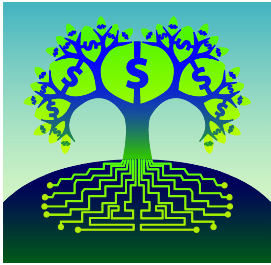


NCWIT ACADEMIC ALLIANCE SEED FUND



Funded by Microsoft, the NCWIT Academic Alliance Seed Fund provides U.S. academic institutions with start-up funds (up to \$15,000 per project) to develop and implement initiatives for recruiting and retaining women in computer science (CS) and information technology fields of study. The NCWIT Academic Alliance includes more than 75 computer science and IT departments across the country - including research universities, community colleges, women's colleges, and minority-serving institutions - dedicated to gender equity and institutional change in higher education computing and information technology.

Following are descriptions of the third round's award-winning projects:



The *Emerging Scholars Program* at Columbia University will use its \$15,000 award to increase the enrollment of female students in computer science beyond the introductory courses, with the ultimate goal of increasing the number of female CS majors.



"*Are You Smarter than your Fifth Grader?*" at Purdue University will receive \$15,000 to engage an influential population – parents – with pair programming via six workshops per semester. The program is open to 24 student-adult pairs and will be offered free of charge.



Towson University will implement a *Multi-Level Mentoring* project that uses intentional role modeling and peer-led team learning to help female undergraduates be successful in their study of computing. The award is \$15,000.

ACADEMIC

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ALLIANCE

Information about the Seed Fund program, including proposal requirements, the review process, and how to become an eligible Academic Alliance member, is available at <http://www.ncwit.org>.



EMERGING SCHOLARS PROGRAM

NCWIT Seed Fund Proposal

Christian Murphy, Kristen Parton, Adam Cannon

Project Description

The Columbia University Department of Computer Science is pleased to present its Emerging Scholars Program (ESP), which seeks to increase the enrollment of female students in CS courses beyond CS1, and ultimately to increase the number of female CS majors, by creating a program that encourages active participation and discussion of CS-related topics in a more positive, relaxed and open environment.

It is well-documented that the number of CS majors is declining, especially among female students. At Columbia, only 18% of undergraduate CS majors are female, compared to 37% total in the School of Engineering and Applied Science. It has been suggested that female students may be put off by the perception that computer scientists necessarily work in isolation, and do little more than sit in front of a computer and write code. It follows, then, that if these students can see that computer science is necessarily a collaborative activity, and that the actual implementation of a computer program is only the final phase of the problem-solving activity that includes algorithmic thinking, more women may be inclined to take further CS courses and perhaps consider it as a major.

The Emerging Scholars Program is influenced by the Peer-Led Team Learning (PLTL) approach, one of the AA Best Practices. ESP involves students working cooperatively in small groups, led by trained undergraduate “peer leaders”. In the weekly hour-long sessions, the peer leader presents CS-related problems for the group to discuss and solve as a team. The problems are developed by the graduate student supervisor in collaboration with the peer leaders. These problems may be classical CS problems (like Traveling Salesperson) disguised as problems relevant to their everyday lives, or other brainteasers designed to enhance algorithmic thinking and general problem-solving techniques, e.g. solving Sudoku puzzles or cryptographs. Special emphasis is placed on solving problems as a team, and making the activities fun.

In Spring 2008, we conducted a pilot program, and the results were very encouraging. Six female undergraduates enrolled in the CS1 course met with an undergraduate peer leader for eight workshops over the course of the semester. These workshops successfully demonstrated to students that CS is a collaborative activity and that it involves much more than just programming. One student wrote that “*The program ...really gave me an idea of what kinds of problems are solved in computer science and how it involves creativity.*” Additionally, students enjoyed the program very much; one said “*I loved it, learned from it, and enjoyed my time. Even people who are not interested in computer science would find these workshops interesting. It’s about problem solving and looking at things in a new light.*”

ESP is different from other PLTL programs in two important aspects. First, ESP is targeted only to female students. We believe that this will create stronger bonds between the students and give them confidence to continue their studies in CS by creating a support network on which they can rely for encouragement and guidance. This seemed to be the case for the students in the pilot program, one of whom remarked that the all-female workshops “*removed intimidation as CS is mostly a male-dominated field*”;

another commented, *“I liked it because women make up a small part of the CS major so it’s nice to meet other girls who might share the interest.”* The other important difference is that ESP workshops do not discuss any programming language-specific topics, such as objects or pointers. This is done so that students can focus more on the collaborative problem-solving aspects of the workshops, and on the algorithmic thinking process, and not be distracted by the details of a particular programming language.

