since 2005		22%	-25%	-41%

Table 8: Underrepresented minority CS student degree completion: Alliance & Taulbee

Graduation for Underrepresented Minority CS Students at PhD-granting Alliance Institutions					Graduation for Underrepresented Minority CS Students Nationally by Taulbee				
	2005-2006	2006-2007	2007-2008	2008-2009		2005-2006	2006-2007	2007-2008	2008-2009
Undergraduate Graduation	265	208	175	204	Undergraduate Graduation	2509	2009	1903	1518
Annual % change		-22%	-16%	17%	Annual % change		-20%	-5%	-20%
% change since 2005		-22%	-34%	-23%	% change since 2005		-20%	-24%	-39%
Graduate Graduation	64	78	48	38	Graduate Graduation	1477	1597	1192	1017
Annual % change		22%	-38%	-21%	Annual % change		8%	-25%	-15%
% since 2005		22%	-25%	-41%	% since 2005		8%	-19%	-31%

4. Alliance Demonstration Projects

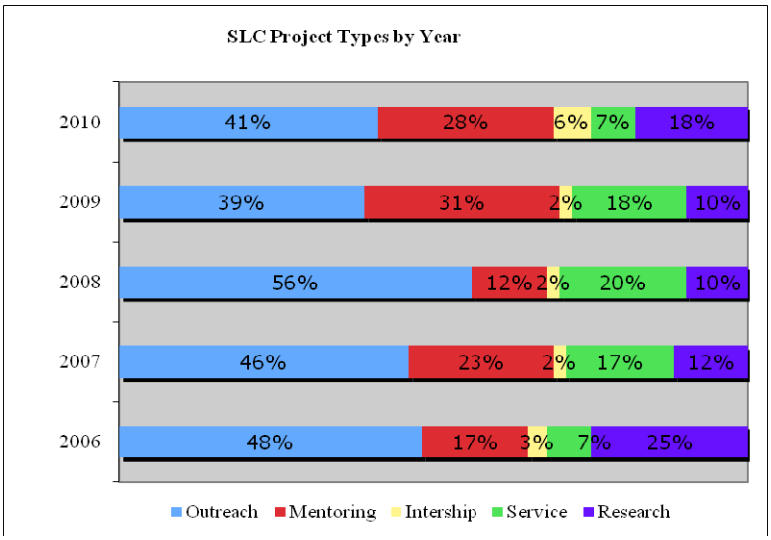
Demonstration projects are focused efforts to reach our STARS Alliance goals of recruiting, retention, bridging, and graduation of CS undergraduates to graduate programs or the computing workforce. These projects represent best practices for curricular and extra-curricular support that can help students be successful. To participate in the STARS Alliance, each STARS institution implements the STARS Leadership Corps every semester, and must implement Mentoring and Pair Programming at least once. C-STARS is a separately-funded project affiliated with STARS. We report here on general outcomes for these demonstration projects, with more information on the SLC's impact on individual students in section 4.

4.1 STARS Leadership Corps

The STARS Leadership Corps (SLC) is a multi-year experience providing students with multiple touch-points to find information and support throughout their academic journey. Within the SLC, students participate in an outreach, research, service, or internship projects supported by community-building through monthly seminars and tiered mentoring. All SLC students write about and present their experiences at the annual STARS Celebration conference. A focused effort is made to inform SLC students of opportunities for Research Experiences for Undergraduates (REUs), graduate education, internships, and outreach opportunities throughout the Alliance.
The SLC fosters an extended student community among people in academia, industry and the community through tiered participation in *civic engagement, mentoring, professional development, and research experiences*.

4.1.1 SLC Project Types

SLC projects can be categorized into the following types.
Outreach Ambassadors: SLC students design their own creative way to spread the word about computing to K-12 students, parents, and teachers in their areas. Ambassadors participate in established outreach programs or create new programs to raise excitement and dispel common misconceptions about computing (study, careers, social impact, skills) that abound among parents, counselors, teachers and students.



Service Learning: Students are enlisted to use their computing skills for community good, e.g., to setup networking and web sites for non-profits or for tutoring gate-keeper courses such as algebra.
Research Experiences for Undergraduates: Undergraduates are guided through a research experience by graduate student mentors, as per Georgia Tech's Intel Opportunities Scholars program, or by a faculty mentor, as per Auburn's Scholars of the Future and UNC Charlotte's McNair Scholars program. Students

write a research paper in a publishable format, present their work to peers and share their experiences with 7^{th}-12^{th} graders.
Internships: Students work in industrial settings to gain experience. Students write about and present their experience to peers and give a career presentation to K-12 students or educators.
Peer Coordinators, Ambassadors, & Mentors: Typically Peer Coordinators (PC) lead students in activities that the PC has previously carried out. Peer Ambassadors may develop a student chapter of a professional society for women or minority students or do tutoring for computing majors. Peer Mentors provide mentoring to younger peers, e.g., juniors and seniors mentor freshman/sophomores and graduates mentor juniors/seniors.

4.2 Mentoring Demonstration Project

The goal of Identity-based Mentoring using the *Thomas Principles (IMTP) across the STARS Alliance is to help colleges and universities increase recruitment, bridging, retention, academic success and graduation of underrepresented students and women in computing and technology. The implementation of the mentoring model includes three steps:

1. Training and technical assistance for mentoring program implementers. Training is provided annually in January followed by bi-monthly meetings for technical assistance.
2. Training for the mentors on IMTP and promoting strong mentoring relationships. Student mentor training is conducted during the STARS Alliance annual celebration in August. Mentor training concepts are reinforced through school-based SLC activities.
3. Evaluation that examines the transfer of Advisor implementation to mentor effectiveness that impacts the increase of underrepresented students and women into computing and technology.

