# Institutional Report Cards for Gender Equality: Lessons Learned from Benchmarking Efforts for Women in STEM 

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Toward Gender Equity in Science, Technology, Engineering, and Mathematics
Evidence has clearly established that women are underrepresented in science, technology, engineering, and mathematics (STEM) disciplines despite decades of interventions aimed at achieving gender parity (National Science Foundation, 2017). The dearth of women in STEM is a complex cultural phenomenon influenced by cognitive, motivational, and sociological factors (Wang and Degol, 2017). As such, efforts to address gender imbalance in STEM must be multifaceted: that is, aimed at reducing barriers and supporting women throughout their educational and academic careers using a variety of policy-based and practical interventions.

Four years ago, The New York Stem Cell Foundation Research Institute (NYSCF) convened a diverse group of scientists, physicians, leaders, and other stakeholders to create a Working Group for the Initiative on Women in Science and Engineering (IWISE). Over the course of three productive meetings and with support from the Doris Duke Charitable Foundation, the IWISE Working Group proposed seven actionable strategies to advance women in STEM (Smith et al., 2015). One of these strategies involved creating an institutional report card for gender equality to be completed by individuals applying for one of NYSCF's highly competitive grant and fellowship programs on behalf of their own academic or private research institution. The goal of this report card was to (1) establish a cross-sectional benchmark of gender representation and related policies against which future interventions, policy changes, or sociocultural progress could be measured (i.e., a "pilot phase" of data collection); and (2) motivate institu-
tions to address their own gender disparities by enabling comparisons over time and against other institutions of similar discipline and type, including highlighting best practices by high-performing institutions (i.e., the "recognition phase"). Indeed, addressing the complex issues that prevent institutional gender equality in STEM requires high-quality baseline data, as underscored in 15 years of experiences by the UK's Athena Scientific Women's Academic Network (SWAN) and the US's ADVANCE program (Rosser et al., 2019).
Here we discuss the outcomes of the 4-year pilot phase of the institutional report card initiative, which gathered information from over 500 institutions in 38 countries, and we outline future directions for efforts to promote gender equity in STEM.

## Implementing an Institutional Report Card for Gender Equality Report Card Development

In February 2015, the IWISE Working Group developed an Institutional Report Card for Gender Equality. The report card was designed to evaluate the commitment of individual institutions to promoting gender parity by collecting quantitative data on gender representation throughout the educational and academic pipeline (e.g., among students, professors, faculty member recruits, invited speakers, and key departmental or institutional committees) in addition to qualitative data on institutional policies to support women in science. Additional details and the report card itself can be found at https://nyscf.org/reportcard.

## Report Card Reporting and Analysis

Over a pilot phase spanning four Request for Application (RFA) cycles (2016-2019), NYSCF required every individual applying for funding through the competitive

NYSCF-Druckenmiller Fellowship and NYSCF-Robertson Investigator Awards to submit a report card on behalf of their institution. During this pilot phase, it was explicitly communicated that data from the report card would not affect funding application decisions.
After the 2019 RFA cycle closed, all the completed reports were consolidated into a secure, anonymized, and aggregated database for cleaning and analysis (see Supplemental Information). Institutional grades were calculated on a 10-point scale by multiplying the average percentage of women among undergraduate and graduate/post-graduate students; assistant, associate, and full professors; and invited seminar speakers by 10 .

## Findings from the 4-Year Pilot Show That Institutions Are Not Making the Grade

## Institution Characteristics

Of 1,287 submitted report cards, 741 provided complete and unique information for a given institution in a given year (Figure S1). Several institutions submitted report cards over multiple years (2 years, $n=82 ; 3$ years, $n=35 ; 4$ years, $n=16$ ). In total, the data represent 541 unique institutions across 38 countries (Figure 1). The majority of report cards were completed by North American (72\%) or European (18\%) institutions. Two-thirds (66\%) of these institutions represented the "basic sciences" and one-third (34\%) represented "clinical sciences." The vast majority (86.4\%) of institutions were university based, as opposed to research institutes, foundations, or privately funded hospital systems.
Gender Representation and

## Institutional Grades

As shown in Figure 2, women were well represented among undergraduate and


Figure 1. Geographic Distribution of Institutions Submitting Report Cards for Gender Equality
graduate/post-graduate student populations (mean $\pm$ SD: $57.1 \% \pm 15.7 \%$ and $52.2 \% \pm 16.0 \%$, respectively). Among faculty, however, as seniority increased, the representation of women decreased (assistant professors, $42.0 \% \pm 21.6 \%$; associate professors, $34.2 \% \pm 23.4 \%$; full professors, $24.0 \% \pm 18.2 \%$ ). In evaluating faculty recruitment over the last 5 years, women represented a greater proportion of first-time tenure track recruits $(40.4 \% \pm 26.6 \%)$ than lateral/senior hires of those who had already achieved tenure $(33.7 \% \pm 30.0 \%)$. Furthermore, nearly one-third of institutions responding to this question (116/377) reported that less than $10 \%$ of their tenured faculty recruits were women.