This proposal requests funding to expand ESP by allowing us to offer two workshops per semester (instead of just one) in order to reach more students and have a greater impact on female students in Computer Science at Columbia. In order to make this a sustainable program, we will fund each of the undergraduate peer leaders as well as the graduate student supervisor. A faculty member, Adam Cannon, currently oversees the program and will provide continuity into the future. The Computer Science Department strongly supports this effort, and plans to continue to support ESP after the seed funding.

Anticipated Impact

Over the course of the next two years, we expect that ESP will have a positive impact on the eight peer leaders and the 48 participating students, not only as a direct result of the contents of the workshops, but also by creating a support network of women in CS, consisting of peers (students who participated in the workshops together) and mentors (more senior students who participated in previous workshops and/or acted as workshop leaders). We also expect the program to have a positive impact on the department, by increasing the retention of female students in CS courses beyond CS1. We have already seen this as a result of our pilot program: five of the six students who participated in the program said they “definitely” would take another CS course, and the other said she “very likely” would. Ultimately we hope this will increase the number of female CS majors; in fact, two participants in the pilot program already said they “definitely” would declare CS as their major and a third said she would be “very likely” to do so.

Assessment

For the pilot program, we gave pre-workshop surveys to the students to measure their attitudes towards CS and their future plans. At the conclusion of the program, we measured how the students’ interest level changed and whether they planned to continue with CS in the future and/or major in CS. The results from the pilot assessment were encouraging, and we would like to expand our evaluation in the second year to give us a better sense of the impact of ESP. Although the goal of ESP is recruiting and retaining women in CS rather than providing academic support, it would be interesting to compare the academic performance of students in ESP to those not in ESP. Anecdotally, we found that ESP helped students connect with other students in the class that they would not ordinarily get to know. Having a support network of other students in the class may help students when forming study groups or seeking help on technical problems. We will also continue monitoring the students from the pilot group to see whether they continue in CS or not. In the long run, the best measure of success will be the percentage of females in the CS department at Columbia University. To that end, we will track the percentage of female majors over the next few years relative to past years and the performance of female majors over the next few years versus performance of past female majors.

Budget

Two undergraduate peer leaders (\$1300 per student per semester)	\$10,400
One graduate student supervisor (\$1000 per semester)	\$ 4,000
Materials, refreshments, etc. (\$150 per semester)	<u>\$ 600</u>
Total	\$15,000

Purdue University
Department of Computer Science
NCWIT Academic Alliance Seed Funding Proposal
Are You Smarter Than Your 5th Grader?
June 2008

Summary

The Department of Computer Science (CS) respectfully requests \$15,000 in seed funding from NCWIT Academic Alliance to broaden the participation of women in Computer Science through a project called *Are You Smarter Than **Your** 5th Grader?*

Background

After years of soaring enrollments in Computer Science at Purdue, the last six years have shown a 52% decrease in the number of high school students interested in pursuing CS as a major and career. The number of women choosing CS has dropped from 13% to 7%. A similar picture is reflected across the nation and is problematic for companies trying to recruit students with CS degrees.

Project/Program Description

The Department of Computer Science has a variety of interrelated programs and initiatives that are designed to increase the exposure of computer science among girls in the K-12 environment. Most of the current programs focus on supporting teaching and inspiring students through camps, professional development workshops, and in-class presentations. In this proposal, we seek to engage another influential layer: parents.

Anecdotally, many of our current CS undergraduates have shared that it was a parent who first encouraged individual interest in computing beyond general computer use. Likewise, Jane Margolis and Allan Fisher have documented many similar stories in *Unlocking the Clubhouse* (2002).¹ To quote the authors, "Parents impart their computer enthusiasm and skills to their children, and through early mastery acquired at home children gain a competence and confidence they carry with them into school." (p. 20). Our proposed program seeks to engage parents alongside their children, thus creating a support system beyond the walls of school. We recognize that many students are often more skilled at general computing tasks than their parents due to the emergence of technology use in schools. This program uses activities that level the playing field for all involved, and allow the child and parent to develop understanding and experience success alongside each other, no matter the skill level of either party.