4.2.1 Mentoring Survey Results

Mentoring began widespread implementation across the STARS Alliance in the 2008-2009 academic year. Therefore the 2008-2009 year is the first available year of program outcomes. An analysis of variance (ANOVA) was conducted to examine the pre- and post-SLC outcomes comparisons for the mentoring program participants in the 2008-2009 academic year (excluding non-mentoring participants). The mean outcomes for the survey constructs of career goals, computing interest, computing climate, self-efficacy, computing identity, attitude towards computing, and ethnic identity were compared showing one significant change from pre-assessment to post-assessment. A significant increase in computing identity was found between pre and post assessment for mentoring program participants (Pre- M=3.35, Post- M=4.75; $p < .01$). Note: The 2008-2009 survey did not distinguish between type of mentoring program participant, i.e. mentor or mentee. Future surveys make this distinction so we anticipate being able to determine differential effects of type of participation. An analysis was conducted on length of students' participation for pre- (i.e., 2008) and post-SLC (2009) without any significant results. These results suggest that time was not a factor in the pre- to post-SLC changes.

4.3 Pair Programming Demonstration Project

Laurie Williams at NC State leads the Alliance efforts to replicate pair programming. Pair programming is a method used to improve computer science course outcomes by training and supporting pairs of students to complete programming assignments together. The method provides students with peer support and social interaction, while increasing student learning. Because pair programming has been shown to promote increased retention in computing programs, the STARS goal has been to foster wide-spread adoption of pair programming. Pair programming workshops were conducted at each January workshop in Tampa (2007-2010) and at each STARS Celebration from 2007-2010. A STARS-supported Masters' student completed a thesis entitled "Students' Perception of Distributed Pair Programming in an Upper-Level Undergraduate Software Engineering Course." Williams and other Alliance faculty frequently conducted pair programming workshops and forums at conferences such as Grace Hopper and SIGCSE

to disseminate pair programming beyond the STARS Alliance. We have released two additional videos to add to our initial video "Fun with Pair Programming." The first video was geared toward students. The additional videos are geared toward faculty members. One video provides research results about pair programming for faculty, particularly those who may be reluctant to try pair programming. The other video provides information on pair programming classroom management techniques. All videos are available at: http://agile.csc.ncsu.edu/pairlearning/

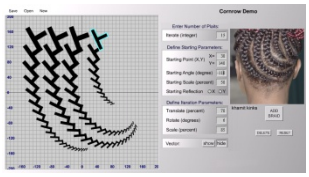
Pair programming successes include:
- Students got to know each other better
- Students were less frustrated
- Teaching staff has less grading
- Students seemed to enjoy lab more
- Students got better grades

Pair programming lessons learned are:
- Teaching assistants must manage the switch between driver and navigator
- Teaching assistants must watch for pairs where one student seems to be doing more of the work
- Pairs work best when students of similar skill level work together
- Teachers must manage the situation where students drop the class and a student is left working alone

Pair programming at STARS schools, 2006-2009(fall)

University	Faculty	Classes	Students
FAMU	3	7	112
Georgia Southern	1	3	86
Hampton University	1	2	41
NC State	1	2	104
U. New Orleans	3	3	71
St. Augustine	1	1	16
Total	10	18	430

4.4 C-STARS Demonstration Project



Culturally Situated Design Tools (C-STARS) help K-12 students learn math & computing in a cultural context as they simulate cultural practices such as Native American beadwork, African sculpture, Break dancing, Mayan temples, Graffiti, and Latino drumming. CSDTs have been used in K-12 schools with large numbers of African American, Latino and Native American students, and preliminary evaluations indicate statistically significant increases in both math achievement and attitudes toward technology-based careers. Through a partnership lead by Ron Eglash (RPI) and Tiffany Barnes (UNC Charlotte), C-STARS engages STARS Leadership Corps students (CSLC) in conducting K-12 outreach with existing CSDTs, and building new tools to teach computing in cultural contexts. These CSLC students create new CSDTs following a design protocol that ensures respectful use of cultural materials by a participatory process involving local members of educational and cultural communities. The project evaluation examines the impact of CSDTs on both SLC students and their outreach constituencies. C-STARS was implemented at UNC Charlotte from 2007-present, Auburn University Fall 2009-Spring 2010,

Georgia Southern Spring 2008- Spring 2010, Hampton University Fall 2009-present, and FAMU Fall 2009-present.

At the STARS Celebrations 2007-2010, we conducted a C-STARS training workshop for planning and conducting outreach to K-12 schools. In January 2008-2010, STARS faculty and SLC students attended a meeting in Tampa conducted by Tiffany Barnes. The focus of these meetings and training has shifted from training with existing CSDTs to training on how to build new CDSTs, and how to conduct undergraduate research for the development and evaluation of these tools. To better facilitate support of undergraduates as researchers, training focuses on data collection, pre- and post-tests and writing research papers. Summaries of C-STARS at three schools is given below.
UNC Charlotte C-STARS: Tiffany Barnes directs C-STARS work for the Alliance and for three groups at UNC Charlotte: GameCATS (4 CSLC), Autism research (3 CSLC), and Dance Tool. The autism research group designed a new cMotion tool to teach facial expression recognition to autistic children through the use of online games. The group also created a virtual reality game called Astrojumper to motivate children with autism to exercise, and this work with Astrojumper has been accepted for publication in the Presence journal. The Dance Tool group created a new tool to teach computing through Dance Choreography and conducted a pilot study in Summer 2009. The tool was improved and another study was performed in Summer 2010. The GameCATS group conducts outreach to middle school students through Citizen Schools in Charlotte, North Carolina, with games and CSDTs. GameCATS ran two summer camps in Summer 2009, and two in Summer 2010 on CSDTs and games. GameCATS have also created BeadLoom Game, a new CSDT-based game that motivates kids to engage in the computational aspects of creating bead patterns, and leverages leaderboards and custom puzzles to engage them. GameCATS have published papers on the BLG, and workshops and Birds of a Feather groups on how to do game-based outreach and research at conferences including the ACM Foundations of Digital Games conference, SIGCE and STARS Celebration.