Women were underrepresented as external seminar program speakers ( $35.2 \% \pm 15.3 \%$ ) and in committees for faculty promotions ( $32.8 \% \pm 16.3 \%$ ), institutional strategy ( $38.5 \% \pm 18.4 \%$ ), and graduate student appointment/ recruitment ( $39.5 \% \pm 17.4 \%$ ). Representation was slightly more balanced on finance ( $43.9 \% \pm 26.7 \%$ ) and awards committees ( $41.0 \% \pm 22.9 \%$ ).

The average $\pm$ SD grade across all institutions was $4.0 \pm 1.3$ out of 10 , corresponding to $40 \%$ overall female representation among students, faculty, and
invited speakers. Figure 2 shows that grades were not normally distributed, however, with a notable rightward skew as very few institutions (only 103/538) achieved a grade 5.0 or above (corresponding to $\geq 50 \%$ female representation). Grades were higher at institutions with a clinical rather than basic science focus $(4.1 \pm 1.3$ versus $3.9 \pm 1.2$, $p=0.026$ ) and those located within Europe rather than North America ( $4.5 \pm$ 1.5 versus $3.7 \pm 1.1, p<0.0001$ ).

## Longitudinal Analysis

Among the 71 institutions with data spanning $>2$ years (e.g., 2016 and 2018), we performed an exploratory longitudinal analysis to evaluate trends in female representation over time. Just over half of institutions (42/71) improved their grades; however, the magnitude was modest (mean $\pm$ SD: $0.80 \pm 0.80$; or an $8.0 \%$ increase in female representation). Furthermore, among the $40 \%$ of institutions with worsening grades over time, the magnitude of this decrease was almost identical to that of the improvements $(-0.74 \pm$ 0.52 ; or a $7.4 \%$ decrease in female representation). In other words, our longitudinal analysis revealed no appreciable trend in gender representation changes, albeit over a short period of time and in a relatively limited subset of institutions.

## Policies to Support Women in Science

At the time of report card submission, $38 \%$ of institutions (278/741) had in place additional support mechanisms to fund paid family leave. Additional policies to support female scientists focused on childcare (e.g., on-site or contract-guaranteed positions at nearby daycares, extended hours, or paid childcare for at least 1 year), flexibility (e.g., videoconferencing for pregnant scientists, lactation rooms, family-friendly meeting times, technology to enable research from home, or extended eligibility periods for leadership positions for those who have taken parental leave), funding (e.g., a "mother's bonus" to be used for personal or research purposes, or extra travel allowances to pay for children and/or sitters to attend meetings), and career development initiatives (e.g., additional research or technical support to enable earlycareer female scientists to meet professional milestones, mentoring and networking programs, or mandated unconscious bias training for those serving on promotional committees).

With regards to gender representation on committees, $8 \%$ ( $56 / 741$ ) had an explicit requirement for a minimum number or percentage of women, $16 \%$ (117/741)


Figure 2. The Proportion of Women Among Student, Faculty, and Committee Populations across 541 Surveyed Institutions The x axis represents the proportion of women ( $0-100 \%$ ) among the given population (red = students; yellow = recruited faculty; blue = professorship or equivalent leadership positions; orange $=$ invited external seminar speakers; green $=$ committee representation) or the average grade ( $0-10$ ) across all students, professors, and external seminar speakers (purple). The y axis represents the number of institutions falling into each bin. Of note, the average was taken for each category for those institutions reporting > 1 year of data.
had general policies promoting gender diversity, and $77 \%$ (561/741) had no policy on the issue.

## How Can We Use This Report Card to Improve Gender Equality in STEM?

Over a 4-year pilot phase, NYSCF collected 741 unique report cards representing 541 institutions, 38 countries, and a diverse array of organizational structures and scientific disciplines. The collection effort itself was revealing: particularly in the early years of the report card initiative, applicants often cited apprehension from Department Heads who are required to submit the report card and indicated data collection or accessibility issues. This has improved
in the last 2 years, with a decrease in clarifying questions asked, and an uptick in percentage of report cards completed by the RFA deadline. Furthermore, by explicitly asking for data on gender representation and parental leave policies, this report card initiative has implicitly encouraged institutions to scrutinize their own policies and procedures to promote gender equity.

