

# BPC-AE: Scaling the STARS Alliance: A National Community for Broadening Participation through Regional Partnerships



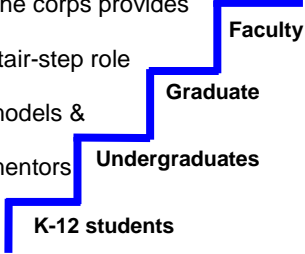
## Annual Report 2011



Teresa Dahlberg, Principal Investigator

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National Science Foundation Award Number: 1042468

<b>The STARS Alliance:</b> Advancing innovation through <b>regional partnerships</b> to broaden participation		
<p><b>STARS Leadership Corps</b>                      Tiered participation of students, professionals, &amp; educators in research and civic engagement catalyzes regional partnerships</p> 	<p><i>Research, Women's, &amp; Minority Universities</i></p> <p><b>Industry</b></p>  <p><b>K-12</b></p> <p><b>Community Colleges</b></p> <p><b>Community &amp; Professional Organizations</b></p>	<p><b>Tiered Participation</b></p> <p>The corps provides stair-step role models &amp; mentors</p> 
<p><b>STARS Celebration:</b> Builds community for STARS and national BPC efforts</p>		
<p><b>GOALS:</b> Recruiting, Bridging, and Retaining underrepresented people in computing</p>		

Report prepared by the Evaluation Team:

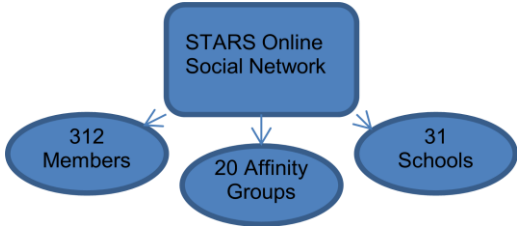
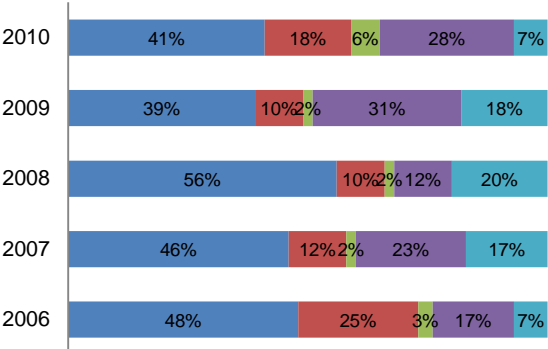
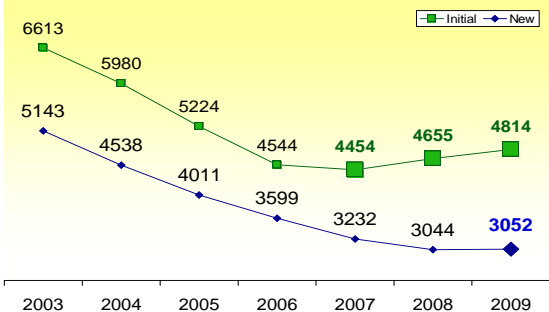
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# The STARS Alliance Scaling Project, Annual Report, December 2011

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**Table 1: Highlights of Activities**

STARS Scaling Project Focus January – December 2011																																																													
<p><b>STARS Leadership Corps (SLC)</b>  <b>333 SLC</b> students at <b>31 schools</b> in Fall 2011</p> <ul style="list-style-type: none"> <li>• <b>17 new schools</b>, 14 continuing</li> </ul> <p><b>STARS Celebration 2011:</b> &gt;240 participants; more partners &amp; sponsors</p> <p><b>STARS Computing Corps:</b> new 501C3 and Director of Development and Marketing</p>	<p><b>Creation of STARS Online:</b> social network and digital library collection</p>  <pre> graph TD     A[STARS Online Social Network] --&gt; B(312 Members)     A --&gt; C(20 Affinity Groups)     A --&gt; D(31 Schools)             </pre>																																																												
Cumulative STARS Outcomes August 2006-August 2011																																																													
<p><b>STARS Leadership Corps (SLC)</b>  <b>843 SLC</b> students at <b>23 schools</b></p> <ul style="list-style-type: none"> <li>• 46.72% Black, 7% Hispanic; 46% women*</li> <li>• 70% applied, 40% accepted to <b>REUs</b></li> <li>• Over <b>36,000 K-12</b> Outreach attendees***</li> </ul> <p style="text-align: center;"><b>SLC Project Types by Fall Terms</b></p> <div style="display: flex; justify-content: space-around; font-size: small;"> <div style="text-align: center;"> <span style="color: blue;">■</span> K-14 Outreach  <span style="color: green;">■</span> Internship  <span style="color: cyan;">■</span> Community Service                 </div> <div style="text-align: center;"> <span style="color: red;">■</span> Research  <span style="color: purple;">■</span> Mentoring                 </div> </div>  <table border="1" style="font-size: x-small; margin-top: 5px;"> <caption>SLC Project Types by Fall Terms</caption> <thead> <tr> <th>Year</th> <th>K-14 Outreach</th> <th>Research</th> <th>Internship</th> <th>Mentoring</th> <th>Community Service</th> </tr> </thead> <tbody> <tr> <td>2010</td> <td>41%</td> <td>18%</td> <td>6%</td> <td>28%</td> <td>7%</td> </tr> <tr> <td>2009</td> <td>39%</td> <td>10%</td> <td>2%</td> <td>31%</td> <td>18%</td> </tr> <tr> <td>2008</td> <td>56%</td> <td>10%</td> <td>2%</td> <td>12%</td> <td>20%</td> </tr> <tr> <td>2007</td> <td>46%</td> <td>12%</td> <td>2%</td> <td>23%</td> <td>17%</td> </tr> <tr> <td>2006</td> <td>48%</td> <td>25%</td> <td>3%</td> <td>17%</td> <td>7%</td> </tr> </tbody> </table> <p><b>Pair Programming*** @ 12 schools, <b>43 classes</b></b> with over 2,450 students</p> <p><b>Mentoring*** @ 14 schools, <b>178 SLC</b> mentors &amp; 475 mentees</b></p> <p><b>C-STARS*** @ 7 schools, <b>47 SLC</b></b></p> <p><b>67 STARS Faculty</b>, 6 tenured, 3 promoted to leadership positions</p> <p><b>Media***</b> 31 journal, 76 conference papers, 12 posters, 2 TV &amp; 5 news stories</p> <p><b>Institutionalization</b> of STARS practices at <b>18</b> colleges/universities</p> <p style="font-size: x-small;">*Master participation list**Survey data***Scorecards/narratives</p>	Year	K-14 Outreach	Research	Internship	Mentoring	Community Service	2010	41%	18%	6%	28%	7%	2009	39%	10%	2%	31%	18%	2008	56%	10%	2%	12%	20%	2007	46%	12%	2%	23%	17%	2006	48%	25%	3%	17%	7%	<p><b>STARS Celebrations: Capacity Building</b>          6 Celebrations including <b>1,357 attendees</b></p> <ul style="list-style-type: none"> <li>• 17 new schools in 2011</li> <li>• Training workshops in best practices</li> </ul> <p><b>STARS Leadership Corps Students**</b></p> <ul style="list-style-type: none"> <li>• 85.2% now considering <b>graduate school</b></li> <li>• 97.7% Improved my leadership skills</li> <li>• <b>Academic performance</b> improved</li> <li>• Found computing more <b>relevant</b></li> </ul> <p><b>STARS Alumni Speak Out**</b></p> <ul style="list-style-type: none"> <li>• 94% SLC developed <b>leadership</b> skills</li> <li>• 75% SLC prepared them for <b>career</b></li> <li>• <b>93%</b> Recommend joining SLC</li> </ul> <p><b>Faculty BELIEVE in STARS**</b></p> <ul style="list-style-type: none"> <li>• STARS <b>connects faculty</b> with one another</li> <li>• Prepares faculty for promotion &amp; research</li> <li>• Inspires computing <b>passion</b> &amp; commitment</li> </ul> <p><b>Total CS UG &amp; Graduate enrollments 2003-2009 for Initial vs New STARS Schools</b></p>  <table border="1" style="font-size: x-small; margin-top: 5px;"> <caption>Total CS UG &amp; Graduate enrollments 2003-2009 for Initial vs New STARS Schools</caption> <thead> <tr> <th>Year</th> <th>Initial</th> <th>New</th> </tr> </thead> <tbody> <tr> <td>2003</td> <td>6613</td> <td>5143</td> </tr> <tr> <td>2004</td> <td>5980</td> <td>4538</td> </tr> <tr> <td>2005</td> <td>5224</td> <td>4011</td> </tr> <tr> <td>2006</td> <td>4544</td> <td>3599</td> </tr> <tr> <td>2007</td> <td>4454</td> <td>3232</td> </tr> <tr> <td>2008</td> <td>4655</td> <td>3044</td> </tr> <tr> <td>2009</td> <td>4814</td> <td>3052</td> </tr> </tbody> </table>	Year	Initial	New	2003	6613	5143	2004	5980	4538	2005	5224	4011	2006	4544	3599	2007	4454	3232	2008	4655	3044	2009	4814	3052
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## 1 Introduction

