Evaluating STEM Department Websites for Diversity

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Abstract? Websites convey the culture of a department through content, design, and structure. They are the official face a department presents to the world. They can affect recruitment of students and faculty, and counter or foster the exclusion of women. How should STEM websites be evaluated for the message they send about diversity? Design of a website evaluation tool must take into account the nature of the diversity issue in STEM. We make an argument here for the importance of websites and website evaluation to support goals of diversity and gender equity. In addition, we describe the development of a website evaluation method, Equity Enhancement Training. This method involves training department representatives to recognize explicit and implicit messages, and to determine if a site is broadly or narrowly appealing, inclusive or offensive, and whether it addresses diversity seriously or just pays lip service. The authors address the particular circumstances of website evaluation in the context of a National Science Foundation ADVANCE Grant for institutional transformation, as well as the kinds of issues that are likely to arise in the course of executing a website evaluation project in the STEM disciplines.

Introduction

The ADVANCE institutional transformation project at Kansas State University was designed to address three broad types of barriers to women's full participation in science and engineering: lack of effective recruitment, subtle biases, and exclusion from networks. The ADVANCE team recognized that websites may contribute to all three of these barriers. Websites do more than communicate data about a department (e.g., course offerings, graduation requirements, contact information). They also convey the culture of a department through the website's content, design, and structure.

Websites are the official face a department presents to the world and all its stakeholders. Yet most designers of science, technology, engineering, and mathematics (STEM) department websites are unaware that websites constitute a "hidden curriculum' – communicating what is there as well as what is not there. Thus, STEM department websites may unintentionally be unappealing or even offensive to the groups they seek to attract. Beyond this effect on prospective members of the community, there is an additional effect on those who are already part of the community. The vision of departmental and disciplinary culture presented on websites gives others implicit permission to act on that vision. To the extent that a department's website contributes to virtual exclusion of women, it fosters their exclusion in the real world.

What method should departments use to evaluate their websites? How should they revise existing websites to make them inclusive and welcoming? A useful website evaluation method would assess explicit and implicit messages and determine if the site is broadly or narrowly appealing, inclusive or offensive, and addresses diversity seriously or just pays lip service. Development of just such a method was included as part of the Kansas State University ADVANCE program, as an outcome of one of the program's Equity Action projects.

The Diversity Issue in STEM

Behind the question "how do we evaluate STEM websites for diversity?" lies the question "what is the nature of the diversity issue in STEM fields?" It is common for diversity advocates to focus their efforts on changing STEM fields (e.g., eliminate weed-out courses, provide better mentoring for junior faculty), or on strategies to attract members of underrepresented groups (e.g., WIE/MIE programs, targeted recruiting). As we have discussed elsewhere, it is less common to directly address resistance to diversity. Resistance to diversity is a predictable outcome of the sense of threat to the group and group identity. The "group" in this case is any particular STEM discipline and/or department. Group identity is the sense of one's self as, for example, a practitioner of engineering/member of an engineering department, and what it means to be an engineer. (Burack and Franks, 2004)

The most widespread understanding (group identity) of engineers, or of any technologically competent person in our society, is that of the geek or the nerd. Geek is not just a label given by outsiders; it is an identity claimed, often quite proudly, by members of STEM disciplines. Geeks are generally understood to be male. And, as Eglash (2002) has noted, the geek or nerd is not just male; he is also white. The female geek and the African American geek do exist as oppositional figures. Eglash claims that their existence serves to undermine the idea that the two pairings are oxymoronic – but only by reinforcing negative aspects of technological expertise. Ultimately, "geek" – and, it follows, any technological practitioner – remains white and male. Everyone else is an exception and needs an adjective, and in this way, group identity is maintained unchanged.