Georgia Southern C-STARS: Dr. Kera Bell-Watkins, C-STARS faculty, along with seven CSLC students at Georgia Southern designed and held two workshop for 4-12th graders called “Learn to Culturally Whip Up a Computer.” They used recipes based on cuisines from African-American, Chinese-American, Latino, and Native-American cultures to help engage students in a hands-on approach to building a computer. Students from 4th grade through college participated in the workshop. Attendees were invited from Girl Scouts, Boy Scouts, Boys and Girls Club, the Charter School and Georgia Southern University. Dr. Bell-Watkins also developed a new curriculum for students in a Software Engineering class to compete on teams to develop new CSDTs. In Fall 2009, college students re-created the Virtual Bead Loom in Java. This competition was very effective in promoting learning in software engineering and Dr. Watkins has published a paper on this technique, and the resulting software has been used in the creation of the BeadLoom Game. In Spring 2009, two teams of 5-6 students developed new versions of the Graffiti Grapher and Skateboard tools, and were awarded one prize for the best software.

Jason Black at FAMU and Ira Walker at Hampton University and their CSLC students have worked to develop partnerships with middle schools in their local areas and have conduct outreach with these schools. FAMU C-STARS held summer camps in 2009 and 2010. Auburn has held CSDT summer camps in 2008 and 2009. Georgia Southern, FAMU, and Virginia Tech have conducted summer REUs for students creating CSDTs.

5. Evaluation Results for the STARS Leadership Corps (SLC) Academic Year 2009-2010

Description of the Pre-Post Comparisons for 2009-2010 Cohorts Participants included 140 undergraduate and graduate SLC students who completed pre- and post- SLC assessment surveys between Fall of 2009 and Spring of 2010. This sample included 44% females; 55% males, and 1% who did not specify

their gender. The sample included 46% African Americans; 6% Hispanics; 29% Whites; 10% Asian American; 1% American Indian; and 3% who did not specify. The response rate across the two survey administrations was 86%. Cronbach's alpha reliability coefficients were computed for each sub-scale and all yielded acceptable levels (above .70).

5.1 Pre-post comparisons of combined SLC Cohorts

There were significant pre-post differences for the 2009-2010 SLC cohort for **computing efficacy** and **computing commitment**. No significant differences were found for perceived social relevance of computing, computing identity, or self-reported GPA (see Table 9). We believe this is due to three factors: a very high ceiling effect for SLC members at pre-assessment (particularly for graduate students), leaving little room for improvement; the fact that the "pre-survey" is not a true pre-intervention measure for returning students; and the likelihood that graduate student outcomes occur more slowly and subtly from those of the undergraduate population. However, other items serve as leading indicators of future retention and continuation behaviors. See Table 10 for items that indicate increases in student contact with faculty, perceptions of faculty contact, and awareness of computing.

Table 9: Mean Differences in Pre- SLC and Post- SLC Scores

Sub-scale	Pre-SLC	Post-SLC	*p* value
Computing Efficacy	5.5	6.0	<.01
Social Relevance			*
Computing Identity			*
Computing Commitment	4.7	5.0	<.05
Grade Point Average GPA)			*

*no significance found in differences between pre and post assessment

Table 10: Key Item Mean Differences in Pre- SLC and Post- SLC

Item	Pre-SLC	Post-SLC	*p* value
Level of faculty contact outside of class	4.2	4.8	<.05
Forming meaningful relationships with Computing professors and staff	5.0	5.8	<.01
Faculty and students are sensitive to diversity issues	4.8	5.4	<.01
A degree in computing will allow me to get a job I like	5.3	5.8	< .05
Degree of interaction with faculty	5.1	5.5	<.05

Taken together, these results support the viability of the SLC model for impacting important leading indicators of undergraduates' success in computing. While our results do not allow us to identify those components of the SLC most responsible for these effects, they do suggest the value of the following SLC elements that are common across all campuses:

- The Alliance's use of long-term co-curricular Leadership Projects to provide hands-on, socially relevant, mastery experiences is a strategy for enhancing efficacy.
- The Alliance's use of a curricular seminar series to support the Leadership Projects and build capacity for mastery experiences is another strategy for enhancing efficacy.
- The Alliance's use of regular, extended face-to-face gatherings (via weekly seminars) builds a sense of community among diverse students.
- The individual SLC's use of self-managed Leadership Project teams, led by graduate or upper-class students provides opportunities for vicarious learning experiences and community-building.
- The Alliance's provision of multiple, diverse role models to enhance the impact of vicarious learning experiences is a strategy for enhancing efficacy.

5.2 Summary and Comments on Control Group Study

In summary, our evaluation of the SLC cohorts provides support for the SLC model of broadening participation in computing. It is a model well-grounded in theory and research, and it has flexible elements that can be adapted in whole or in part by other institutions seeking to enhance student success and to attract and retain underrepresented students in computing. However, the findings are limited to the leading indicators examined. While preliminary comparisons between Alliance institutional enrollment, retention, graduation and continuity into graduate programs data indicate some positive departures from national trends, additional research is needed to confirm the relationships between these lagging indicators and the leading indicators. The study is also limited by its reliance on self-report survey data and the lack of an alliance-wide control group. We have begun collecting data from non-SLC students at Alliance institutions to use as a control group and plan to include findings from this study in the STARS Extension Grant reports.