The **STARS Alliance** is a community of practice for student-led regional *engagement*<sup>1</sup> as a means to broaden participation in computing (BPC). The Alliance has demonstrated the **STARS Leadership Corps (SLC)** as a model for catalyzing regional partnerships through the tiered participation of students, professionals and educators in civic engagement and experiential learning. The STARS Initiation Project (NSF Award #0540523, 2006-2009) supported the piloting of the SLC and other STARS practices at 10 Southeastern colleges and universities. The STARS Extension Project (NSF Award #0739216, 2008-2012) extended STARS participation to more than 20 Southeastern colleges and universities and added activities for broadening participation within the computing faculty ranks. The STARS Scaling Project (NSF Award #1042468, 2009-2016) is scaling the STARS Alliance to become a national resource for BPC. Evaluation outcomes show that participation in STARS activities, particularly the SLC, enhances commitment and academic success in computing for diverse student groups. The **STARS Scaling Project** focuses on the national adoption of SLC practices to bring about a computing workforce that is larger, more diverse and with broader skill sets.

Note that the STARS grants have been awarded on a calendar year cycle (beginning in January/February), but the STARS programs operate on an academic year cycle (beginning in August). As such, in each of the sections below, we report on two levels of activities and outcomes. At level one, we report the activities of the STARS Scaling Project during Year 1 of the grant, January 2011- December 2011. At level two, we report the cumulative outcomes of the STARS Alliance from August 2006 - August 2011 with emphasis on the most recent academic year, August 2010 – August 2011.

For quick reference, Table 1 (above) highlights STARS activities and outcomes, and section 2 summarizes outcomes on a national, organizational, and individual basis. An overview of the STARS Alliance is given in section 3. Section 4 provides a summary of the STARS Scaling Project activities during 2011. Detailed description of national, organization, and individual outcomes is given in sections 5, 6, and 7 respectively. Section 8 describes our feedback from external evaluators, and shows the STARS Scaling Project Logic Model.

## 2 Summary of Outcomes

### 2.1 Alliance National Impact

The STARS Alliance is a national resource for the recruitment, retention and graduation of diverse students in computing through student-led regional engagement. Since 2006, the Alliance has supported over 40 colleges and universities to integrate student-led regional engagement into computing departments through a co-curricular program called the STARS Leadership Corps (SLC). Many of these schools have institutionalized the SLC and have also implemented and institutionalized STARS demonstration projects, including mentoring and pair programming. The Alliance fosters continued national adoption of student-led regional engagement by providing: seed funding to computing departments that implement the SLC; a community of support through the STARS Online social network, website, and digital library; and the annual STARS Celebration leadership conference. Qualitative and quantitative measures of impact include, but are not limited to: Faculty surveys and interviews, Celebration attendee surveys, social media and digital library resources and usage, follow up surveys of social media and digital library users. Outcomes include the following.

#### STARS Scaling Project Year 1 – January 2011 to December 2011

- STARS Online Social Network was established and rolled out in August 2011 with
  - 312 individual members and 20 Affinity Groups (professional networks).
- STARS Online Digital Library was created - STARS Collection within the BPCPortal.org.
- Over 31 Colleges and Universities participated in the STARS Celebration in August 2011.
- The STARS Computing Corp 501c3, a **new nonprofit**, was created.

#### STARS Alliance – August 2006 to August 2011

- Dissemination: **31 journal articles, 76 conference papers, 12 posters, 2 TV & 5 news stories**
- STARS Celebrations: **1,357 student and faculty participants** from over 40 colleges and universities.

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<sup>1</sup> The National Survey of Student Engagement (NSSE) defines *engagement*: “Student engagement represents two critical features of collegiate quality. The first is the amount of time and effort students put into their studies and other educationally purposeful activities. The second is how the institution deploys its resources and organizes the curriculum and other learning opportunities to get students to participate in activities that decades of research studies show are linked to student learning.” <http://nsse.iub.edu/html/about.cfm>

## 2.2 Alliance Organizational Capacity Building Impact

Computing departments receive two-year seed funding to participate in the STARS Alliance, requiring them to implement the SLC every semester and implement the STARS mentoring and pair programming demonstration projects at least one semester, with the intent to institutionalize these practices. Departments can continue to receive funding to institutionalize the SLC and to support STARS scaling by contributing to nationally available resources and supporting new STARS schools. Participation enhances the capacity of computing departments to: 1) interweave engagement throughout the undergraduate and graduate student experience; 2) promote student-led regional engagement (e.g., with K-12, industry, and the community); 3) recruit and advance diverse student groups in computing by engaging in a community of practice (e.g. SLC, demonstration projects, STARS Celebration, online social network, Affinity Groups, digital library). Measures of impact include, but are not limited to: the number of student organizations or clubs established, the number of STARS courses established, and the degree to which STARS engagement activities, such as outreach and pair programming, are integrated into existing computing courses. Faculty surveys, individual interviews and focus groups, Celebration attendee surveys, social media and digital library usage, institutional enrollments and graduation rates trends compared to national trends (Taulbee Report), institutional engagement trends compared to national trends (e.g., planned comparison to National Survey of Student Engagement). Outcomes highlights include the following.

### STARS Scaling Project Year 1 – January 2011 to December 2011

- *Teaching Tekkotsu Robotics: Vision, Navigation, and Control* collaborative workshop between ARTSI Alliance and STARS Alliance, held in Charlotte, NC in October 2011 with 31 attendees from four universities and one community college.
- STARS Online Social Network has **20 Affinity Groups, 31 School Groups, and 312 Individual members**.
- 31 colleges and universities are actively participating in the STARS Alliance; **17 are NEW** and 14 continuing; a new institutional application and stipend process was developed for increased accountability.
- An **online evaluation toolkit** provides support for student-led participatory evaluation research.
- Evaluation Assistant **Research Pods** have been formed to conduct **K-14 outreach impact studies**.

### STARS Alliance – August 2006 to August 2011

- More than **40 schools implemented the SLC**, most also implemented mentoring or pair programming.
- **18 schools institutionalized the SLC**, by integrating into course or program requirements, responsibilities of permanent staff, or the mission of student organizations.
- Faculty Surveys consistently show that STARS faculty are **expanding their professional networks and forming meaningful collaborations** with others for BPC efforts.
- STARS participation has **positively impacted undergraduate and graduate student enrollments** as illustrated in Table 1 above.

## 2.3 Alliance Individual Impact

The primary Alliance activity is the STARS Leadership Corps (SLC), a co-curricular service-learning program that fosters student-led regional engagement. College students join an SLC for an average of two semesters and perform projects (e.g. K-14 outreach, mentoring, tutoring, pair-learning, research, internships, community service) for an average of 5 hours a week. Professional development and community building opportunities are provided to students and faculty through partnerships and the STARS Celebration. Measures of success include: number of participants, outreach attendees, community partners, behavioral change (e.g., REU, retention, GPA, etc.), skill development (e.g. leadership), and attitudinal changes (e.g. computing efficacy, commitment, etc.). Outcomes highlights include the following.

### Scaling Project Year 1 – January 2011 to December 2011

- **333 SLC students** participated in Fall 2011 across 31 colleges and universities and will continue during Spring 2012.
- 29 SLC students function as Evaluation Assistants, learning and conducting evaluation research practices, while collecting data for their school.
- STARS Haiti exploratory project supported with supplement from NSF OISE – STARS is partnering with local and national nonprofits to create international service learning projects for SLC students
- 4 students at 4 institutions were supported by **STARS Research Experiences for Undergraduates (REU)** and 11% of SLC students participated in other REUs.

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### STARS Alliance - August 2006 to August 2011

STARS evaluation results across multiple controlled studies between 2006 and 2010 demonstrate that participation in the SLC has a **significant positive impact** on:

- Computing efficacy (belief that effort will lead to success in a computing curriculum)
- Perceived social relevance of computing (belief that computing has social as well as technical relevance and can be used to benefit individuals and society)
- Computing commitment (intention to remain in the field of computing through college and into the workplace)
- Computing identity (a feeling of inclusion in a larger computing community)
- Self-reported grade point average
- **Longitudinal Achievement:** 7 former SLC members are recipients of the prestigious **National Science Foundation Fellowship awards.**



Team Building during STARS Celebration 2010, Orlando, Florida

## 2.4 Alliance Institution Scorecards

The STARS Alliance Evaluation Team constructs an annual performance scorecard for all Alliance institutions. The scorecard presents a summary of each school's participation levels. The scorecard below represents the academic year 2010-2011, which is the most currently available at the time of this report. We present it to show how Alliance participation compares across institutions, and as a demonstration of what is being continued through the Scaling Project. Green shading indicates exceptional performance in an area, while yellow shading indicates lower performance. Context is taken into account, e.g., while Meredith and Spelman have lower performance across areas, this is expected due to institutional size; Winthrop and CPCC informally began their SLC programs in 2009-2010 as UNC Charlotte partners, so their lower numbers are also expected.