This group identity – the technologically competent person as white, male, and geeky – is threatened by the entrance of women and minorities into STEM fields. The sense of threat to the group as a whole is commonly articulated in public as a defense of merit or standards. With an (unexamined) understanding of the engineer as white and male, those who are not white or male are viewed as technologically incompetent. (Faulkner, 2000) Coupled with a discourse of STEM practitioners as the "best and brightest", this yields the "standards" complaint: *If those others were good enough, they'd already be here; insisting that we open our doors to them will mean lowering our standards (destroying the group).*

The sense of threat to group identity for individuals of the group is rarely articulated openly because it operates at a more unconscious level. Hacker (1990) has described the way in which technological mastery becomes a way of doing (white) masculinity. The motto of the technological man is "I tinker, therefore I am." Consequently, technological mastery unsexes women, and at the same time their intrusion into engineering territory is experienced by men as a threat to masculine self-identity. (Bix, 2004) *I tinker, and women can tinker too, therefore…what am I?* This identity threat is an unarticulated subtext of engineering's trenchant resistance to diversity initiatives. (Burack and Franks, 2004)

Margolis and Fisher (2002) have described the consequences of the implicit understanding of computers and computer science as the proper domain of males: even teachers who want to recruit girls into computing "are looking for girls who 'look like boys' " (48). And Robinson and McIlwee (1991, as cited in Mack, 2001) have noted, "Men are not better engineers, but they are better at *appearing* to be better engineers in a *male-defined* way". For girls or women who seek careers in STEM fields, "looking like boys" means not allowing 'distractions' like relationships, parenthood, elder care, or emotional distress to interfere with long hours of complete devotion to work (Wilson, 2004). It requires a demonstration of facility with tools even when this expertise is not necessary for job performance (McIlwee and Robinson, 1992). It also means that women will not be rewarded for expertise in skills typically associated with femininity, such as relational skills and emotional intelligence, even when official rhetoric identifies these skills as necessary for STEM practitioners in the new millennium (Fletcher, 1999). Finally, women must focus their attention within the disciplinary boundaries that men have declared as proper STEM material. Oldenziel (1999) has ably illustrated how certain things and fields of study (machines, mechanized processes) came to be called technology and coded masculine, while others (fabrics, artisanal and craft work) were excluded and coded feminine.

The diversity issue in STEM, then, is quite profound. It is critically important for group leaders to play an active and visible role in redefining group identity and reshaping group boundaries. When this happens, the results can be astonishing. At Carnegie Mellon, the computer science department increased the percentage of women in its program from 8% to 42% in just 5 years, in large part because of leaders committed to change. They altered their admission criteria to give more weight to leadership potential and less to prior programming experience, and certain first-year programming courses were redesigned. In short, they stopped looking for girls who looked like boys, and started seeing technological competence in a different guise. They were willing to consider a change in group identity, as well as a different way of "doing" computer science. They started the process of creating a different story about computing and computer scientists.

Diversity and STEM Websites

Websites are one place where departments foster group identity and tell the story of what it means to be a member of the profession. It is disingenuous at best for faculty members to claim that website content is unimportant, or that their department's website is equitable because it does not mention gender at all. Eisenhart and Finkel (1998) have described the pernicious effects of pretensions of gender neutrality, and elsewhere we and our colleagues have described how one STEM department's adherence to gender-neutrality rhetoric impeded an institutional transformation initiative (Montelone et al., 2006).

There is an active process of socialization into the profession that begins in undergraduate classes and continues throughout one's career. Thomas L. Magnanti, dean of MIT's school of engineering, acknowledged this when he said of online courses that we should "not…confuse knowledge transfer with education…this provides access for many, but it does not provide socialization" (Field, 2006). By default, the dominant socialization process will be one that reinforces the STEM group identity described in the previous section, and that casts females and minorities as lacking in technological expertise. Institutional transformation must involve group members inlearning how to socialize themselves as well as prospective group members into a more expansive group identity. To this end, a department's website can demonstrate a vision that is inclusive, and that celebrates its profession as interesting, satisfying, and making a contribution to society. Or it can underscore a department's recalcitrant dedication to a limited and stereotypically negative view of engineering, even if they do not realize that this is the vision of their profession they offer the world.