Currently, we do have data from a pilot study at one Alliance institution (UNC Charlotte). This data shows significant differences in SLC and non-SLC students, as summarized in Table 9. This study also supports the conclusions about the SLC that are summarized above.

Table 11: SLC and Control Students' Mean Ratings of Computing Community and Commitment**

	Item	SLC	Control
Community	I am satisfied with the degree of interaction I have with Computing faculty	5.00	4.49*
	I am satisfied with the degree of interaction I have with other Computing students	5.22	4.70*
	I feel a sense of belonging to the Computing community	4.75	3.91*
	I have a lot in common with other Computing students	4.91	4.42*
	I feel a part of the Computing program	4.66	4.10*
Commitment	I am confident that Computing is the right major for me	5.11	4.62*
	I believe a career in Computing is worth the time and effort it takes to prepare for it	5.51	5.18
	I plan to obtain a graduate degree in Computing	5.22	4.70*
	I plan to stay in the field of Computing long-term	5.50	4.91*
	At the present time, I am confident that I will keep Computing as my major	5.60	5.25*
	Overall Satisfaction with Computing Program	4.78	4.60

* denotes means significantly different at $p < .05$

** Items adapted from AWE Assessment Project

5.3 Important Evaluation Notes for this Study of Combined Data

The following scales were formed using items that were included on all three administrations of the SLC survey: self-efficacy for computing, sense of computing community, perceived social relevance of computing, intention to remain in computing, and self-reported GPA. Sense of computing community items were designed to assess student interactions with each other, the computing faculty and their feelings of inclusion. Perceived social relevance of computing includes items such as "Computing research should focus on using computing to improve the lives of others." Intention to remain in computing was used as a proxy measure for retention and graduation in computing and was termed "computing commitment." Because items had to be included on all pre- and post-survey administrations over the three cohort periods, the scales for this analysis consisted of fewer items than the analyses previously reported for each year separately. In cases where the item scales differed across cohort years, scales were transformed to 6-point scales for all items.

6. Detailed Results for Faculty Academic Liaisons

Academic Liaisons are computing faculty members who direct the SLC at STARS institutions. During the Fall 2010 semester, nine of 20 academic liaisons completed a brief questionnaire for Alliance faculty. Highlights of faculty comments are presented below. The annual Alliance faculty survey, conducted in August 2010, corroborates these qualitative findings.

- 89% felt their involvement with STARS helped them connect with other faculty members
- 88% believe that through STARS, they learned about promotion and research opportunities
- 100% found ways to partner with their communities for BPC efforts
- 100% believe their students demonstrated passion and commitment to their projects
- 100% felt their expectations had been met & their students developed leadership skills
- 100% understood their role and had a clear sense of responsibility within STARS
- 100% felt they had developed helpful professional collaborations through STARS

6.1 Academic Liaison Questionnaire Responses from Fall 2010

Question: What would you like to tell NSF (National Science Foundation), who has funded STARS for $5 Million, about STARS's impact on your students and your department?

- "Our students have established a community around STARS. Our students and department have benefited greatly."
- "The STARS Alliance has been extremely beneficial to the recruitment, [retention], support and progression of CIS students toward completion of both undergraduate and graduate degrees. At times, it has been the lifeline of the department, and the only source of visibility for what we do. I am unsure about what we would be doing without STARS!"
- "STARS has been extremely beneficial to my career. I have received tenure, and a lot of the work I do with STARS counted towards that. I have been very successful in leveraging STARS activities to receive additional funding, both from NSF and from outside the Agency. I have also met many colleagues and built relationships that have led to more collaborations and research opportunities for myself and my students."
- "This program has helped me to better understand the issues and challenges that our new computing students face. By better understanding the importance of a peer-to-peer mentoring program, I am better able to lead our departmental faculty in supporting these, and similar, activities focuseds on student retention."
- "I was a Ph.D. student when I began serving on the STARS Steering Committee, and through the experience I have gained invaluable mentors who have given me excellent advice on professional matters over the past few years. I have completed the Ph.D. and plan to continue in a faculty career."

Question: What would you like to tell NSF (National Science Foundation), who has funded STARS for $5 Million, about STARS's impact on BPC?

- "I think that STARS has greatly impacted the BPC effort in an extremely positive way. The recruitment and support efforts provided by STARS has directly led to the production of more CS/IT degrees nationally. I think without STARS the numbers would be a lot smaller."
- "Our institution has seen increased retention of computing students, and our outreach to middle school students to spark their interest in computer science has had promising results as well. I believe that through STARS, more students are coming to and remaining in computer science at our institution, particularly students from underrepresented groups."
- "STARS has increased the engagement of our participating students greatly. The program has helped them commit to Computing goals beyond a two-year degree."

7. Longitudinal Study

An Alumni Survey was conducted in Fall 2010, which was designed to obtain feedback from former SLC participants. The survey had 81 completed responses.

- 69% Feel that STARS participation was helpful in earning their degree
- 75% Feel that STARS participation was helpful in preparing them for their career
- 94% Believe that STARS participation helped them develop leadership skills
- 94% Enjoyed their time in the SLC
- 93% Would recommend SLC participation to other students

The overall themes from student participant responses to the questionnaire (conducted in Fall 2010) about STARS Alliance impact show appreciation for the opportunity to be involved in teaching the community about computing, and about giving back to the community, with notable comments such as:

- "I'm glad that our government is funding the sciences, especially Computer Science. My undergraduate CS program in New Orleans was cut after Hurricane Katrina, and I was shocked that so many seem to consider CS an unimportant discipline. STARS does an excellent job of raising awareness about the importance of our field."
- "Your money was well spent. This opportunity gave me the grounding to get jobs at small startups and continue my experience all the way to Google! In addition to the help around campus, the modest stipend helped attract me to the organization and truly gave me an opportunity that would open many doors."
- "As a STARS mentee, I have been impacted tremendously from this alliance. As a first generation college student, I had no idea what to expect from the Computer Science courses and just college life in general. My STARS mentor was a very helpful resource and provided guidance as I transitioned from high school to college. I am now a mentor because I enjoy providing the same assistance to incoming freshman Computer Science students."
- Sample comments from former SLC participants who have not yet graduated, include the following:
- "It will provide an opportunity to network with others that are similar to you, and will allow you to learn about both opportunities in the IT field as well was learn about yourself."
- "The STARS program was one of the best programs I've ever been involved in. To interact with young outreach students every month and see them enjoy using computing was such a great feeling and knowing that we could make a change in someone's life was priceless."
- "SLC helps you learn how to love helping others."