Table 2. STARS Alliance Scorecard 2010-2011 Academic Year

	Auburn	FAMU	FSU	Meredith	NCSU	Spelman	UNCC	USFP	CPCC	Winthrop
SLC students	14	32	17	3	24	2	26	18	2	5
SLC Undergrad	6	27	15	3	13	2	26	18	2	5
SLC Graduates	8	5	2	0	11	0	0	0	0	0
SLC Female	6	25	11	3	9	2	8	6	0	3
SLC Male	8	7	6	0	15	0	18	12	2	2
SLC Returning	9	23	10	2	19	2	18	10	1	3
SLC New	5	9	7	1	5	0	8	8	1	2
Outreach Events	20	16	23	1	7	0	7	5	0	7
Outreach Attendees	1,174	824	4,053	20	195	0	858	26	0	236
Partners	7	9	61	0	13	0	5	8	4	7
Grants	1	4	0	0	1	0	1	0	0	0
Publications	7	0	0	0	14	0	2	0	2	1
SLC Survey Rate	82%	78%	85%	83%	90%	0%	94%	58%	100%	90%
# SLC w/o stipends	4	0	0	0	0	3	25	0	1	5

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Table 2. Continued STARS Alliance Scorecard 2010-2011 Academic Year

	Hampton	JCSU	NCA&T	UNO	USC	UTK	Vtech	St. Aug	Wilberforce
SLC students	13	9	9	4	3	9	3	7	8
SLC Undergrad	13	9	9	3	3	4	3	7	0
SLC Graduates	0	0	0	1	0	5	0	0	0
SLC Female	7	5	4	0	3	1	0	1	4
SLC Male	6	4	5	4	0	8	3	6	4
SLC Returning	11	8	8	4	0	6	1	0	0
SLC New	2	1	1	0	3	3	2	7	0
Outreach Events	6	4	3	3	0	3	2	0	3
Outreach Attendees	222	96	80	24	0	300	87	0	165
Partners	2	6	3	2	0	0	7	0	10
Grants	0	0	0	0	0	0	1	0	0
Publications	1	4	0	0	0	0	1	0	10
SLC Survey Rate	88%	67%	100%	88%	50%	83%	100%	57%	0%
# SLC w/o stipends	1	0	0	0	0	0	3	0	0

### 3 Overview of the STARS Alliance

The Students & Technology in Academia, Research, and Service (STARS) Alliance is a nationally connected system of regional partnerships among higher education, K-12 schools, and leaders in the nonprofit, business, and community sectors. The Alliance comprises a **vibrant community of practice** for broadening the participation of women, under-represented minorities, and persons with disabilities in computing through student-led regional engagement. The STARS Scaling Project aims to support at least 50 STARS colleges and universities (20 existing and 30 new) to adopt and institutionalize the STARS Leadership Corps (SLC), resulting in higher computing student diversity, enrollments, and graduation rates. These schools will sustain the SLC through curricula. A vibrant STARS community of practice flourishes through online social networking and an SLC practices digital library collection. The STARS Scaling Project builds upon the prior STARS grants to involve more people and produce greater, sustained outcomes, with less funding, ultimately resulting in the STARS Institute nonprofit to sustain the annual STARS Celebration and to continue to engage new universities in the STARS Community.

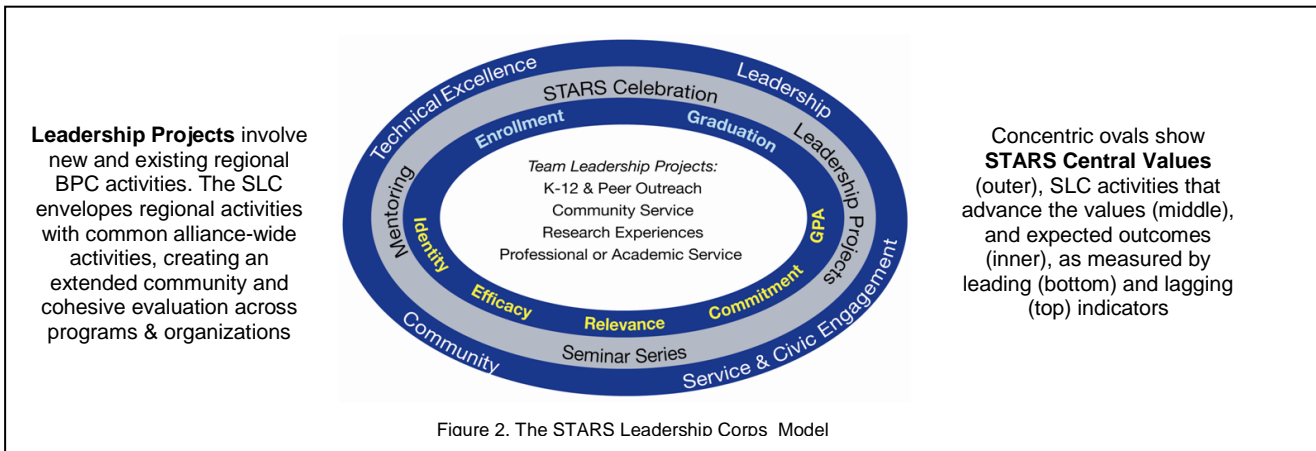
- Alliance activities advance the **STARS Central Values** of
- ❖ **Excellence** – Technical skill, confidence and interest in computing; Workforce preparation; Innovation & advancement.
  - ❖ **Leadership** – Soft skills, including management, teamwork, writing, communication, and work / life balance.
  - ❖ **Community** – A sense of belonging and a common computing identity not tied to gender, race, ethnicity or physical abilities.
  - ❖ **Service & Civic Engagement** – Sense of responsibility to use computing to serve society; Social relevance of computing.

Figure 1. STARS Central Values

Each regional community is led by a STARS member college or university with local partners including K-12 schools, industry, and professional and community organizations such as the Girl Scouts, Citizen Schools, the Black Data Processors Association, and ACM-W. STARS Alliance activities are designed to advance the **STARS Central Values** of developing *Technical Excellence*, *Leadership*, a sense of responsibility to use computing in service to society through *Civic Engagement*, and a sense of belonging to a *Computing Community*. These values are effective for recruiting, bridging and retaining under-represented groups in computing. Collaboration within STARS regional communities is catalyzed by the **SLC**, an innovative program that envelopes new and existing regional programs for BPC (e.g., K-12 outreach, community service, research experiences) with common alliance-wide activities. The SLC is implemented at all STARS schools as a repeatable one-year program that begins and ends with an alliance-wide annual leadership conference called the **STARS Celebration**. The Celebration inducts students (and now faculty) into the Corps with activities built around the STARS Central Values.

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During the Celebration, the SLC is called to action to *recruit, develop and become the next generation of computing professionals*. The SLC responds by undertaking leadership projects, such as: Outreach to pre-college students to inform and excite kids about computing; College outreach to support and advance college students; Community service to use computing skills to serve society; and Research Experiences and Internships to advance innovation and to serve by improving one's own expertise in computing. All projects include written reflection, presentation to peers, and outreach components. Student SLC teams carry out leadership projects during the academic year at their home schools, spending an average of 5 hours per week, including participation in a seminar series centered around the STARS Central Values and tiered peer mentoring (*have a mentor, be a mentor*). SLC students and faculty showcase successes at the next Celebration. Our theme of **Advance Yourself, Advance Others** encourages student participation over multiple years, accepting support when needed and giving back when able.



The SLC pools resources and enables **cohesive evaluation** across disparate BPC programs spanning multiple years and diverse institutions and populations. The SLC employs **Tiered Participation** among youth, academics, and professionals, creating stair-step role models and mentors. For example, industry professionals work with SLC students to offer computing programs for high school students; and faculty guide graduate students to mentor under-graduate research. Leadership activities catalyze regional partnerships and sustain them through a common purpose.

The STARS Alliance **fosters adoption and scaling of BPC Demonstration Projects (DP)** by hosting DP workshops at the STARS Celebration. The Alliance further supports the STARS Mentoring and Pair Programming DPs by offering participant stipends to DP adopters. The **STARS Tiered Peer mentoring DP** was developed by Dr. Nate Thomas at USFP to support underrepresented students in computing. Using principles from his Ethnic-based Mentoring Model, upper-class students mentor first year students. A holistic approach is used to support mentor and mentee college adjustment, GPA, retention, graduation and career preparation. Dr. Laurie Williams at NCSU leads the **STARS Pair Programming (PP)** DP to train and assist faculty to use Pair Programming to deepen student learning.