Inclusive websites will soon become even more important recruiting tools. STEM departments truly dedicated to diversifying their faculty can expect to encounter increasing difficulty in the future. Orchestrated, nationwide challenges to programs for minorities and/or women have been coordinated by Roger Clegg and the (Orwellian) Center for Equal Opportunity (http://www.ceousa.org/). These will likely continue, and may result in blocking use of some current strategies (Schmidt, 2004; 2006; 2006a). Demonstrating an institution-wide commitment to diversity will be important in maintaining affirmative admissions, scholarship, and outreach programs (Caperton, 2004). In this climate, STEM departments will have important roles to play, and they will need to be creative. A department that successfully projects a sense of inclusiveness to targeted recruiting groups is a department that will succeed in diversifying its faculty. A well-designed website may encourage a potential candidate to apply and can help compensate for other factors outside a STEM department's control, such as whether its university is perceived to be in a desirable location, or has a prestigious reputation. A poorly designed one certainly won't attract candidates, and may turn a candidate away.

Departments clearly have many stakeholders to address with a website: undergraduate and graduate students, faculty, alumni, potential students and potential faculty. If members of the department are involved in outreach programs, then K-12 students and teachers as well as parents may be part of their audience. The audience may be everyone in the state, if the department is situated in a land-grant university. A department's website is implicated in telling the story of the profession to those inside and out, at many different levels. Ideally, the department website would include necessary information for its students and faculty; inspire alumni to donate; illustrate the excitement and relevance of the profession to potential students; and provide information for extension or outreach projects. It would be easy to read and navigate. It would show women and minorities in active roles in the profession. It would be explicit about the department's commitment to diversity and what that means for the profession as a whole. It would reveal a department whose members are unthreatened by "others" because they understand the others to be potential members of the professional group.

An evaluation method that would assess these traits must go beyond checking whether there are a few pictures of women and minorities on the site, or a link to the university's diversity statement. Certainly looking at images and examining how men and women are described on the site would be of importance. But the site as a whole should be looked at as a text and examined for the holistic message it delivers. Does it celebrate geeky boy culture or oppose stereotypes? Does it give lip service to diversity, and then subvert this message with the rest of the site's content? Does it present a view of the profession that would be attractive to a diverse group of people? Does it demonstrate throughout all its pages a particular vision of diversity for the department?

There is a difficulty in having STEM practitioners evaluate STEM department websites. Some things that help defend the group boundaries and identities in STEM are not readily observable by STEM practitioners themselves. By their very nature, they are part of what it means to be a member of that discipline. Women and minorities who enter STEM fields are socialized into the dominant white male group identity. Even though they can never completely "live up" to this "ideal", it is what they understand as the identity of someone who works in STEM. An example is the discourse of "engineers are the best and brightest" mentioned earlier. Franks had heard some version of this rhetoric for nearly all her professional life as an engineer. Not only did she not view it as problematic, she was not even fully aware of it – it was a "given", just something engineers say about engineers. (See, for example, NAE 2004, Ch. 3 within, and Tonso, 1996.) Only when Burack pointed out to Franks the problem inherent in this rhetoric did it become obvious to Franks.

Conversely, a non-STEM practitioner would benefit from collaboration with someone in STEM to help them understand particularities of the profession and to guide them in effective ways of communicating with STEM practitioners. Burack's research (2004) has focused on the importance of language, images, and communication in groups and institutions. She has lectured on race and gender issues and has conducted workshops for faculty groups, professional organizations, and federal government offices on workforce diversity issues. Franks (2005) is an engineer and scientist with experience in academic and corporate workplaces, and was the founding director of the Kansas State Women in Engineering and Science Program. She has published scientific work as well as work on gender and science. Margolis and Fisher (2002) have described the benefits of working together to conduct an interdisciplinary STEM assessment project. We have found our experience on this project to be similar to theirs.