8. STARS Celebration: Forming BPC Community

The annual STARS Celebration, which is held each August, is our hallmark event. The conference is a significant part of the Alliance in that it culminates our key values by showcasing excellence, leadership, civic engagement and community through posters, presentations, keynote speakers and workshops. Participation in the Celebration continues to grow, ranging from 128 participants to 277 participants (Table 12). Participants include students in the STARS Leadership Corps, faculty leaders within the STARS Alliance, and Alliance partners. Partners include BPC Alliances and projects including A4RC, El Alliance, CRA-W, as well as regional K-12 and community colleges. Celebrations offer numerous opportunities for training sessions spanning such topics as Leadership, Technical Excellence, Web Development, and Community Outreach as well as workshops featuring Culturally Situated Design Tools, Pair Programming, Mentoring, and Assistive Technology (Table 13).The Celebration has been central to building a computing community among underrepresented students and faculty. New SLC students are introduced to mentoring, leadership skills, research experiences, graduate school preparation, professional development, and civic engagement. Returning SLC students assist with training new students by sharing their experiences and engaging in leadership roles. New faculty and partners are oriented to the Alliance model and provided opportunities for networking and professional collaborations, such as writing circles and demonstrations of technical excellence. Working in teams, the students choose their academic year assignment during the conference, while faculty Academic Liaisons determine their SLC objectives and plan for the upcoming year.

Table 12: Celebration attendance 2006-2010

	2006	2007	2008	2009	2010
Students	105	113	183	212	168
Faculty	23	43	52	41	53
Partners	0	50	26	24	24
Total	128	206	261	277	245

Table 13: STARS Celebrations overview 2006-2010

Year	Theme & Features	Location	Keynote(s)	Program Chair; Poster Chairs
2006	Diversity: The Mis-education of Generation X	Georgia Tech, Atlanta, GA	Mladen Vouk	Maureen Biggers
2007	"Shaping the Future" Partners & public forum Poster competition introduced	UNC Charlotte, Charlotte, NC	Jan Cuny, Joan Lorden, Dorothy Yancy	Teresa Dahlberg; Tiffany Barnes, Cheryl Seals, & Vickie Suggs
2008	"Innovation through Service: Tomorrow's Leaders Start Today" $1000 Mentoring Award: NCSU	Auburn Univ., Auburn, AL	Juan Gilbert	Cheryl Seals; Jason Black & Kristen Watkins
	Awards: K-12 Outreach: NCSU, Retention: GT & UNCC, Research: NCSU, Service: FSU			
2009	"Making a Different through Computing: YES WE CAN!" All sessions peer reviewed Snag'em networking introduced	FSU & FAMU, Tallahassee, FL	Brian Blake, Naomi Boyer, Tracy Camp	Jason Black & Ebe Randeree; Kristen Watkins & Chutima Boonthum
	Awards: K-12 Outreach: USC & UNCC, Retention: FSU, Service: GSU & Hampton			
2010	"Ready. Connect. Engage!" Snag'em continued New ad hoc sessions & reflections	Orlando, FL	Juan Gilbert, Kristen Grauman, Bryant York	Nathan Thomas; Chutima Boonthum & Anthony Chow

Each year, participants are surveyed about their experiences at the Celebration. Students, faculty, and partners consistently note that the Celebration is a positive experience for building community, igniting passion for BPC initiatives, and for professional development. Students report feeling connected to their peers and to faculty, learning about and developing interest in graduate school, and having fun. Faculty and Partners report enhanced professional networks, inspiration for BPC initiatives, and ideas for research & publications. For detailed summaries of the Celebrations, please see the previous annual reports and Celebration programs online at www.starsalliance.org.

9. Impact at STARS Initial Schools

9.1 Auburn

Auburn University has had a vibrant SLC program since the beginning of the STARS Alliance. Auburn SLC students are fully engaged in mentoring, research, and as peer ambassadors, but they have distinguished themselves in Outreach. Through their partnership with Auburn City Schools, SLC students have engaged hundreds of K-12 students in computing through computing summer camps and after-school computing clubs. Auburn has also distinguished itself through Alliance leadership and dissemination activities. Auburn STARS has assured its lasting impact by institutionalizing the STARS SLC program and by partnering with established organizations to sustain its K-12 outreach partnerships.

9.2 Florida A&M University

The FAMU STARS focuses on retaining CIS majors and conducting recruiting outreach beyond the university. CSTARS and Pair Programming are the demonstration projects they most frequently employ. FAMU STARS is especially skilled at being visible on campus, through continuous speaking engagements and local TV appearances. They leverage partnerships with two community colleges, and two female-focused computing organizations, Black Women in Computer Science and TRI-IT (Tri-Regional Information Technology project). Students learned early on to establish regular and timely student communications through student organizations, routine student reporting, and by implementing online social networking. They have created a lasting impact by providing a student leadership DVD, establishing formal partnerships with area community colleges and regional schools, as well as collaborating with historically black colleges and universities (HBCUs) in BPC efforts. They plan to institutionalize FAMU STARS by establishing an elective service learning IT course that focuses on BPC outreach.