Despite an average grade of 4.0/10 across all institutions (corresponding to $40 \%$ female representation among students, professors, and invited seminar speakers), the proportion of women holding higher ranks or serving on influential committees remains disappointingly low. This is consistent with literature demonstrating decreased promotional opportu-
nities and increased attrition of women throughout the academic and professional pipelines (Nelson, 2017) due to a myriad of reasons including a lack of sponsorship or networking opportunities, disparities in funding and salary support, work-life tensions that disproportionately burden women, and implicit biases that slow the trajectory of women into leadership positions. In other words, the problems seem to lie less in the recruitment of women into STEM and more so in the retention and promotion of these women into those high-level positions where mentorship, influence, and groundbreaking research are most likely to originate. Of note, committee representation was not included in the summary grade calculation because a 50:50 gender
balance may not represent an equitable workload distribution or be the most productive use of a female scientist's effort and time, depending on the percentage of women within that organization and the type of committee (i.e., administrative versus strategic). Nevertheless, the findings about committee representation reported in the bottom row of the figure are sobering-institutions must monitor closely women's participation on committees, not only because diversity is valuable to promote the collective intelligence of groups but also because certain committees do have strategic importance and may serve as pathways to develop the leadership skills and visibility necessary to advance within an organization.

Nevertheless, the findings of this analysis, which are intended to serve as a cross-sectional benchmark rather than an evaluation of incremental change over time, should not discount efforts that have been made to promote the representation of women in STEM, for example by Athena SWAN, ADVANCE, or the Science in Australia Gender Equity (SAGE) programs. It is notable that several institutions-particularly those in Europe-reported to us innovative policies that subscribe to the seven actionable strategies proposed by IWISE in 2015, including flexible family care spending (\#1), "extra hands" funding (\#2), and gender-balanced peer review and speaker selection policies (\#3) (Smith et al., 2015). Additional initiatives noted in the literature include the creation of a "future STEM faculty" listserv to facilitate diversity in applicant pools (part of an ADVANCE project by Case Western Reserve University; https:// case.edu/ideal-n/about/project-description/ full-project-description) (\#7), incorporation of implicit bias statements in funding applications by the Doris Duke Charitable Foundation (\#4) (Alvarez et al., 2019), and dissemination of a quarterly publication focused on women's health, women in science, and funding opportunities by the National Institutes of Health (NIH) Office of Research on Women's Health (https://orwh.od.nih.gov/sites/orwh/ files/docs/ORWH-Spring-Newsletter2019-Vol2no1-508.pdf) (\#5).

The second phase of our institutional report card initiative (i.e., the "recognition phase") will be modeled-in part-after the Athena SWAN charter. Since 2005,

Athena SWAN has conferred awards of bronze, silver, or gold status to member institutions who have demonstrated good practices and meaningful interventions to advance gender equity (https:// www.ecu.ac.uk/equality-charters/athenaswan/). In 2016, the National Institute for Health Research (NIHR) Biomedical Research Center began requiring Athena SWAN silver status in order to shortlist applications for funding (https://www.nihr. ac.uk). For any strategies designed to promote or recognize women in STEM, however, an important consideration will be limiting administrative burden on both male and female applicants, for example by suggesting that an administrative assistant or representative from the Office of Diversity and Inclusion collect the data for the applicant's and Department Head's review.

Independent surveys and case studies suggest that Athena SWAN has had a perceived positive impact on women's career progression in STEM by improving opportunities for training and development, transparency, fairness of workload allocation, and department engagement in equality and diversity matters (Munir et al., 2013), although objective data are lacking. Furthermore, studies suggest that women perform most of this gender-equity work (Caffrey et al., 2016; Munir et al., 2013) and that both perceived positive discrimination (Ovseiko et al., 2017) and the withholding of NIHR research funding for a subjectively determined Athena SWAN status (Munir et al., 2013) may foster resentment.

To capitalize on the opportunities created by the report card initiative, the second phase of NYSCF's institutional report card strategy will focus on highlighting best practices, providing comparative data to institutes, and monitoring progress over time. We will also investigate the inclusion of other critical equality factors in the report card, such as the presence of women in top leadership positions, institutional investment in data collection and leadership development programming, the retention of tenured women as an indicator of a female-friendly work environment, and equitable salaries across gender, race, and ethnicity, as currently implemented by the Doris Duke Charitable Foundation application process (Alvarez et al., 2019). This
initiative will continue to focus on high-quality data collection in an effort to raise awareness of specific gender disparities and evaluate whether improvements in gender representation are occurring as a result of, versus independently from, report card collection. We hope that other funding bodies, like the NIH, will adopt a similar report card for funding mechanisms. In the absence of sweeping societal and cultural change, only through purposeful strategies and effort by scientific institutions will women reach gender parity in STEM.

## SUPPLEMENTAL INFORMATION

Supplemental Information can be found online at https://doi.org/10.1016/j.stem.2019.08.010.

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## AUTHOR CONTRIBUTIONS

W.B. consolidated and cleaned the data, performed analyses, and wrote the paper; R.J. provided supervision, performed analyses, and wrote the paper; K.A.S and R.H. collected the data, provided supervision, and wrote the paper; R.S.A. wrote the paper; E.S. provided supervision and wrote the paper; and S.L.S. led the IWISE workshop and conceptualization of the report card, provided supervision, and edited the paper.

## WEB RESOURCES

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