Developing a Website Evaluation Method

Research for development of the evaluation method began in 2003. When the consultant began this research, few resources were available for evaluating websites for content related to gender diversity. There were web-based resources to teach students to evaluate websites for accuracy and relevance to their scholarly projects. Other resources provided criteria for web use by accessibility, navigability, and the sophistication of website design. Many of these resources were pedagogical materials sponsored by universities and directed toward university students. Resources that provided criteria for users to evaluate the content of websites did not tie these criteria to the specific goal of facilitating gender or racial diversity.

On the other hand, there were diversity projects and initiatives, many of which had been created in and for institutions of higher education. These included curricular projects or initiatives that concentrated on improving the campus climate for women students and/or faculty. Others provided tools for diversity programs to collect data on gender and racial identity as well as the recruitment and retention of women and minority men. One notable example of a resource for evaluating websites to determine the extent to which "important multicultural principles [are] actualized (or not actualized)" is the "Multicultural Approach" developed by Paul Gorski (1999). The Multicultural Approach includes seven "criteria categories": relevance and appropriateness, credibility, bias identification, accuracy, accessibility, navigability, and "multiculturality." As Gorski points out, these criteria integrate concerns of "educational evaluation" (relevance, accuracy, navigability) with the specific content and conceptual concerns of a multicultural model (bias identification and multiculturality).

Another valuable extant resource for evaluating websites in the STEM disciplines for diversity is the Girls Tech Model, developed at Douglass College (the Women's College of Rutgers, the State University of New Jersey). The collaboration between Douglass and the Girl Scouts of the U.S.A. was directed by Denise E. Agosto, Project Investigator. Agosto developed the evaluation

Model to “to address the problem of women’s underrepresentation in, and seeming reluctance to pursue, technology fields.” The purpose of the framework is to provide adults who want to “bridge the gap between girls and technology” with tools for evaluating materials, including but not limited to web sites. The Model consists of eight evaluation criteria: confidence, collaboration, personal identification, contextuality, flexibility, motility, social connectivity, inclusion, and graphic/multimedia concentration. All these criteria are listed and explained on the Girls Tech website, located at http://www.girlstech.douglass.rutgers.edu/gt1a.html.

Both the Multicultural Approach and the Girls Tech Model suggest useful conceptual tools for a project whose purpose is to evaluate university websites in the STEM disciplines for gender diversity. However, neither of these excellent models were sufficient for the purpose. It would be necessary to devise and implement a website evaluation method that targeted higher education audiences in the STEM disciplines. In addition, the method would have to be sensitive to the particular kinds of diversity issues that arise in these disciplines.

The development of the Kansas State University website evaluation method was, therefore, an inductive project. Rather than beginning with some conception of how websites in the STEM disciplines should look or perform with regard to women and gender issues, the consultant began by surveying STEM discipline websites throughout the United States. Burack viewed websites of units (colleges, programs, and departments) in the disciplines of medicine, mathematics, physics, engineering, computer science, biology, chemistry, and geology. In addition, she surveyed the websites of units in diverse geographic regions and in a variety of institution types, from Doctoral/Research Universities to liberal arts colleges. The results of the survey confirmed that there is no generally accepted template for such websites. However, they did reveal certain themes that would be useful and important to address in a website diversity evaluation method.

Among these themes were: 1) the perception in STEM disciplines that websites are merely neutral conduits for the transmission of particular kinds of programmatic information, and 2) the absence, or less than optimal presence, of material on the websites that would convey affirmative messages about the diversity aspirations of units, disciplines, and their members. A complicating factor in the development of the evaluation method was that websites serve a variety of stakeholders. A viable method had to be flexible enough to meet the needs of a diverse group even as it appealed to a primary audience of students and prospective students.