The *Are You Smarter Than **Your** 5th Grader?* program will be targeted at girls in grades 4-6 and their parents or guardians. The workshop will consist of 6 sessions per semester to be held on Saturday mornings or weekday evenings on the campus of Purdue University, West Lafayette. It will be open to 24 student/adult pairs and will be offered free of charge. The children will experience pair programming with their adult counterpart. Activities will include an Alice [www.alice.org] storytelling challenge and Pico Cricket [www.picocrickets.com] design studio. Meals will be provided during each session. Separate activities will be conducted for parents and students during the mealtime. Parent topics may include guest speakers to inspire parents to share the joy of technology with their children or college admission information while the student meals will engage children in *CS Unplugged*² activities or exposure to other Purdue specific opportunities such computing majors and extra-curricular opportunities available on campus. At the conclusion of the workshop, the students will be given the Pico Cricket kit to take home. Sessions will be led by local K-12 teachers and supported by current Purdue students.

¹ Margolis, Jane and Allan Fisher. **Unlocking the Clubhouse: Women in Computing**. MIT Press, 2002.

² M. Fellows, T. Bell, and I. Witten. **Computer Science Unplugged**. Computer Science Unplugged, 2002.

Additionally, the following semester will offer two follow up sessions where students and parents will be invited to come back to campus and be given additional challenges based on their suggestions.

An attitudinal survey will be given to both the parents and children at the beginning and end of the workshop. The pre-survey will assess prior knowledge of and interest in robotics, programming, and computer science concepts. The post-survey will assess change of knowledge and interest among the participants. Students will then be entered into our data tracking system and they will be informed of future opportunities such as summer camps, Women in Computer Science Career Day, and admissions opportunities throughout their middle and high school years. Additionally, they will be encouraged to seek computer science opportunities in high school and to consider it as a discipline in college.

Alignment to NCWIT Academic Alliance Best Practices

This project combines three of the existing promising practices to engage our students and parents. The first is the use of Alice to introduce computing via storytelling. By challenging the parents and students to learn Alice together, the programming pairs will have specific tasks and stories to tell such as a commercial challenge and animate your family activity. In doing so, the programming pairs are introduced to the fundamentals of programming as well as logic and problem solving. The second practice is that of using robotics to introduce computing concepts. We intend to use Pico Cricket kits due to suitability of the age group and interest to girls. Groups will be given a themed design challenge to create and program during the session. The final practice we will use is Computer Science Unplugged. The CS Unplugged activities will focus on the problem solving aspect of computer science and engage the students in kinesthetic activities to demonstrate these ideas. It is our hope that in using these promising practices, we will identify an emerging and new practice of targeting parents alongside of the girls to sustain interest in computing throughout the K-12 years.

Budget

Item	Cost
Pico Cricket Kits	\$6480 (24@ \$270)
Food	\$3000
Space Rental	\$1000
Teacher/ Purdue Student Stipends	\$3700
Marketing /Printing	\$ 820
Total	\$15,000

Conclusion

Support for *Are You Smarter than Your 5th Grader?* will enable the Purdue University Department of Computer Science to continue and enhance the programs that will build the pipeline of women pursuing technical degrees in many ways. It will spark interest in girls while they are young and encourage them to continue their pursuit and interest in technology. Additionally, it will create a network of students with similar interests and start the computer science community building early on so that in 8-10 years, these girls are not merely one in 14 in their computer science classes.

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Multi-Level Mentoring
Towson University, Fisher College of Science and Mathematics
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Statement of Need: Although the value of mentoring in recruiting and retaining women in computing is well-known, there is a lack of comprehensive models that provide mentoring support throughout the undergraduate curriculum. Detailed examples of the comprehensive application of mentoring - from entrance to graduation - are needed to demonstrate how women can best be encouraged and retention improved in computing fields.

Towson University's Department of Computer and Information Sciences is uniquely situated to address these questions. As a large - and a rapidly growing - public institution, Towson is being asked by the state of Maryland to support growth and increased demand for information technologies workers. Our expanding range of articulation agreements with local community colleges provides a steady stream of incoming students who would directly benefit from recruitment and retention efforts. Our unusual curricular model - separate majors in Computer Science and Computer Information Sciences, sharing a common core of programming and data structures classes - provides both multiple models for success and retention and a platform for comparative evaluation of program success involving comparable, but distinct groups of computing students. Our college's STEM teaching community project is promoting the participation of undergraduates as learning assistants in undergraduate courses. Finally, Towson University's intentional advising provides all students with direct advising support from faculty.

To support the retention of women in computing, we propose to implement a **multi-level mentoring** model, which will combine elements of both intentional role modeling and peer-led team learning toward the ultimate goal of showing all female undergraduates in our programs pathways to success in computing. Experienced students will mentor students in introductory courses, while faculty will support and mentor student mentors. We will draw upon Towson University's successful Mid-Atlantic CIO Forum and our graduate computing programs to identify professional women to serve as mentors for graduating women about to embark on their careers.