9.3 Florida State

Florida State University has distinguished itself by its ability to attract both SLC student participants and industry and professional partners to support its many STARS projects. Although these projects include a range of activities, their greatest impact has been through high school and college outreach. FSU SLC students have developed and refined two types of college outreach—Game Day and Entrepreneur Night—that reach hundreds of FSU students. SLC students have also developed two K12 outreach programs—Computing Careers Night and Girls State—which have impacted hundreds of pre-college students. The lasting impact of the FSU STARS is helping to change the image of computing and building the computing pipeline through its outreach to college and pre-college students.

9.4 Georgia Tech

Georgia Tech STARS focuses on mentoring and research, leveraging local partnerships with Girl Scouts and high schools to showcase educational and career opportunities to generate excitement about computing. GT STARS evolved from a faculty-led program to a student driven program, whose primary

focus now includes collegiate recruiting and retention in addition to external K-12 recruitment and retention. They have established monthly meetings having learned that communication is important to maintain momentum. GT STARS also learned how to design activities for internal recruitment and retention through their collaborations with other STARS Alliance institutions. Their lasting impact is the GT STARS online community and continued partnerships for K-12 outreach.

9.5 Johnson C. Smith University

Since JCSU established its own SLC chapter in 2007, they have presented at national conferences, and partnered with a local middle and high school in efforts to increase computing interest among young students. Campus recruitment is important to JCSU, and they actively seek connection with local high school students and incoming freshmen.

9.6 Landmark College

While in the STARS Alliance, Landmark College did well sustaining SLC participation without the help of a computing program, department, or staff. Landmark's SLC consisted exclusively of students with learning disabilities and attention disorders. Their research concentrations explored the distraction properties of web design, teaching strategies useful for those with learning disabilities or attention disorders, and usability issues in the classroom. Unfortunately, largely due to the lack of a computing program and staff, Landmark College was unable to continue its participation in the STARS Alliance beyond Spring 2009.

9.7 Meredith College

Meredith College's SLC has maintained a dedication to outreach during its participation with the STARS Alliance. Their all-girl SLC has made them unique in the STARS Alliance, and has made them an important component to the Alliance's goal of promoting interest in computing to females.

9.8 NC State University

North Carolina State University has steadily supported one of the largest SLCs in the STARS Alliance, and their SLC students are leaders in pair programming and peer mentoring implementation. Along with pair programming and peer mentoring, NCSU also has students doing outreach, internships, and research. NCSU expects their SLC to continue to grow as a result of their extensive recruitment efforts throughout their campus.

9.9 Spelman

Spelman's SLC has helped create "Geek Week" at their college, which is a week in the fall semester dedicated to informing students about information technology and the computer science department. The SLC is small but uses the time at Geek Week to do recruiting and inform people about the STARS Alliance. Each year, all members of Spelman's SLC participate in undergraduate research.

9.10 UNC Charlotte

UNC Charlotte has the largest SLC in STARS. By organizing the SLC into teams, the UNC Charlotte SLC has maximized its efforts, allowing them to reach a spectrum of community groups in a variety of ways. The UNC-Charlotte C-STARS program has continued to grow and develop games teaching kids computer concepts, while their outreach program continues to be a leader in the STARS Alliance.

9.11 University of South Florida- Polytechnic

The University of South Florida-Polytechnic (formerly USF-Lakeland) SLC has a strong focus on mentoring, using the Thomas Principles of identity development, psychological support, social support, academic support, sense of belonging, and leadership development, to focus on community, faculty, and students. Through these principles, they are building partnerships with businesses and faculty to create opportunities for student internships and research. The USF-Polytechnic SLC also hosts an annual summer camp aimed at promoting youth interest in writing, technology, and math.

10. Publications and Dissemination

* Denotes a STARS Leadership Corps student

Published Journal Papers (fully refereed)

Barnes, T., T. Dahlberg, K. Buch, & K. Bean. (2009).The STARS Leadership Corps: An Innovative Computer Science Learning Community. *Learning Community Journal,* 1, 2, 5-18.

Bell-Watkins, K., Barnes, T., and Thomas, N. 2009. Developing computing identity as a model for prioritizing dynamic K-12 computing curricular standards. *J. Comput. Small Coll. 24*, 3 (Jan. 2009), 125-131

Kristy Elizabeth Boyer*, Robert Phillips, Michael D. Wallis, Mladen A. Vouk, and James C. Lester. Investigating the Role of Motivation in Computer Science Education through One-on-One Tutoring. In *Computer Science Education,* Vol. 19 No. 2, 2009, 111-136.

Davis, M., Watkins, K. Z., and Allen, D. SoTL Commons Conference: A Spirit of Inquiry, Invited Essay on SoTL, International Journal for the Scholarship of Teaching & Learning, vol. 3, no. 2, July 2009.

*Swanier, C., Seals, C.D., *Billionaire, E. (2009). Visual Programming: A Programming Tool for Increasing Mathematics Achievement. July - Sept'09, *Journal of Educational Technology*, Vol.6 No. 2. pp. 1-5.

Seals, C.D.,* Rouse, K., *McMillian, *Y. Williams, A., Gilbert, J. and Chapman, R. (2008). **Computer Gaming at Every Age: A Comparative Evaluation of Alice**. *Journal of Educational Technology*, Vol.5 No. 3.

Watkins, K. Z. and Watkins, M. Towards Minimizing Pair Incompatibility to Help Retain Under-represented Groups in Beginning Programming Courses, ACM Journal of Computing Sciences in Colleges, vol. 25, no. 2, pages 221 – 227, December 2009.