The final evaluation method was based upon a central construct, the Equity Matrix (Figure 1). The Equity Matrix is comprised of eight main criteria divided into two groups. The more basic criteria address educational-asthetic issues and are grouped in a category called Inclusion. These include website aesthetics, uses of gender-inclusive language, images of women, and gender-inclusive links to other sites. The second category, dubbed Aspirations, consists of criteria that involve more complex avowals of purpose, linking diversity with departmental and disciplinary aspirations, and deep readings of websites as texts. Thus Aspirations includes the construction of affirmative discursive commitments to diversity on websites, descriptions of ways in which diverse professionals would be attracted to the applications of the discipline in the marketplace, and close attention to the ways in which female and male students and professionals are represented in texts. It also includes an open-ended criterion of eliminating discriminatory disciplinary traditions and practices (Burack and Franks, 2004). Each element in the matrix can be considered in relationship with any of the others; for example, III. (Photographic images) might clearly be involved in addressing elements VII. (Use science and technology in the real world) and VIII. (characterize female and male students and professionals).

FIGURE 1

THE EQUITY MATRIX

INCLUSION	
How we use or include:	
I. Color and Font	**II.** Language
III. Photographic Images	**IV.** Diversity-Friendly Links
ASPIRATIONS	
How we show that we do or have:	
V. Commit to Diversity	**VI.** Eliminate References to Discriminatory Traditions and Practices
VII. Use Science and Technology in the Real World	**VIII.** Characterize Female and Male Students and Professionals

Equity Enhancement Training comprises a three-step process: initial training of department representatives on the elements of the Equity Matrix and their use; revision of websites by department members or under departmental direction by applying the Equity Matrix to the particular needs of their discipline and university; evaluation of the revised websites by the trainer with a final report to the departments.

The K-State Equity Action Website Evaluation Project

The Equity Action website evaluation project began at K-State in the Spring of 2004, with the presentation of the Equity Matrix to the six partner departments in the ADVANCE program.. This initial training for faculty and other interested parties in these departments used a PowerPoint document containing the essential terms of the evaluation method with hyperlinks to STEM websites that provided positive and negative examples of each criterion of the matrix. The ADVANCE team also provided hard copies of all website materials to workshop participants. In this way, participants could view the website examples in real time and also take these examples from the seminar as a text to use in their own website revisions. A copy of this presentation can be viewed at the K-State ADVANCE website. (Burack, 2004a)

The partner departments had committed to several Equity Action projects, one of which was the Equity Enhancement Training. It was very important to emphasize their role as partners in institutional transformation. Avoiding the appearance of punitive or dictatorial approaches was important in getting the departments to take ownership of website diversity issues. In light of this, the consultant considered and rejected two possible pedagogical strategies because of their potential for creating an adversarial relationship between the parties to the website project. The first strategy would have been to evaluate the partner department websites before they were revised so that faculty and students would have a baseline against which to judge subsequent revision and evaluation. Although there was no baseline evaluation of websites, three departments did submit their websites for informal review before they began revisions, and the consultant returned comments intended to facilitate revisions consistent with the Equity Matrix. The second strategy would have been to use examples from partner department websites to illustrate positive and negative examples of evaluation points in the Equity Enhancement Training. Using only non-Kansas State STEM unit websites underscored for participants that the ADVANCE team's, as well as the consultant's, primary interest was in the revisions the partner departments would produce during their participation in the website evaluation project, and not in the unrevised versions with which they began the process.

After presenting the matrix in initial workshops, Burack returned to campus in the Fall of 2004 to consult in small groups with department representatives who would be responsible for website revisions and to present the matrix to interested representatives of non-partner departments. These small group meetings permitted members of partner departments to examine their websites with the consultant and to consider specific content or disciplinary issues and challenges. With the conclusion of these meetings, The ADVANCE team encouraged units to complete and submit website revisions by the end of Spring, 2005. Hence, the Equity Enhancement Method took approximately 15 months from the initial instruction phase to the submission of revised websites for evaluation.