Figure 3. STARS Scaling Project Goals and Outcomes

- ❖ Recruiting of under-represented populations to increase computing enrollments and awareness
- ❖ Bridging for under-represented populations to increase readiness to enter computing graduate programs and careers
- ❖ Retention of individuals from under-represented populations to increase GPA, computing efficacy and graduation rates
- ❖ Advancement of computing faculty role models to increase faculty research and grants scholarship, tenure, and promotion.
- ❖ Sustainability of the STARS Community to institutionalize SLC practices at STARS member colleges and universities
- ❖ Dissemination of STARS activities, outcomes, and assessment to promote broadening participation through regional communities and SLC practices
- ❖ Scaling of the STARS Community for national adoption and institutionalization of the STARS Leadership Corps, participation in the Celebration, and regional Celebrations



## 4 Summary of Scaling Project Activities

The STARS Alliance is supporting the participation of 31 colleges and universities in the SLC and other STARS activities during the 2011-2012 academic year. This includes 17 schools new to STARS and 14 returning schools. Over 40 schools have adopted the SLC since 2006, but only the 31 supporting schools report assessment data. In 2011, we created a new application process for institutions to apply for STARS funding, instituted a new stipend payment process, hired a Development and Marketing director, and revised and streamlined our evaluation plan. In addition, we deployed an **online social network** and an **SLC Collection within the BPC Digital Library** so that STARS initiatives can be freely shared with our larger national community. The sections below highlight the Scaling Activities during Year 1.

### 4.1 STARS Online Social Network and Digital Library

An initial version of the STARS Online Social Network and Digital Library was implemented and is being piloted. Our aim is to have STARS Online be the hub for online activities, promoting greater communication and engagement. This will require adding more extensive STARS-specific functionality to link activities across STARS and encourage interaction and sharing. Additional features are planned to add reporting features to the online community.

- The STARS Online Social Network has 312 members, 20 Affinity Groups and 31 schools.
- The Digital Library is being populated with outreach instructional materials, and other resources.

### 4.2 STARS Celebration 2011

The STARS Celebration continued in 2011 with an increase in workshops and keynote speakers. A collaborative workshop led by David Touretsky, of Carnegie Mellon University and the ARTSI Alliance, delivered the *Teaching Tekkotsu Robotics: Vision, Navigation, and Control* workshop. Nineteen attendees participated in this hands-on activities based workshop that introduced them to Tekkotsu, a free, open-source software framework from Carnegie Mellon that makes advanced robotics accessible to undergraduates and high school students.

- The STARS Celebration 2011 hosted 240 students, faculty and partners.
- A second *Teaching Tekkotsu Robotics* workshop was held in Charlotte, NC in October 2011 with 31 participants.
- Faculty and student interviews and focus groups were conducted leading to summative and formative findings (discussed in sections 7 and 8 below).

### 4.3 STARS International Service Learning in Haiti

With supplemental funding from NSF OISE, we have sent a team of seven STARS people (three faculty, two high school teachers, one graduate student and one undergraduate student) people to Haiti. The team is working with *Mothering Across Continents*, a nonprofit that undertakes leadership training for women and girls in third world countries; *Hands for Haiti*, a nonprofit that has built a school for girls in Northern Haiti; and with the *WavePlace Foundation*, a national nonprofit that provides laptops and training to people in third world countries. The objective of the STARS team is to work with these two organizations to formulate a plan for SLC students to undertake international service-learning projects such as providing computer literacy training to high school girls in rural Haiti.

- The STARS Haiti International Project was initiated, sending 7 STARS individuals to conduct training.

### 4.4 New Cohort of Institutions and Application Process

Thirty-two schools applied to join STARS Scaling for the 2011-2012 academic year. Each school submitted an initial application that was reviewed for fit within the Alliance, commitment to the STARS goals, and potential contributions to the project. Of the 32 applications, 31 were accepted. Only one was rejected due to a few factors: the institution's lack of focus on computer science and its low number of students, particularly female students. The 31 schools that were accepted then completed a more detailed Participation Agreement. The 17 new schools agreements outlined their plans for recruiting students; developing community partnerships; gaining departmental support; and working towards institutionalization of the SLC -- during two years of seed funding from STARS. The 14 continuing schools agreements outlined their plans for institutionalization (if not already accomplished); for integrating SLC practices across multiple years of the undergraduate curriculum; and for contributing to the STARS national community by mentoring new schools, leading online activities and contributing to digital library resources.

- A new application process for Alliance funding resulted in 32 institutional applications with 31 accepted.

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### 4.5 New Stipend Process

The faculty and student stipends are managed centrally within UNC Charlotte, to streamline the administrative process of tracking the activities of over 300 students within over 30 schools. Over 300 SLC stipends are paid each fall and each spring, and over 300 Celebration travel scholarships are awarded each summer. This new process has linked administrative and evaluation functions together. The result is greater accountability among Alliance institutions for reporting their respective STARS activities and outcomes.

- A new stipend payment process centrally locates payment administration, allowing for greater accountability.

### 4.6 New 501C3 Organization

With *pro bono* legal help, this month we submitted our application to the IRS to establish the *STARS Computing Corps* 501c3, a nonprofit organization to sustain the STARS Community beyond the timeframe of the NSF Scaling grant. We hired Ashley Peeler as the STARS Computing Corps Director of Development and Marketing. We organized an initial board of directors to guide the nonprofit activities. The initial focus is to leverage the national STARS Celebration to attract industry sponsors; to develop a community of STARS alumni; to grow STARS Online participation and resources; and to create a long-term development strategy.

- A Director of Development and Marketing was hired in 2011 to support STARS Celebrations and develop corporate sponsorships for the nonprofit organization.

### 4.7 Streamlined Evaluation

In response to ongoing challenges faced in conducting a multisite evaluation, the Evaluation Team developed and began implementation of an in depth training program for Evaluation Assistants, which serves as a project management solution to multisite evaluation problems (e.g. collecting accurate data across multiple institutions, understanding unique contexts within each institution) and as a mechanism for conducting local K-14 outreach intervention studies. These EAs operate as apprentices within the SLC who participate in bi-monthly seminars about evaluation methodology and techniques, and carry out basic data collection and reporting functions at their respective institutions. Academic credit is available to EAs. They work in Research Pods that are grouped together by like projects, e.g. middle school robotics or elementary school Alice outreach, to conduct studies on the impact of SLC outreach on K-14 participants. Research Pods projects culminate in poster presentations at the STARS Celebration, along with other journal and conference dissemination. An online evaluation toolkit containing sample documents, content slides, and helpful resources has been created to support their efforts (<https://sites.google.com/site/starsevaluationassistantsite/>). From an evaluation perspective, this model allows us to conduct a participatory evaluation. From a project perspective, we are enhancing SLC student research knowledge and skills via evaluation research training.

- Evaluation has been streamlined through local Evaluation Assistant SLC positions, which includes an online evaluation toolkit and seminar schedule.
- Evaluation Assistants work in Research Pods to conduct K-14 outreach intervention studies.

## 5 National Impact of the STARS Alliance

### 5.1 Celebration 2011- Inaugural Scaling Project Event

The annual STARS Celebration, held each August, is a national community-building event. The Celebration serves to both kick-off and conclude our academic activity cycles by showcasing successes from the prior year and by preparing for the upcoming new year. The 2011 Celebration served as the inaugural event for the Scaling Project, where the 17 new institutional members were oriented and prepared to embark upon their first academic year of engaging in STARS activities. The conference is a significant part of the Alliance in that it communicates our key values by showcasing excellence, leadership, civic engagement and community through posters, presentations, keynote speakers and workshops. Participants include students in the STARS Leadership Corps, faculty leaders within the STARS Alliance, and Alliance partners, including BPC Alliances (A4RC, EI Alliance, ARTSI, CRA-W), as well as regional K-12 and community colleges. The Celebration has been central to building a computing community among students from underrepresented groups 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

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provided opportunities for networking and professional collaborations. 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. In 2011, there were 240 participants. This slight decline in participants (from 245 in 2010) was due to the new institutional members having not fully recruited SLC students for the start of the Fall 2011 term. Based on prior years of experience, we now encourage new STARS schools to attend the celebration with just a few outstanding student leaders and then recruit their full SLC at the beginning of the Fall semester. This enables a new school to fully understand the SLC before recruiting students. In 2011, we invited more speakers, added social events and continued the very successful networking game, Snag'em. All attendees are invited to take a survey following the Celebrations; interviews are also routinely conducted at Celebrations. In 2011, faculty focus groups were also conducted. Interview and focus group themes from 2011 are discussed in section 7.