Watkins, K. Z. "Peer Evaluation as a Needed Web 2.0 Activity in Project Management for Teaching Practical Software Engineering," Proceedings of the 2009 ACM Special Interest Group for Information Technology Education Conference, pages 173 – 177, Fairfax, VA, October 22 – 24, 2009.

Watkins, K. Z. and Cook, R. "Learning to Culturally Whip Up a Computer," Proceedings for the Scholarship of Teaching & Learning, pages 14.1, March 11 – 13, 2009.

*Williams, A., *Rouse, K., Seals, C.D.(15%), & Gilbert, J.E. (2008). **Enhancing Reading Literacy in Elementary Children using Programming for Scientific Simulations**, *International Journal on E-Learning, 8:1*.

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Strategies for Attracting, Retaining, Supporting, and Developing Underrepresented Students in Computing. Association of Computer Machinery, *Transactions of Computing Education, Special Issue on Broadening Participation*.

Dahlberg, T., T. Barnes, K. Bean, & K. Buch. (in review). Engaging Under-represented Computer Science Students in Service: An Innovative Course and Case Study Findings. Submitted: *Computer Science Education*.

Seals,C.,*Agarwal,R., Agarwal,S., Evans, C., (submitted September). **Experiences of computing camps to aid at risk youth with CAMP ROC: Reaching Our Children**, Journal of Transformative Education.

Fully Refereed Papers in Conference Proceedings

Barnes, T., E. Powell, A. Chaffin, H. Lipford. Game2Learn: Improving the engagement and motivation of CS1 students. ACM GDCSE 2008. *

Barnes, T., Richter, H., Powell, E.*, Chaffin*, A., Godwin, A.* (2007). "Game2Learn: Building CS1 learning games for retention," *Proc. ACM Conference on Innovation and Technology in Computer Science Education (ITiSCE 2007*), Dundee, Scotland, June 25-27, 2007.

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Refereed Symposium and Workshop Proceedings

An Empirically Derived Question Taxonomy for Task-Oriented Tutorial Dialogue. Kristy Elizabeth Boyer*, William J. Lahti, Robert Phillips, Michael D. Wallis, Mladen A. Vouk, James C. Lester. Proceedings of the Second Workshop on Question Generation, Brighton, U.K., 2009.

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Barnes, T. (2009). BoF: Sustaining efforts to broaden participation in computing. ACM SIGCSE 2009, Chattanooga, TN, March 3-8, 2009.

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Bonto-Kane*, M., St. Amant*, R. "Examination of Variance in Production of Task Operators Questions GOMS Ability for a Quick Semi-Automated Usability Assessment of User Interfaces." Grace Hopper Conference for Women in Computing 2008.

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Samantha L. Finkelstein*, Andrea Nickel*, Lane Harrison*, Myra Reid*, Evan A. Suma*, and Tiffany Barnes. (2009). cMotion: A New Game Design to Teach Emotion Recognition and Programming Logic to Children Using Virtual Humans. Poster, IEEE Virtual Reality 2009.

Doran, Katelyn*. (2009). EleMental: The Recurrence. Poster accepted for the ACM Student Research Competition at Tapia Celebration of Diversity in Computing 2009.

Lucy Shores*, John Nietfeld*, Kristin Hoffman*, Scott McQuiggan*. (2009). An Examination of Individual Differences in a Narrative Centered Learning Environment. In Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications 2009 (pp. 3782-3788). Chesapeake, VA: AACE. (Best Poster Award)

Posters (not refereed) (all students)

Apilli, B. (2008). iTutor: Assisting Students in Learning Java Programming. NCSU STARS Fall Semester Poster Session.

Bonto-Kane, M., McCarthy, K., Udechukwu, R. (2008). STARS: Internships Fall 2008. NCSU STARS Fall Semester Poster Session.

Chung, D., Watkins, L., Wright, M., Paige, E., Rowe, J. (2008) Community Service at the Raleigh Rehabilitation Center. NCSU STARS Fall Semester Poster Session.

Nilsson, K, Rowe, J. (2008). Support Tools for Intelligent Learning Technologies Research. NCSU STARS Fall Semester Poster Session.

Robison, J., Lauck, D., Lam, S., Assi, C., Thompson, J., Pittman, G., Drayton, R. (2008). SPARCS Middle School Outreach. NCSU STARS Fall Semester Poster Session.

Watson, A. Wireless Mesh Networking in Raleigh. NCSU STARS Fall Semester Poster Session.

Udechukwu, R. (2008). NC State STARS Website. NCSU STARS Fall Semester Poster Session.

Cherie Frazier and Jessica Jones. Pair Programming at Hampton University. *STARS Celebration 2009*, Tallahassee, FL.

Blaize Blackmon, Jessica Jones, Gheric Speiginer, and Omotunwase Olubayo. Retaining Students in Computing Majors through Tutoring Program. *STARS Celebration 2009*, Tallahassee, FL.

Lianne Evans & Julian Ross. Attracting and Retaining Computing Students. *STARS Celebration 2009*, Tallahassee, FL.

Tara Durant and GiaVonni Powell. A Study of the Effectiveness of CSDTs for Activity Times of Varied Duration within a Tutoring Session. *STARS Celebration 2009*, Tallahassee, FL.

Courtney Henry and Quentin Robinson. A Student of the Effective of Personalized Tutoring Approaches in mathematics. *STARS Celebration 2009*, Tallahassee, FL.

