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Can gender-based diversity programs benefit everyone? We tested whether and how a broadening participation program intended to benefit women working within male-dominated academic fields of science, technology, engineering, and mathematics, may relate to job satisfaction for all who feel involved. Informed by self-determination theory (Deci & Ryan, 2012), we designed and tested a gender-diversity program that supported women faculty's psychological need for autonomy, relatedness, and competence through their involvement in five activities embedded in three "ADVANCE Project TRACS" (*T*ransformation through *R*elatedness *A*utonomy and *C*ompetence *S*upport) initiatives. Longitudinal repeated measures collected over 3 years from men and women tenure track faculty across disciplines show that for everyone, involvement with the program predicted a significant positive change in psychological need satisfaction. This change was associated with positive changes in job satisfaction over time. Results demonstrate the success of this particular program, and suggest that diversity programs that target one group can have wide-spread positive impacts on all who feel involved.

Keywords: self-determination theory, gender, STEM, diversity, job satisfaction

The United States government is heavily committed to bringing about gender equity within academic science, technology, engineering, and mathematical (STEM) fields. As one of the most comprehensive examples of this commitment, in 2001 the National Science Foundation (NSF) established the ADVANCE program to broaden the participation of women in STEM. With nearly a dozen NSF directorates and offices contributing resources to ADVANCE, this taxpayer funded endeavor—a broadly supported social, institutional, and intellectual "experiment" (Mervis, 2000)—aims to transform institutions to be more equitable and inclusive for women researchers in STEM. To date, ADVANCE grants have been implemented in

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more than 100 universities and nonprofit organizations. Institutions have devoted these and other resources to bringing about gender equity both because of the moral and political importance of creating equal opportunity, and because there is evidence that having a diverse and inclusive STEM workforce is important for the education of future scientists and to science itself (Harding, 2015; Intemann, 2009; Page, 2008). At the start of the ADVANCE program in 2001, 23.7% of tenure track STEM faculty at U.S. universities were women; the most recent statistic available from 2013 shows that this figure is up to 33.8% (National Science Foundation, 2004, 2014). Although it is impossible to attribute the increase in women in STEM over the years to any one factor, the increase nonetheless has important implications for the advancement of science and technology.

A 10% increase in the number of women faculty in STEM is worth celebrating. Yet, these numbers fluctuate wildly across various organizations and in subfields within STEM (e.g., Ceci, Ginther, Kahn, & Williams, 2014). There are abundant reasons to continue pursuing diversity (Apfelbaum, Phillips, & Richeson, 2014; Intemann, 2009), especially given that barriers to broadening the participation of women in STEM persist. For example, there is often resistance to affirmative action programs and policies aimed at correcting past gender biases (Harrison, Kravitz, Mayer, Leslie, & Lev-Arey, 2006; Thomas & Plaut, 2008) and a tendency to devalue research detailing the biases facing women in STEM (Handley, Brown, Moss-Racusin, & Smith, 2015). Moreover, attempts to "pass the buck" up the pipeline (e.g., "we need more women faculty role models to inspire young students") and down the pipeline (e.g., "we need secondary school teachers to do a better job of preparing girls") can make it difficult for any one institution to take responsibility for action. Indeed, a "supply side approach" to broadening the participation of women in STEM is likely to fail without a focus on changing the very culture of the STEM workplace (Bilimoria, Joy, & Liang, 2008; Carnes et al., 2012; Chen & Hamilton, 2015; Mitchneck, Smith, & Latimer, 2016). This suggests it is necessary to implement diversity-based programs that, while targeting the intended group, can benefit everyone.