The STARS Celebration 2011 included a number of workshops with collaborative partners. Barbara Ericson, of Georgia Institute of Technology facilitated two workshops: *Attracting Students to Computing with App Inventor* and *Attracting Students to Computing with CS Unplugged and Scratch*. The App Inventor workshop had 28 participants and taught students to use drag-and-drop style programming to create mobile applications. The CS Unplugged and Scratch workshop had 16 participants who were introduced to activities that change students' attitudes towards computing. David Touretsky, of Carnegie Mellon University and the ARTSI Alliance, delivered the *Teaching Tekkotsu Robotics: Vision, Navigation, and Control* workshop. In this workshop, 19 attendees participated in hands-on activities that introduced them to Tekkotsu, a free, open-source software framework from Carnegie Mellon that makes advanced robotics technologies accessible to undergraduates and high school students.

Figure 4. STARS Celebration 2011 Highlights

	Theme & Features	Location	Keynote(s)	Program Chair; Poster Chairs
2011	<b>Inspire, Create, Innovate!</b> Snag'em Welcoming new members	Raleigh, NC	Annie Anton, Donald Thompson, David Touretzky, Suzanne Gordon	Kristy Boyer; Chutima Boonthum & Kristen Watkins
<b>Awards</b>	Omar Estrella, NCSU, Ashley Rutstein, FSU, Mark Draelos, NCSU; For K12 Outreach; Mark Draelos, NCSU, Courtney Kallmeres, FSU, Anne Watson, NCSU for Retention; Trisha Biswas, NCSU, Sommer Moore & Ehijele Olumese, Hampton, David Dearmore, NCSU, for Service Learning; Leslie Watkins, Meredith, Maynard Yates, FAMU, Clarence Edmonds & Darryl Clark, Norfolk State for Research			

Out of the 240 Celebration participants in 2011, 148 were students and 64 were faculty. Survey response rates for students were 60% (n=89) and 72% (n=46) for faculty. Items were rated on a 5 point Likert scale; percentages below indicate strongly agree and agree responses combined.

Table 3. STARS Celebration 2011 Survey Feedback

<b>Students felt connected</b>	<b>Faculty were inspired</b>
89% felt that the Celebration builds community	88% expectations were met
91% agreed they connected with peers	92% satisfied overall
71% agreed they connected with faculty	87% satisfied with speakers
71% learned about graduate school opportunities	83% developed helpful professional collaborations
63% said it was very beneficial	91% inspired to become more involved in BPC
<b>Favorite:</b> Snag'em & networking with peers	<b>Favorite:</b> Networking with peers

## 5.2 Cumulative STARS Celebrations

Detailed reports of each of the six Celebrations are provided in previous annual reports, available at [www.starsalliance.org](http://www.starsalliance.org). The table below demonstrates the number of individuals participating at each event. The slight decrease in participation numbers in 2011 are due to several factors. In 2011, the 17 new members had not yet fully recruited their SLC students, as explained above. Furthermore, beginning in 2010, we implemented an accountability structure that provided funding for Celebration attendance only for those participants who fully submitted all data required for evaluation, which resulted in fewer travel awards. In 2008 and 2009, partner Alliances, EL and A4RC, were able to participate in the Celebration, but unfortunately did not have the funds to participate in subsequent years.

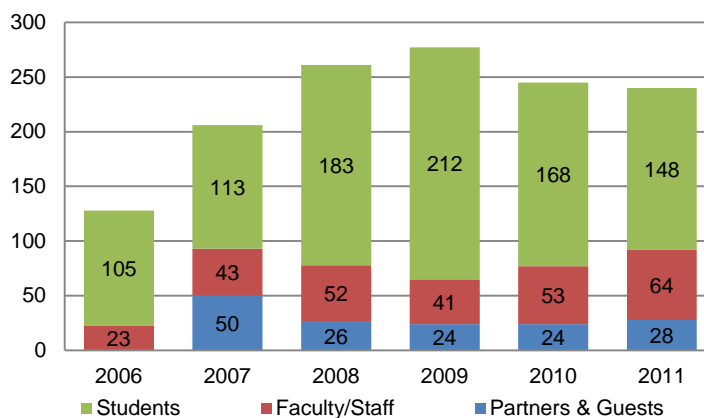


Figure 5. STARS Celebration Attendees

## 5.3 ARTSI Robotics Workshop in Charlotte

The 4-hour Tekkotsu workshop at the Celebration was followed by two 8-hour Robotics Workshops held at UNC Charlotte on September 30 and October 1, 2011. These workshops were attended by a total of 13 faculty and 18 students from four STARS universities and one community college. In these in-depth workshops, participants were exposed to state-of-the-art robotics technology and ways to introduce robotics electives at their universities or use robotics in K-12 outreach. An affinity group called "ARTSI-STARS: Robotics Education and Outreach" was created in the STARS Online Community to enable continued conversation and learning about using robotics in the classroom.

## 5.4 STARS Online Social Network Community

The STARS Online Community is a platform for informal sharing and dissemination of activities and artifacts within STARS, while the digital library is for broader, more formal, dissemination. Work began in Spring 2011 on creating the STARS Online Community by first researching and choosing a customizable social networking platform, JomSocial, which is built upon the open source content management system Joomla. This platform provides a variety of social features, such as creating profiles, creating events, and discussion forums. We customized the functionality to add file sharing, an event calendar, and added a number of Affinity Groups and School Groups. Our first version of the site was opened to STARS members in August 2011, in time for the STARS Celebration, at <http://community.starsalliance.org/>. An updated version with minor changes and bug fixes was released November 2011.

STARS Online as of November 2011:

- 20 Affinity Groups
- 31 School Groups
- 312 Individual Members

Each School Group is used by one STARS school to organize their SLC activities. Each Affinity Group is open to anyone (not just STARS schools) for sharing information and fostering collaboration on the topic of that Affinity Group – such as high school outreach, use of robotics in outreach, use of games in outreach, and support for new STARS member schools. At the 2011 Celebration, individuals could join the community, view all of the sessions, RSVP to different sessions, and add comments or blog about each event session. Each school added a document of their yearly plans to the site. After the Celebration, all STARS faculty and students were asked to join the community in order to participate in their school teams and affinity groups, have discussions, and share activities. STARS members can now easily view and find other members across the country, and connect with their own

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local members as well as others across STARS with similar interests through affinity groups. The most active Affinity Groups have been the New Members affinity group, where faculty have asked questions about STARS logistics and requirements, and the STARS Haiti group, a group of students and faculty focusing on outreach in Haiti. A Robotics Affinity Group was started by Dave Touretzky and Chutima Boonthum of the ARTSI alliance to support STARS schools wanting to use Tekkotsu robots in SLC outreach. STARS members across the alliance created approximately 30 events during September and October 2011.

### 5.5 STARS Collection within the BPC Digital Library

The STARS digital library was made available as a sub-collection of the BPC Digital Library in October 2011. The library was created by Dr. Alice Agogino's group of the Engineering Pathways project. In order to customize the meta-data for each resource, we have added a set of STARS-specific special topics that relate to the projects and goals of STARS, such as K-12 Outreach, Mentoring, and STARS Celebration. We have also chosen which of the standard meta-data fields are most relevant to our resources. We began collecting and cataloging resources for the digital library in November 2011. Resources include annual reports and published results from STARS, educational games and workshops created by and used by STARS students in outreach activities, posters from the STARS Celebration, evaluation materials, and more.

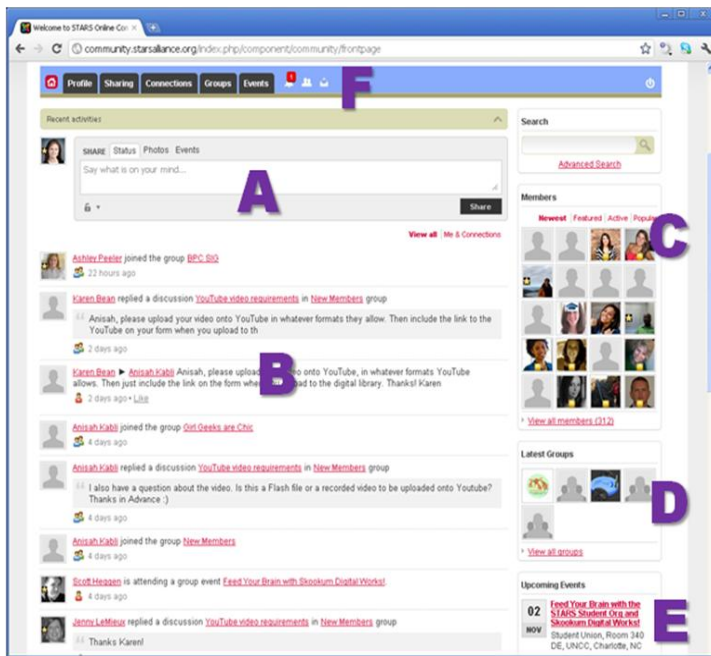


Figure 6. Home page of the STARS Online Community. Users can share status updates on the site (A), which are displayed in a site-wide news feed (B). Participants can also view other members (C), groups (D), and events (E), and navigate to other parts of the community to share files or create events using the navigation bar (F).