Podcasts

Barnes, T. (October 2007). STARS Alliance. Computer Science Teachers Association, http://www.csta.acm.org/Resources/sub/Podcast_Files/Tapia/TiffanyBarnesSTARSAllianceUNCC.mp3

Eagle*, M., L. Harrison*, E. Powell*. (October 2007). STARS Alliance. Computer Science Teachers Association, http://www.csta.acm.org/Resources/sub/Podcast_Files/Tapia/MichaelEagleLanceHarrisonEvePowell.mp3

Television Programs

CIS Faculty – FAMU Research Press Conference discussing research and programs in the CIS department at FAMU; recorded Wednesday, Dec. 6, 2009 for local television channels (appeared on local news).
Jason T. Black, recorded October 20, 2008, FAMU Today television program, hosted by O. Sylvia Lamar and recorded for FAMU public television, local channel 20, Tallahassee, Florida

Invited Talks and Presentations at Professional Meetings and Universities

Barnes, T. (2007). The STARS Alliance and collaboration with K-12 teachers. Invited talk at Microsoft-sponsored luncheon for high school CS teachers at SIGCSE.
Barnes, T. (July 2007). Broadening Participation in Computing. Invited talk at NIU.

James Lester*, Scott McQuiggan*, John Nietfeld*, Jennifer Robison*, Hiller Spires*. Supporting Self-Regulation Through Affective Modeling in Intelligent Narrative-Centered Learning Environments. The 2009 Annual Meeting of the American Educational Research Association (AERA-2009) San Diego, CA, 2009.

News Articles
Geek is chic at CPCC: Annual festival highlights cutting-edge technology. *Charlotte News & Observer.* Nov 13, 2009. http://www.charlotteobserver.com/local/story/1052840.html
St. Aug Computer Science Students and Faculty Attend STARS Celebration, submitted to *Falcon News*, Aug 15, 2008

Presentations about STARS
Griffith*, Dionne, Black, Jason. Implementation of a Virtual Pair Programming Tracking System. Presented at Annual New Mexico Alliance for Minority Participation (NMAMP) Conference, Sept. 30 – Oct. 1, 2009, Las Cruces, NM.
Black, Jason. STARS Alliance and Careers in CS and IT. Presented to various high school and community college groups, Fall, 2009, Tallahassee, Florida

*Black, Jason (2008) and various SLC students. STARS Alliance and Careers in CS and IT. Presented to Rickards High School 9-12 grade students on Career Day, April, 2008.

Black, Jason (2008) and Jerone Gant*, SLC. STARS Alliance and Careers in CS and IT. Presented to Godby High School 9-12 grade students, March 2008.

Black, Jason (2008). STARS Alliance and Careers in CS and IT. Presented to Leon High School 9-12 grade students, March 2008

Black, Jason (2008). STARS Alliance and Careers in CS and IT. Presented to Carver High School, Atlanta, Georgia, September 26, 2008.

Black, Jason (2008). STARS Alliance and Careers in CS and IT. Presented to various high school students, Orlando, Florida, November 21, 2008.

Black, Jason (2008). STARS Alliance and Careers in CS and IT. Presented to Tallahassee Community College students, October 2, 2008, Tallahassee, Florida (at FAMU)

Materials (Presentations, posters, handouts) developed for outreach K-12, teachers, counselors
Bell-Watkins, K., “Learn to Culturally Whip Up a Computer,” Developed a curriculum to give to K-12 educators for implementing a CSDT in the classroom. Georgia Southern University.

Caitlin Buckhaults*, STARS participant; John Bowles, faculty mentor. Development of robotics simulation for FIRST robotics teams. Capricia Pettaway, REU participant from Benedict College (not STARS); Caroline Eastman, faculty mentor.

Chung*, D., Watkins*, L., Wright* M., Paige*, E. (2008). Email Reference Guide for Senior Citizens. St. Augustine.

Capricia Pettaway*, REU participant from Benedict College (not STARS); Caroline Eastman, faculty mentor. Preliminary development of a CSDT based upon sweetgrass basket weaving. University of South Carolina at Columbia.

Seals, C. D. Lesson Plans for Elementary, Middle School computer Clubs and Saturday Academies http://www.eng.auburn.edu/stars/

Williams, L. Pair Programming Video, A Resource for Educators (2008). http://agile.csc.ncsu.edu/pairlearning/educators.php#ppvideo.

Exhibitions

Seals, C.D., & Gilbert, J.E. (2009). Engineering Day Gaming Exhibitions by AU STARS students. Auburn EDay 2009.

Seals, C.D., & Gilbert, J.E. (2008). Engineering Day Gaming Exhibitions by AU STARS students. Auburn EDay 2008.

Seals, C.D., Chapman*, R., & Gilbert, J.E. (2007). Alice EDay Exhibition. Local Alice computer camp students exhibited their works at Auburn EDay 2007

Seals, C.D., Chapman*, R., Carlisle*, W.H., & Gilbert, J.E. (May, 2008). Alice EDay Exhibition. Local Alice computer camp winners exhibited their works at Auburn EDay 2008.

Seals, C. D. & Lindsey*, R. (March, 2008). ACMSE Digital Animation Festival. Top 8 students from our area computer camps presented their Digital animations in Alice 3D at ACMSE Poster Session.

Seals, C. D. & Lindsey*, R. (Feb, 2008). Alice Film Festival Competition. We brought the top 10 students from our area computer camps to UAB for the Alice film festival and won 4 of the top 7 places in our category.

Seals, C.D., Chapman*, R., & Gilbert, J.E. (2007). Alice EDay Exhibition. Local Alice computer camp students exhibited their works at Auburn EDay 2007.

Related Reports

Berenson, S., Bracken, S., Vouk, M., Michael, J., & Woodward, R. (2008). MOSS: Markers of STEM Success [MOSS]: An Eleven Year Longitudinal Study of High Achieving Young Women's Career Choices. Year Two Report to the National Science Foundation, Grant #0624584.

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