Transforming an institution is a tall order. Identifying best practices, programs, and interventions is an important place to start (Bilimoria et al., 2008), but without examining *how* and *for whom* such programs work (Walton, 2014), it is difficult to ensure the success and longevity of the transformation. There are some noteworthy examples of university equity and diversity programs that use social science to inform trainings and assess interventions that broaden participation. Researchers at the University of Wisconsin, for instance, drew from research on implicit bias and implemented a gender-bias-habit-changing intervention. After this intervention, faculty reported increased self-efficacy for the promotion of gender-equity behaviors, increased value in faculty's own research, and a greater perceived ability to address both personal and professional conflicts (Carnes et al., 2015). At West Virginia University, the ADVANCE team drew from feminist and organizational theories to develop a department-level communication intervention designed to improve decision-making processes by working with each unit to develop a strategic plan. The preposttest intervention intentionally did not emphasize gender equity to minimize resistance. Preposttests showed improved levels of collective efficacy toward gender equality and decreased conflict across all of the STEM departments (Latimer, Jackson, Dilks, Nolan, & Tower, 2014).

We extend this past work and present a theoretically driven investigation of whether and how one such ADVANCE-funded institutional-level program to support women faculty in STEM brings about positive change for any faculty (no matter their gender or department) who feel involved. The program set out to create a self-determined context that supports the universal psychological needs of people to make meaningful connections with others (relatedness), have flexibility and choice over processes and outcomes (autonomy), and feel efficacious in mastering their environment (competence; Deci & Ryan, 2000). These three psychological needs together are posited to form the basis of human motivation, and when these needs are optimally satisfied, people experience the epitome of "self-determination" (Deci & Ryan, 2012).

Self-Determination Theory and Psychological Need Satisfaction

Self-Determination Theory (SDT) research shows that positive changes in psychological need-satisfaction, as measured by relatedness, autonomy, and competence, is associated with a host of positive markers including persistence, engagement, improved mental health, and better quality relationships with others (Baard, Deci, & Ryan, 2004; Deci & Ryan, 2012; Deci et al., 2001). For example, research shows that satisfaction of these three combined basic psychological needs is associated with decreased workplace-related exhaustion (Williams et al., 2014), as well as lower turnover intentions, lower burnout, higher workplace motivation (Trépanier, Fernet, & Austin, 2015), and higher annual performance evaluations (Baard et al., 2004). Although there is some evidence that one psychological need (e.g., autonomy) might influence a particular outcome more so than another psychological need (e.g., relatedness), the three needs are typically highly correlated and the theoretical convention is to understand overall need satisfaction for best predictive utility (see Deci & Ryan, 2000 for a review).

We were especially interested in the possible role of psychological need satisfaction in helping to understand the impact of involvement with a gender-diversity program on faculty job satisfaction. Job satisfaction is an important research focus because it significantly predicts a number of positive outcomes including enhanced job commitment (e.g., Chang, Leach, & Anderman, 2015), elevated organizational pride (e.g., Lam & Gurland, 2008), and low turnover rates (e.g., McBride, Munday, & Tunnell, 1992). Past research connects feelings of autonomy, competence, and relatedness with employee job satisfaction. For example, psychological need satisfaction in school principals was associated with greater emotional connection and support with their school districts and greater job satisfaction (Chang et al., 2015). Likewise, psychological need satisfaction predicted public and private sector administrators' lower reports of emotional exhaustion as well as greater levels of job satisfaction (Richer, Blanchard, & Vallerand, 2002). Cross cultural evidence further supports the psychological need satisfaction-job satisfaction connection; for example, employees in a United States-owned and a Bulgarian-owned business who self-reported higher satisfaction of the three psychological needs for competence, autonomy, and relatedness at work also reported more job satisfaction and higher work motivation in both countries (Deci et al., 2001). The evidence is replete with examples whereby greater feelings of self-determination are associated with employees' greater feelings of job satisfaction. As such, measuring a self-determined working situation may not be not new, but ours is the first project of its kind to use self-determination theory to understand faculty job satisfaction as a function of a diversity-based program in the academic workplace.