## 6 Organizational Capacity Building Impact

The Alliance goals are to enhance institutional capacity to interweave engagement throughout the undergraduate and graduate student experience and to enhance institutional capacity for student-led regional engagement (e.g., K-12, industry, community). The table below (6.1) shows new Alliance institutional members who began implementing STARS practices in Fall 2011 as part of the Scaling Project. Table 6.2 presents a cumulative table of Alliance members showing the years of implementing STARS practices, with those institutions who are also part of the Scaling Project indicated by yellow highlighting. Both tables point out the unique features of each SLC program. All data indicates Fall term unless otherwise noted.

### 6.1 NEW STARS Scaling Project Institutions Table

(M=Mentoring, PP=Pair Programming, C=SLC Course, O=SLC Student Organization)

STARS Members	Type	# SLC students	Projects	SLC Highlights
		2011		
Arizona	Doctoral	8	SLC	"Mini-modules" for college outreach
Columbus State	HBCU-UG	6	SLC	Outreach
Depauw	Doctoral	12	SLC	Encourage HS girls to take CS1-2
Duke	Doctoral	12	C, M, SLC	Service learning course
Florida International	Doctoral	9	SLC	Tutoring in CS, K-6 robotics outreach
George Mason	Doctoral	9	SLC	Creating 2+2 with NVCC
Indiana U. Bloomington	Doctoral	10	C, SLC	HS outreach, Girl Scout summer camp
Indiana/Purdue	Doctoral	12	M, SLC	Mentoring, tutoring, & fund raising
Loyola	Doctoral	10	SLC	Urban K-12 outreach
N. VA CC	Comm.Coll	4	SLC	Creating 2+2 with George Mason
NW Florida State	UG	3	M, SLC, O	STARS Internships
SC State	HBCU-Doc	10	C, PP, SLC	Tutoring in CS, robotics outreach
Seminole State	Masters	8	PP, SLC	Hot New Technology Expo
UNC Greensboro	Doctoral	10	SLC	Outreach, Scratch, CS Unplugged
Wilberforce	HBCU-UG	8	SLC, O	Girl Scouts collaboration, Interdisciplinary approach to computing and the SLC
Winthrop	UG-Masters	14	PP, O, M, SLC	Tutoring in CS, Campus outreach

All schools expect to ramp up to at least 10 SLC students in Spring 2012.

### 6.2 Continuing STARS Institutions Table of Participation Overview

(M=Mentoring, PP=Pair Programming, C=SLC Course, O=SLC Student Organization)

STARS Members	Type	# SLC participants						Projects	SLC Highlights
		2006	2007	2008	2009	2010	2011		
<b>Auburn</b>	Doctoral	25	14	18	29	12	14	PP,M,C	K-6 Computer Clubs
<b>Florida A&amp;M</b>	HBCU-Doc	12	11	29	24	25	32	PP,M,O	SLC K-12 outreach scholarships
<b>Florida State</b>	Doctoral	15	15	15	14	12	17	M,C	"Feed Your Brain" campus outreach
<b>Georgia Tech</b>	Doctoral	10	14	22	26	-	9	M	SLC mentors freshmen
<b>Meredith</b>	Women-UG	4	5	7	4	5	3	PP	Computing outreach to HS girls
<b>NC State</b>	Doctoral	13	16	12	20	28	24	PP,M,O	Graduates mentor UG research
<b>Spelman</b>	WHBCU-UG	2	4	4	3	-	2	M,O	Geek Week campus computing event
<b>UNC Charlotte</b>	Doctoral	22	16	19	33	32	26	PP,M,C	SLC a repeatable elective course
<b>USF Polytechnic</b>	UG	4	13	8	9	9	18	M	Facebook connects students & alumni
<b>CPCC</b>	2yr				5	3	2	C,O	Preparing students for 2-year or 4-year degrees in computing
<b>Hampton</b>	HBCU-UG			14	17	15	13	PP,M,O	Freshmen mentorship program
<b>J.C. Smith</b>	HBCU-UG		10	10	10	10	9	O	SLC fulfills required volunteer hours
<b>NC A&amp;T</b>	HBCU-UG			12	11	10	9	PP,M	Focus on community building
<b>U. New Orleans</b>	Doctoral			9	8	7	4	PP,O	SLC earns 1-hour class credit

### 6.3 STARS Department Chair Interviews

To measure STARS Alliance capacity building at our institutional participants, the evaluation team periodically conducts interviews with Department Chairs. These interviews are planned for Spring 2012 to follow up with the 14 continuing institutions and to collect baseline information from the 17 new members. Results from the December 2009 Department Chair interviews indicated that STARS is having a positive impact on the student body in computing departments, and is also positively impacting faculty. A summary of the 2009 interviews is presented below, in order to illustrate the type of interviews that will be conducted for the STARS Scaling project beginning in 2012.

From December 2009 to January 2010, individual telephone interviews were conducted with the department chairs of ten participating institutions in the STARS Alliance in December 2009 through January 2010. The purpose of

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the interviews was to obtain data for a qualitative analysis of each department chair's perspective of the STARS program and the SLC students whom they oversee. Interviewees were given consent to the interview sessions. Interviews averaged 45 minutes and were conducted by Evaluation Team members. Themes indicate that the awareness of the STARS Alliance was strong, the intentions of the Alliance to build community among students are being realized, and that continuation of the Alliance is important to faculty regardless of funding mechanisms.

### Awareness and Positive Impact

- 100% were aware and familiar with the goals and mission of STARS
- They felt that STARS and the SLC have a positive impact in their department/college
  - "We wouldn't have as many minorities and females [without the STARS program]."
  - "A sense of community is being developed across our departments, not just for our computing students."

### Building Community

- Most (7 out of 10) mentioned the feeling of community and the building of leadership skills as positive effects of the SLC students
  - "They're [the SLC students] the leaders of our department."
  - "Students that are in it – nothing but positive things I have heard."
  - "A number of good kids that are involved. I think they're getting some benefit out of it. Any type of leadership positions helps, especially computer students, because they tend not to take those types of roles."

### Continuing STARS is Important

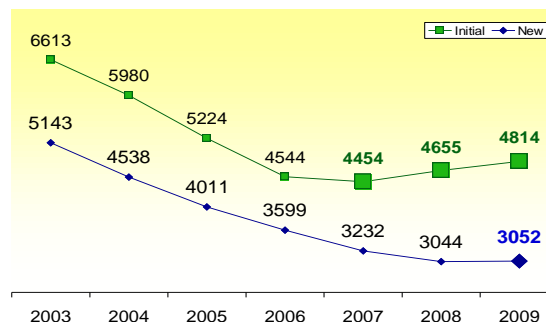
- STARS is important to the faculty in the computing department
  - "They [faculty] share my pride in the accomplishments the STARS students have achieved."
  - "Faculty that pay attention, they get it; other not paying attention but would agree it is important."
  - "It's very important to the professors who participate in STARS. But it's also important to those who don't. STARS is making our students better students. The students are learning to be better prepared. It's helped all of our faculty."
- Sustaining STARS beyond NSF funding is important to their campuses
  - "Whether we continue through STARS or start our own program, I don't know, I'll have to see the results."
  - "I think a lot of the activities we participate, we'd continue."
  - "I think it's important to continue and we'll figure it out after an advanced notice."

A variety of ideas for broadening computing participation on campus were provided by the department chairs. Suggestions included: minority role models and creating more diverse computing departments as critical, more use of media exposure, and offering NSF funded STARS research professorships to continue BPC work.

## 6.4 STARS Institutions Enrollment and Graduation Trends

Over half of the Scaling Project institutions are embarking upon their first year of implementing STARS practices during Fall 2011. We have collected baseline enrollment and graduation data from our 17 new members, and continue to collect this data annually for all Alliance institutions. We anticipate a positive impact on enrollment and graduation trends within two years of engaging in STARS practices, based upon our trend analysis of the first and second STARS Alliance cohorts. We provided a detailed summary of the trend analysis, which includes a comparison to the Computing Research Association's annual Taulbee Report ([www.cra.org/resources/taulbee](http://www.cra.org/resources/taulbee)) in the STARS Alliance 2010 Annual Report, which is available at [www.starsalliance.org](http://www.starsalliance.org). An enrollment overview table is presented below.

Figure 7. Total Computer Science Undergraduate & Graduate Enrollments 2003-2009 for STARS Cohort 1 versus Cohort 2



## 7 Alliance Individual Impact

*College Students:* The STARS Alliance impacts attitudes, behaviors and cognitive abilities of college students, primarily through their participation in the STARS Leadership Corps. As previously stated, the SLC is a co-curricular service-learning program that fosters student-led community engagement as a means to enhance student retention and success. The SLC model is grounded in Astin’s Involvement Theory, which posits that student engagement is a key mediator of retention and academic success<sup>2</sup>. Student engagement occurs through engagement with the subject-matter or curriculum of a discipline; engagement with faculty and staff in an academic unit; engagement in student life and co-curricular activities, and engagement with other students, especially students who share common characteristics or interests. The SLC model combines pedagogies of engagement by creating learning communities focused on research, service and outreach. While these pedagogies of engagement have been shown effective for all types of students across all disciplines, there is evidence that they are particularly effective for at-risk students and students from underrepresented populations in STEM disciplines.