Once all six partner departments had submitted their revised websites, Burack used the Equity Matrix to evaluate the websites and to issue a full report to each participating unit. Each report used a 5-point Likert scale to assign a numerical score for each of the eight matrix elements or categories: 5=Excellent, 4=Very good, 3=Good, 2=Fair, and 1=Poor. The final, overall score for each department reflected a cumulative total of points for the eight categories of the Equity Matrix. Total scores could range from a minimum of 8 ("poor" on every criterion) to a maximum of 40 ("excellent" on every criterion). Actual scores of the partner departments ranged from a low score of 24/40 to 35/40. As this range indicates, no department received a perfect score. The raw scores could essentially be translated into the equivalent of letter grades, in which case the lowest-scoring department received a D and the highest scoring department received a B+.

In addition to numerical scores, the reports broke out the eight evaluation criteria and used these criteria as bases for extensive comments on the website as a whole, as well as positive and negative examples from individual pages. Each set of discursive responses was presented in the eight categories and in sub-categories that were given particular attention in the scoring process. The discursive evaluations provided more detailed feedback, illustrated the Equity Matrix in action, and pointed to the basis for the numeric scores. Discursive responses were sub-divided into two groups of comments: positive examples presented as "Achievements," and remaining negative examples presented as "Suggestions." The "Suggestions" could certainly be used by departments for further revision, if they so chose.

A report issued to the ADVANCE team included all individual partner department evaluations. The cumulative report also included a chart with the Likert scores of each unit on each evaluation criterion, including total scores for each department. This reporting format highlighted specific information about the success of departments on each of the evaluation criteria, and it provided an accessible comparison of the final outcomes for the project. Of the six partner departments, five received passing scores for the website evaluation project, while one received a failing score. The department with a failing score chose not to make any revisions at all to their website. A discussion of the implications of their decision is presented in more detail elsewhere. (Montelone et al., 2006).

The Equity Enhancement Method was not designed as an iterative process. The "Suggestions" provided to partner departments in the evaluation reports could certainly be used by them for further revision, if they so chose. However, there was no requirement for the departments to do so. And while the partner departments had agreed to participate in the website project, there were no penalties for failing scores. The K-State ADVANCE team did conduct an evaluation of the effectiveness of the website revisions and found that the "aspects of the websites identified by…focus groups as making them welcoming and easy to navigate strongly paralleled the criteria used [in the] evaluation rubric." (Montelone et al., 2006) Other results and outcomes of the project, including extensions to other departments, are described in the same report.

One important finding from the Equity Enhancement Method that may have implications for other STEM departments engaged in diversity initiatives is that the majority of partner departments received "failing" scores on one key criterion of the Equity Matrix. Five of six partner departments received their worst numeric score on element V., "affirmatively committing to diversity." To receive a high score on this criterion, websites had to craft direct statements that described a unit's commitment to diversity. These statements did not need to conform to any particular template, so they could reflect a department's unique goals, language, or history. However, the criterion did require that statements of commitment to diversity could not be segregated on pages intended only or primarily for viewing by members of "diverse" groups. As useful as they might be at communicating to members of underrepresented groups in the STEM disciplines, such segregated messages *do not* communicate to all members of a disciplinary community that diversity is a central mission of departments and disciplines. The fact that the majority of partner departments in the Kansas State project were reluctant to thoroughly integrate statements of their commitment to diversity in their revised websites suggests that much work on diversity and cultural change in the STEM disciplines remains to be done.

Conclusions

The reluctance of STEM departments to affirmatively commit to diversity on their websites presents a serious problem, not just for diversity advocates, but for universities, and for STEM professions as a whole. As a recent National Academy of Engineering (2005) report has made clear, "…in the United States…the numbers of minorities will grow rapidly whereas those of the traditional majority will decline in a relative sense. This has major implications for the future of engineering." (4) Justice Sandra Day O'Connor, in announcing the *Grutter v. Bollinger* decision, charged universities to eliminate the need for race-conscious admissions policies within 25 years (NPR, 2003). It seems clear that the continued strength of the STEM enterprise in the U.S. will hinge upon a major influx of women and minorities. For this to happen, given the Supreme Court's timeline and the opposition of groups like the Center for Equal Opportunity, institution-wide commitment to increasing diversity must happen *now*. The willingness of STEM departments to publicly commit to diversity as a value is a necessary first step.

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