Initiatives to Support Systemic Change for Women in Undergraduate Computing

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SUMMARY

The National Center for Women & Information Technology (NCWIT) Extension Services for Undergraduate Programs (ES-UP) has created a large group of trained consultants (ESCs) and clients who are passionate about women's participation in computing. This panel will describe how our ESCs and clients have worked together to effect change and will show outcomes from our activities over the past three years.

The ES-UP recruited, motivated, and guided 34 diverse undergraduate computing departments to engage in systemic reform that increases enrollment, retention, and graduation of women. Each of these departments is committed to participating in a process that follows the best expert advice for essential steps toward positive organizational change.

The process for working with university departments involved a baseline study to understand the recruitment and retention history of women in the department and the factors that might support or hinder increased participation of women in the department; strategic planning with departmental leadership targeting the most pressing actions the department could take; and establishing metrics to measure the success of those efforts. Some institutions also administered the "Student Experience of the Major" (SEM) survey [1] to understand the factors underlying low participation among women in the department. This analysis fed into the strategic planning [2, 3] and revealed an initial set of actions the department could take. Thus, many of our client institutions are showing positive increases in women's enrollments, retention, and graduation rates.

Our model of systemic reform in undergraduate computing includes a focus on the events and practices women experience directly and those that indirectly affect their outcomes. The components of the model shown in Figure 1 derive from research on women in undergraduate computing, research on change in higher education, and research and theories of communication and marketing [4, 5]. The components include recruitment, pedagogy, curriculum, institutional policies, evaluation, and student support. Each of these components can affect the others in one way or another and should therefore be assessed when trying to increase women's representation.

Table 1: Characteristics of ES-UP Client Institutions

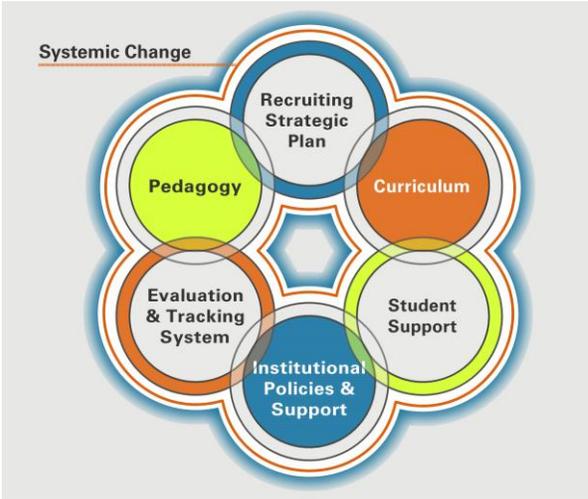|	
Carnegie Classification	Research University: 26 4-year College: 3 Master's College: 4 Engineering School (4-year): 1
Control	Private: 12 Public: 22
Special Populations	Women's College: 2 Minority-Serving Institution: 2
Size	Small: 5 Medium: 4 Large: 24
U.S. Region	Far West 7 Midwest 8 Southeast 5 Southwest, Rockies 5 New England, Middle Eastern 8

Figure 1: Systemic Change in Undergraduate Computing

NCWIT ES-UP advocates a research-based approach to sustained change. Reform initiatives should:

- Integrate teaching methods that create inclusive, collaborative environments in early curriculum.
- Successfully implement a strategic recruiting plan for creating an enduring pipeline of diverse students with appropriate competencies.
- Help students understand how their classes and other experiences (internships, REUs, etc.) contribute to their future identities as computing professionals.
- Align assignments and coursework with student interests and career goals.
- Foster everyday positive student-student and student-faculty interactions that contribute to a sense of belonging in the departmental community.
- Include visible, high-level administrative support and resources for sustained implementation and evaluation.
- Ensure that efforts to diversify are positively reinforced within the reward structure for promotion and tenure.
- Evaluate efforts to identify what works and what doesn't work; make mid-course corrections to increase success; and communicate findings for increased support and replication by others.

1. LEISA D. THOMPSON

As Director of Research and Consultation for ES-UP, Dr. Thompson will briefly describe some of the resources ES-UP has developed to assist the consultants. She will also be the moderator and introduce the other panelists.

2. LECIA J. BARKER

As co-PI for this project, Dr. Barker will discuss the systemic change model, the importance of strategic planning for recruitment and retention, and describe combined outcomes of ES-UP client departments.

3. RITA MANCO POWELL

Dr. Powell is a consultant and representative at the University of Pennsylvania. She will discuss different initiatives in curriculum, increased student/student and student/faculty interaction, and outreach to high school girls that her department has implemented with a corresponding increase in women's enrollments, graduation rates, and a decrease in attrition in computer science.

4. CATHERINE E. BRAWNER

NCWIT has developed numerous resources for Extension Services consultants and their clients to use together to evaluate the conditions for undergraduate computer science students, particularly underrepresented populations (women and minorities). Dr. Brawner will discuss how her clients, large, state-supported research universities with substantial engineering

colleges, have used the information provided by the NCWIT Student Experience in the Major survey and Entry survey to assess and modify their planning and practices.

5. TOM McKLIN

Dr. McKlin will discuss one client's outcomes from strategic planning and how they are on their way to becoming a national exemplar for diversity in computing and information technology, by working on goals to accelerate recruitment and retention of women. He will describe the process this department took to set goals, actions they took with administrators and faculty, and their processes for measuring near-term outcomes.

6. ACKNOWLEDGMENTS

7. REFERENCES

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