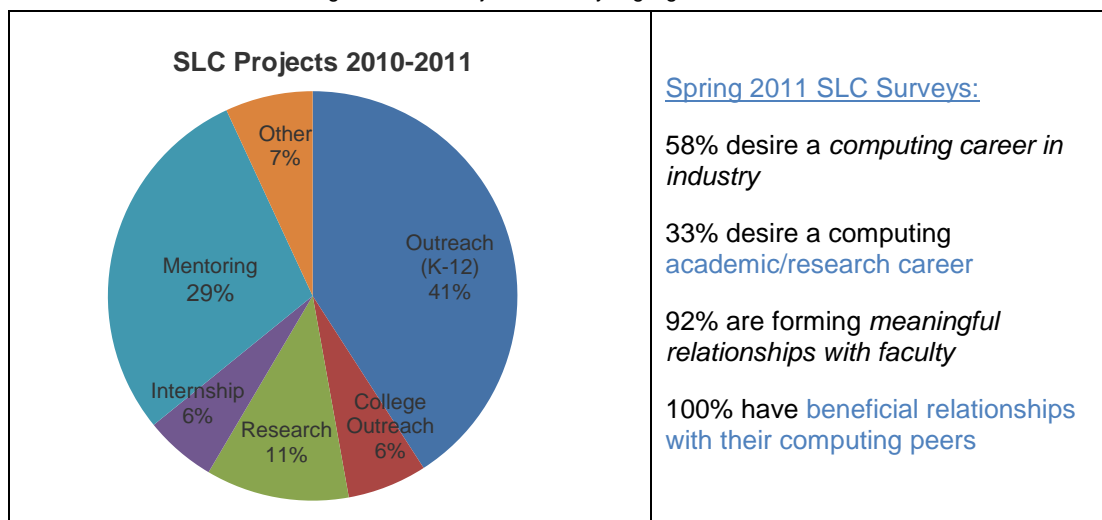
*Faculty:* The STARS Alliance impacts professional networks and mentoring for faculty who participate not only as SLC managers and Academic Liaisons, but also as partners in BPC efforts. The STARS Scaling Project engages faculty to increase the number of faculty who participate in BPC and benefit from the STARS Community. Faculty can undertake their own SLC leadership projects, such as implementing Mentoring or Pair Programming; including SLC practices in the digital library; hosting a Celebration workshop; or mentoring a new STARS school starting an SLC. We are planning a *STARS faculty mentoring program* to formally support faculty advancement. New workshops at the STARS Celebration 2011 were conducted to help faculty write better proposals, leverage their STARS participation to attract synergistic BPC grants, and enhance broader impact of research grants. We anticipate seeing an increase in grant proposals, acceptance, and in professional dissemination from our faculty; collection of this information is ongoing.

As indicated in section 2.3, during year 1 of the STARS Scaling project, we recruited 17 new colleges and universities to adopt the SLC and 14 returning schools to continue to implement the SLC and contribute to Scaling the alliance. Students and faculty from these schools participated in the 2011 STARS Celebration, and 333 students from these schools participated in the SLC during Fall 2011. At the time of writing this report, evaluation outcomes for Fall 2011 participants is not yet available. Below we report on the Alliance impact on individuals during the 2010-2011 academic school year, which included 20 STARS colleges and universities supported by the STARS Extension Project. The same type of analysis will be presented for the Scaling project in our 2012 report.

### 7.1 SLC Participants 2010-2011: Program Evaluations and Student Surveys

SLC students participate in a pre-survey in August and post-survey in May. They also report their semester activities via a program survey each December and April. SLC students continue to report intentions to attend graduate school, and that their participation in STARS has improved leadership skills and academic performance. They also continue to report that STARS demonstrates the relevance of computing to them.

Figure 8. SLC Project & Survey Highlights 2010-2011



<sup>2</sup> Astin, A. W., Vogelgesang, L. J., Ikeda, E. K. AND Yee, J. A. (2000). *How Service Learning Affects Students*. Higher Education Research Institute, University of California.



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Over the course of the STARS Celebration 2011, Evaluation Team Members conducted individual interviews with students and faculty, as well as conducted faculty focus groups. These interviews and focus groups sought the participants' stories regarding STARS generally and specific components of the STARS program. For faculty, questions seeking information on career outcomes, institutionalization, problems/issues, campus recognition and engagement were posed. For students, interviews were focused on students' perceptions of STARS, particularly on how STARS has helped them in both their academic careers, as well as in planning for the future. Key themes that emerged in these sessions are highlighted below.

### 7.2 Student Interview Themes

Students were interviewed during the STARS Celebration in 2011 to investigate what is most meaningful to them about their participation in the SLC. Interviews were voluntary, consent was given, and each interview was approximately 45 minutes. A total of 5 interviews were conducted by evaluation team members. Themes indicated that the SLC has a **positive influence** on future plans towards graduate school, provides a supportive team, piques curiosity about BPC and computing, demonstrates cutting edge technology, and facilitates a value of mentoring and giving back to others.

#### SLC Students say about STARS.....

- "Being at school for STARS has provided me a family of people who are just like me."
- "I think our strong foundation is made stronger by STARS; many STARS members are mentors in our department".
- "I like STARS. There's nothing to lose."

#### SLC Student Interview Themes

- Future plans include research and graduate school
- SLC students receive research support from team
- STARS helps shape a desire to continue on to graduate school
- There is a tremendous amount of interesting information (computing, STARS)
- It is possible to get an advanced degree; confidence and efficacy is realized
- The Celebration provides opportunity to see the many technological advances and new things that students are working on
- A value emerges for SLC student of the importance of mentorship, both for self and others

### 7.3 Cumulative Study of SLC Impact 2006-2009

Significant and sustained positive impacts on attitudes and behaviors related to academic success have been found among SLC participants. STARS evaluation publications<sup>3, 4</sup> add to this literature, offering conclusive longitudinal evidence that SLC participation positively impacts key attitudes and behaviors of undergraduate STEM students. This evidence comes from controlled studies showing significant positive change over time as students participate in the SLC, as well as significantly more positive outcomes for SLC students when compared to non-SLC control students. Specifically, longitudinal tracking of all undergraduate SLC participants across all STARS institutions has revealed a positive effect of participation in the SLC on the following variables known to be related to student academic success and retention in STEM disciplines in general and computing in particular:

- Computing efficacy (belief that effort will lead to success in a computing curriculum)
- Perceived social relevance of computing (belief that computing has social as well as technical relevance and can be used to benefit individuals and society)
- Computing commitment (intention to remain in the field of computing through college and into the workplace)
- Computing identity (a feeling of inclusion in a larger computing community)
- Self-reported grade point average.

<sup>3</sup> Dahlberg, T., Barnes, T., Buch, K. & Rorrer, A. (2011). The STARS Alliance: Viable strategies for broadening participation in computing. *Transactions on Computer Education, Special Issue on Broadening Participation*, 11, v3, article 18.

<sup>4</sup> Dahlberg, T., Barnes, T., Rorrer, A., Seals, C., Lustria, M., Hawkes, L. (2007). The STARS Leadership Corps: Case studies in broadening participation in computing Association for Computing Machinery Special Interest Group on Computer Science Education (SIGSCE) 2007 Conference Proceedings, Covington, Kentucky.

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STARS evaluation results across multiple controlled studies has demonstrated that participation in the SLC has a significant positive impact on all of these variables, except computing identity. The lack of increase in computing identity appears to be the result of a ceiling effect, whereby pre-SLC scores are already high as students join the SLC. However, SLC students do have significantly higher computing identity than non-SLC control students. Thus, evaluation results show positive effects of SLC participation on ALL of the above variables, which are known predictors of academic success and retention. We have also conducted sub-group analyses to test for differential effects of SLC participation by gender, race, institution, and length of time in the SLC. These results have found:

- Males have significantly higher computing efficacy scores than females, both before and after participating in the SLC, but there is no gender difference in GPA
- Students from under-represented minorities have significantly higher perceived social relevance of computing and computing commitment scores than white students, both before and after participating in the SLC
- No significant differences in any variable across Alliance institutions
- Students participating in the SLC for more than one semester have significantly higher post SLC scores than do those participating for one semester on computing efficacy, computing identity, and perceived social relevance, and the differences are more pronounced for female than for male students.

In summary, longitudinal evaluation has demonstrated significant and sustained positive effects of SLC participation on attitudes associated with academic success for undergraduate computing students across gender, race, and institutions. Full results are published in Transactions on Computing Education's special issue on broadening participation (footnote 3 above).