Current Investigation

Drawing from the framework offered by Self Determination Theory, we designed our ADVANCE gender-diversity program—called Project TRACS: (*T*ransformation through *R*elatedness *A*utonomy and *C*ompetence *Sup*port)—to enhance women faculty's general need satisfaction and inculcate greater job satisfaction and motivation across a university context. The Project TRACS program (described in the Method section and Appendix) aimed to promote gender equity through activities that fell into one of three initiatives: enhancing research capacity and opportunity, enhancing work-life integration, and enhancing cultural attunement.

Many organizational change theories posit that all people within the working context need to have buy-in for a broad cultural shift to produce the lasting changes that will address the gender disparity in STEM (e.g., Kezar & Eckel, 2002; Mitchneck et al., 2016). Indeed, according to SDT, changing the institutional climate is less about the degree to which a single woman in STEM has her psychological needs met, and more about whether, on average, the broader context fosters need-satisfaction (Baard et al., 2004; Deci, Connell, & Ryan, 1989). By inviting all faculty from all departments to be involved with Project TRACS, we were able to test if involvement with this gender-based diversity program targeting STEM women faculty can benefit all who feel involved, no matter gender or field of study.

Given that women faculty in STEM are the focus of the ADVANCE program, we actively sought out their participation. As such, women

faculty in STEM by definition should be more involved with Project TRACS compared with other faculty. Yet, the factors that improve working and learning conditions for women are the same factors that often improve the working and learning conditions for everyone (e.g., Brandes et al., 2001; Britton et al., 2012; Etzkowitz, Kemelgor, Neuschatz, Uzzi, & Alonzo, 1994; Page, 2008). Thus, we hypothesized that for everyone, no matter their gender or field, greater involvement with the three initiatives would have long lasting benefits. Thus, we set out to systematically test the effectiveness of Project TRACS in fostering job satisfaction via psychological need satisfaction. Drawing from SDT, we hypothesized that:

Hypothesis 1 (H₁): Women faculty in STEM would feel most involved with Project TRACS.

Hypothesis 2 (H₂): Greater felt involvement with Project TRACS would be associated with improved job satisfaction over time.

Hypothesis 3 (H₃): Greater felt involvement with Project TRACS would be associated with greater positive changes in psychological need satisfaction.

Hypothesis 4 (H₄): Greater psychological need satisfaction would predict enhanced job satisfaction over time.

Hypothesis 5 (H₅): The indirect effect of faculty's involvement with Project TRACS would result in positive changes in psychological need-satisfaction that, in turn, would improve faculty job satisfaction over time, regardless of faculty's gender or discipline.

Method

The ADVANCE Project TRACS Program

Montana State University (MSU) in Bozeman, MT is uniquely positioned both as a "higher activity" research university in the Carnegie classification and as a land grant, mid-sized, public university serving a rural state. In September 2012, MSU was awarded an NSF ADVANCE Institutional Transformational grant, led by a social science team with the

University's President and Provost as coinvestigators. We designed three initiatives (see Appendix) and focus here on five activities developed within these initiatives to meet faculty psychological needs in ways that would be particularly beneficial for women in STEM. We focus here on the portions of the program that were fully implemented in Year 2.

1. Enhancing research capacity and opportunity. The primary activity for this initiative was hiring a grant coordinator to help women in the process of securing extramural funding. This staff person's job included supporting faculty's feelings of: autonomy over the grant-funding process by offering creative and flexible options for controlling the grant seeking process; competence in how to manage and complete grant-related paperwork; and relatedness through facilitation of one-on-one and group meetings of similarly situated people and research mentors.

2. Enhancing work-life integration. The major activity for this initiative was the services of a dedicated faculty member as Family Advocate. This person provides confidential informational support for work-life issues and supports faculty's feelings of: autonomy in major life transition moments (i.e., childcare, elder, or partner care) by offering personalized choices for navigating family leave, breastfeeding, and other issues; competence in understanding university policies and practices; and relatedness through one-on-one advocacy and support.