Project Overview: The vision of the multi-level mentoring model is that female undergraduates who are committed to or considering majoring in a computing discipline should have regular interactions with role models who can help them learn, assist them as they chart a path through their studies, and demonstrate the possibilities for professional success.

The core of this vision will be a set of undergraduate mentors. Each semester, ten women who have excelled in our introductory courses will be hired as peer mentors. Each mentor will be assigned five female students who are currently enrolled in one of the classes in that sequence. As each mentor will focus on one of the courses in the sequence, the students assigned to any given mentor will all be taking the same course in the sequence. During the semester, the mentors will lead weekly peer-learning sessions, reviewing material and working out problems with their students. Additional activities will involve one-on-one tutoring, support, and advocacy as needed.

Student mentors will be supported by faculty: female faculty members in the department of Computer and Information Sciences will each be assigned two mentors. Faculty will help mentors develop materials for tutoring sessions and provide role models for mentors. Faculty participants will also provide mentors with opportunities to get involved in their research. Finally, all women in both Computer Science and Computer Information Systems - including those not otherwise involved in this program- will be assigned a female advisor from the ranks of the tenure-track faculty in our department.

We will work with our department's industrial advisory board, Towson University's Mid-Atlantic CIO Forum, and contacts in state and federal agencies to identify professional women in computing careers to act as

mentors for the mentors. Ideally, we will locate employers who are willing to commit employee resources to the support of this project, with the hopes of identifying potential future employees. Our planned inclusion of accomplished female computing researchers from the Baltimore-Washington region in our departmental seminar series will provide another venue for demonstration of professional success for women in computing. . We will also use on-campus events such as Towson's Science and Technology Day in November to recruit interested women to our majors.

Alignment with NCWIT Academic Alliance Best Practices: This project is closely aligned with several NCWIT AA Best practices. Tutoring sessions led by student mentors build on existing models for ***peer-lead team learning*** and ***mentoring***. Female faculty members acting as advisors for undergraduate women act as ***intentional role models***. Inviting students to participate in research provides ***faculty perspectives***

Likelihood of Success and Transfer: Our active and engaged faculty includes women at all ranks (from instructor to professor) who are committed to fostering women in computing. Our large student body (400+ majors, including many transfer students from community colleges) provides an ideal model for understanding processes necessary for mentoring and retaining women in computing. Lessons learned from this effort will be applicable to similar institutions throughout the U.S.

Anticipated Impact: During each semester of this two-semester project, ten mentors will each be assigned to work with five students, for an anticipated direct impact of 60 students /semester, or up to 120 students total. Students not directly participating as mentors or in mentored groups may be reached through assignment of female faculty advisors and attendance in our planned lecture series.

Assessment Plan: Assessment efforts will examine the response and performance of both mentors and mentored students. Mentored students will be assessed through a combination of qualitative and quantitative methods, including beginning and end of semester surveys of their attitudes towards computing, their interest in pursuing computing as a major, their responses to the mentoring, and their mastery of the material. Relevant subsets of these survey (those not involving mentoring) will be given to women not participating in the mentoring program and to male students, for comparison points. We expect women in the mentoring group to show greater level of interest in computing than women in the control group, perhaps even comparable to response from men. Enrollment data tracking number of students moving through the introductory sequence, and their grades, will provide quantitative data.

Impact on mentors will be assessed by a similar combination of methods. Surveys regarding their experiences will be conducted at the end of each semester, along with a project-wide focus group to understand success and opportunities for improvement. Grades and progress towards degree will be examined in search of preliminary indication of any relationship between participation as a mentor and further academic success. Whenever possible, existing assessment instruments such as NCWIT's Student Experience of the Major Survey-in-a-Box will be used for data collection

We plan to track both sets of students through subsequent semesters and through graduation in the hopes of understanding downstream impacts of mentoring. We anticipate that some students who initially participate as members of mentored groups may themselves act as mentors in later semesters.

Budget Justification

- Mentors will be paid \$10/hour for 50 hours each of two semesters – total, \$10,000.
- Faculty support for advising and working with mentors: Five female faculty members \$500 each /semester, total: \$5000.

Total Request: \$15,000

Ongoing support will be provided through collaboration with our college's STEM Teaching Community (STEM-TC) program, which aims to encourage undergraduate participation in peer education, and with our undergraduate research program. Successful completion of this work will support its inclusion in ongoing STEM-TC efforts.