### 7.4 Faculty Participants: Surveys & Interviews

Since 2008, we have offered writing and research circles and faculty mentoring workshops at the Celebration. We formed *Writing Circles* to increase faculty publications in both BPC and traditional computing research publications. We formed *Research Circles* to foster collaboration aligned with common interests, particularly related to gaming, computing education, and assistive technology research. We provide *Faculty Career Mentoring* by offering a *Faculty Advancement Track* and a *CRA-W sponsored Faculty Mentoring Workshop* at the STARS Celebration, and we encourage participation at the CRA-W, CDC and ABI career mentoring workshops. Of the Alliance steering committee, 6 junior and 3 senior computing faculty from underrepresented groups have been promoted since 2006 (see Table 1).

Faculty who serve as academic liaisons and SLC leaders are surveyed annually, as well as interviewed during the STARS Celebration each year. They are asked what they believe is effective, meaningful to their students, and to their departments, college and individual careers regarding their participation in STARS. We also seek out formative feedback, i.e. constructive input to improve the Alliance and the SLC.

### 7.5 Faculty Survey

Nine faculty responded to the spring 2011 survey. However, despite the low response rate, the results followed prior trends reported in previous annual reports.

#### All agreed that the SLC

- Expectations were met
- Developed student leadership skills
- SLC students demonstrate passion and commitment to their projects

All agreed that they have *developed professional networking collaborations* through STARS. As one faculty noted, "Most important about STARS to me is the ability to connect with other faculty who care deeply about the STARS goals."

"The STARS Model is comprehensive and easy to use regardless of your institution type and culture."

### 7.6 Faculty Interviews and Focus Groups Themes

Six individual faculty interviews and three focus groups were conducted during the Celebration 2011. Individual interviews were conducted with veteran faculty members who were unable to participate in a focus group. The focus groups consisted of two groups of new faculty to STARS, and one group of veteran STARS faculty. New faculty themes that emerged were: a sense of being overwhelmed by start-up activities, a need for support for

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practical implementation concerns, feelings of excitement and enthusiasm for being part of STARS, and some surprise at the size and scope of the Alliance. Veteran faculty themes indicated that STARS is a beneficial professional network, that institutionalization of STARS is unique for each school, and that STARS generates a visible community at each school with positive recognition.

### Beneficial Professional Network: STARS ....

- Provides a network of support for faculty
- Helps with faculty spearheading the goal of institutionalizing diversity throughout the organization
- Facilitates gaining other important grants that support the department and enhance career development
- Stimulates faculty research interests
- Provides an important service component for some, for others is just part of their natural cycle of giving back to students and the community

### Institutionalization is Unique and Occurring

- Summer camps and student competitions
- Positioned STARS Alliance as an elite group within school
- Merging STARS with a student-lead mentoring organization with STARS activities
- Leverage STARS for fundraising; creating economic streams from using the STARS model
- Leverage STARS to gain buy-in from small businesses by creating liaisons between business and STARS students for discounted CS work
- Company sponsorship of Geek Week and similar projects
- Institutionalization is challenging at some schools because finding upper level support and funding can be illusive and competitive

### Visible Community & Campus Recognition

- Increased momentum after hosting STARS Celebration
- Chair likes the recognition that STARS provides
- STARS helped make department known as a “family-oriented” department

#### Faculty say about STARS

- “I’ll think “mission accomplished” when our students are superstars”
- “The ability to have students get involved in REUs that we know about because of STARS and attending the STARS Celebration has really set our department apart.”
- “I think the whole Alliance has turned out to be a great positive. I think the STARS Alliance is doing a great job, providing the students with the leadership that they need. I think it’s making a difference.”

In addition to the above themes, faculty provided constructive feedback about the challenges and lessons learned in STARS. Challenges include the workload of managing an SLC and fulfilling the reporting requirements; limited on-campus support for grant writing and other initiatives for sustainability. As a result of the interviews, formative feedback was taken into account for orienting new faculty, such as building time into Celebrations for the ‘STARS 101’ session to induct and prepare new faculty to lead SLC initiatives. We believe that these focus groups served dual purposes. The primary purpose of collecting formative feedback for STARS Scaling Project was fulfilled. A secondary purpose was to provide faculty with more opportunity to collaborate and share experiences. For veteran faculty, these groups enabled them to continue their relationships, and for new faculty, the groups allowed them to form new relationships with their peers.

## 8 Evaluation

The STARS Evaluation Team sought external guidance for our evaluation efforts. In the summer of 2011, we solicited feedback on our Alliance Scaling evaluation plan from two external experts in science, technology, engineering and math — Dr. Brian Blake (University of Notre Dame) and Dr. Barbara Bogue (Pennsylvania State University). Dr. Blake and Dr. Bogue had both served as external evaluators for an evaluation panel that we arranged in 2009 for the STARS Extension project. Dr. Bogue also served as an evaluator on the NSF Site Visit of

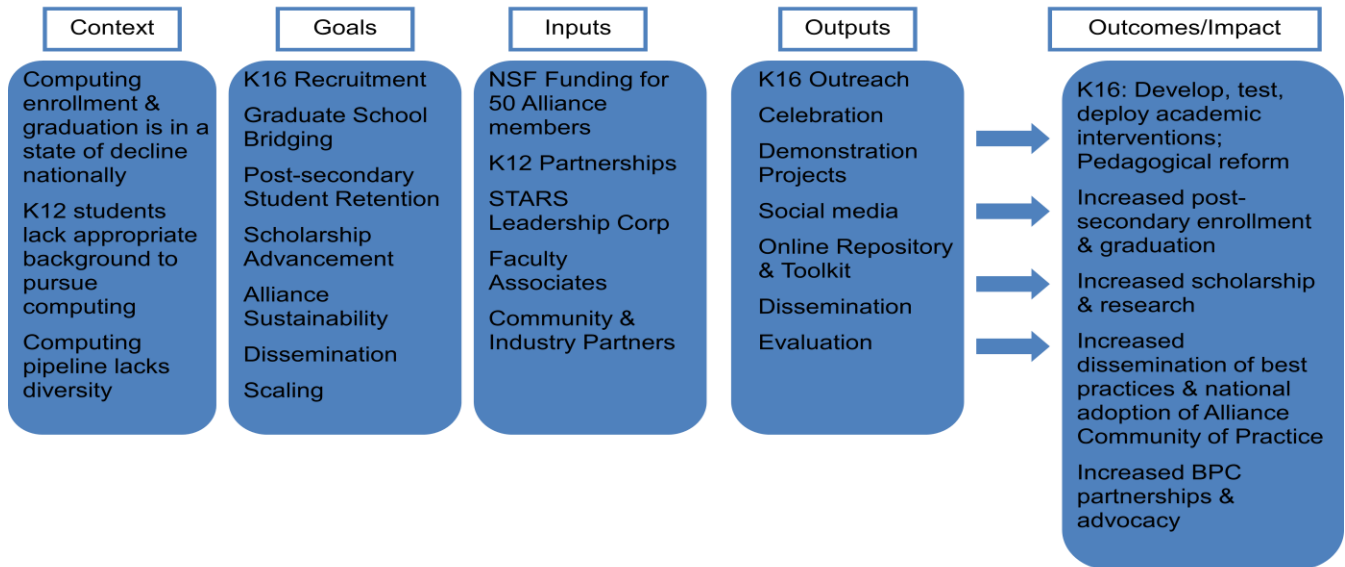
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the STARS Initiation project in 2007. We provided the evaluators the STARS Scaling Project proposal; our revised evaluation plan; and a set of guided questions. The external reviewers provided us with very useful written and oral feedback which we have used to revise our plan. A major point made was that we are perhaps attempting to capture too much data on individual outcomes, given the ambitious goals of the Scaling project to add an additional 30 institutional partners. In response, we have scaled back on the number and frequency of some of our participant surveys and interviews and intend to focus more on assessing organizational capacity and Alliance impact (as defined by the NSF Common Core).

"The STARS Scaling Project Evaluation Plan is broad and ambitious, sophisticated in scope and in the identification of assessment metrics that will support a valid evaluation of the impact of the overall program." – Barbara Bogue

Later in the summer, we met with evaluation professionals in the College of Education at UNC Charlotte for additional feedback, Dr. Richard Lambert and Dr. Mark D’Amico (Center for Educational Measurement and Evaluation). The major point taken from their face-to-face feedback was the need to better assess differential implementation of STARS activities across institutions. In response, we are developing an “intensity of intervention” rubric which we plan to use to determine if those schools that more deeply involve students in STARS activities are experiencing significantly greater impact. The logic model, which includes the project context, goals, activities, products and expected outcomes, is shown below.

**STARS Alliance Scaling Logic Model**



Formative assessment: SLC and K16 Outreach, Partnerships, Tools, Celebration  
 Community of Practice & National Resource: Lessons Learned, Best Practices, Social Network, Resources & Evaluation Repository/Toolkit, Research, Summative Evaluation