3. Enhancing cultural attunement. This initiative contains three activities: organizing campus-wide cultural attunement workshops/ lectures focused on the value of gender diversity in the academy; training 24 faculty and staff as Equity Advocates to provide information to combat problems related to "chilly climate" or departmental isolation; and offering training to all faculty search committee members on evidence-based strategies to broaden searches and attract diverse candidates. This larger initiative generally fostered psychological need support of faculty's feelings of: autonomy by demonstrating how decision making can be undermined through implicit bias (see Smith, Handley, Zale, Rushing, & Potvin, 2015); competence by providing faculty with strategies and resources to reduce bias and create a positive and inclusive workplace; and relatedness by facilitating small group meetings of people to network, connect, and support

each other around the shared goal of equity, inclusion, and diversity.

We implemented these five activities within 33 academic departments across nine colleges situated within an institution of higher learning that is racially homogenous (91% White at baseline). Gender homogeneity was especially evident within STEM, which had 81% men faculty at baseline, with the 17 STEM departments across three colleges ranging from 67 to 100% male. By Year 3, the STEM departments had 75% men faculty, with departments ranging from 64 to 100% male.[1] We designed the activities to support women tenure-track faculty in STEM, but the entire campus community was informed about and invited to participate in Project TRACS activities, with campus communication and support for the program coming from top institutional leadership (i.e., the Provost and President and all academic Deans).

Participants

Figure 1 presents the characteristics of those eligible to participate each year and the characteristics of those who volunteered for the study, as well as information on those who completed the surveys at all three time points (i.e., Year 1, 2, and 3). There was a clear overrepresentation of women in both STEM and non-STEM who completed the survey all 3 years than would be expected from the general population of faculty; although, there were still more men than women respondents overall. The total sample of 152 participants with complete data from all 3 years was used in the longitudinal analysis. We report on the characteristics of the larger sample each year below because we also performed analyses at each time point using the full data available at that time point to understand possible group differences and similarities.

Year 1: Baseline: A total of 260 tenure track faculty (42.7% women; 47.3% in STEM; 93.0% White) of the possible 472 tenure-track faculty participated in an online baseline survey, representing a 55% overall faculty response rate, in the fall of 2012.

Year 2: Implementation year: A total of 239 (45.2% women; 45.6% in STEM; 92.5% White) faculty representing a 50% overall faculty response rate, participated

in the online campus-climate survey 1 year following baseline, in the fall of 2013.

Year 3: Follow-up: A total of 252 (46.0% women; 42.5% in STEM, 89.2% White) faculty representing a 53% overall faculty response rate participated in the third annual campus-climate survey in the fall of 2014.

We collected complete data from all 3 years from a total of 152 faculty (44.5% women; 48.7% within STEM, M_{age} = 47.27 years, SD = 2.29 years; 93.1% identified as White; see Figure 1). There was at least one respondent from every academic department who provided data at each time point. Participants in STEM were fairly evenly distributed between the STEM colleges: College of Letters and Science (36.5%), College of Engineering (33.8%), and College of Agriculture (29.7%). Non-STEM faculty came from a wide range of colleges, but were primarily from the College of Letters and Science (30.8%) and the College of Education, Health, and Human Development (19.2%). Faculty respondents from the other non-STEM colleges included the College of Business (14.1% of non-STEM respondents), College of Agriculture (6.4%), College of Nursing (10.3%), the Library College (6.4%), and the College of Art and Architecture (12.8%). At follow-up in Year 3, respondents' time at MSU ranged from 2 to 37 years (M = 11.71 years, SD = 8.80 years, with a mode of 5 years).

Procedure Overview

In October of 2012, before implementing any of the initiatives, we collected baseline (Year 1) job satisfaction and psychological need satisfaction data via an online survey. All tenure track faculty were sent an email link to an "annual campus climate survey" with a randomly generated code number (the same code was used every year), used only to match participant data over time. Incentives

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[1] With extensive cooperation between Project TRACS and the Computer Science Department, that unit recruited its first and second female tenure track professors who both started in the 2015–2016 academic year, but this fell outside our data collection window.
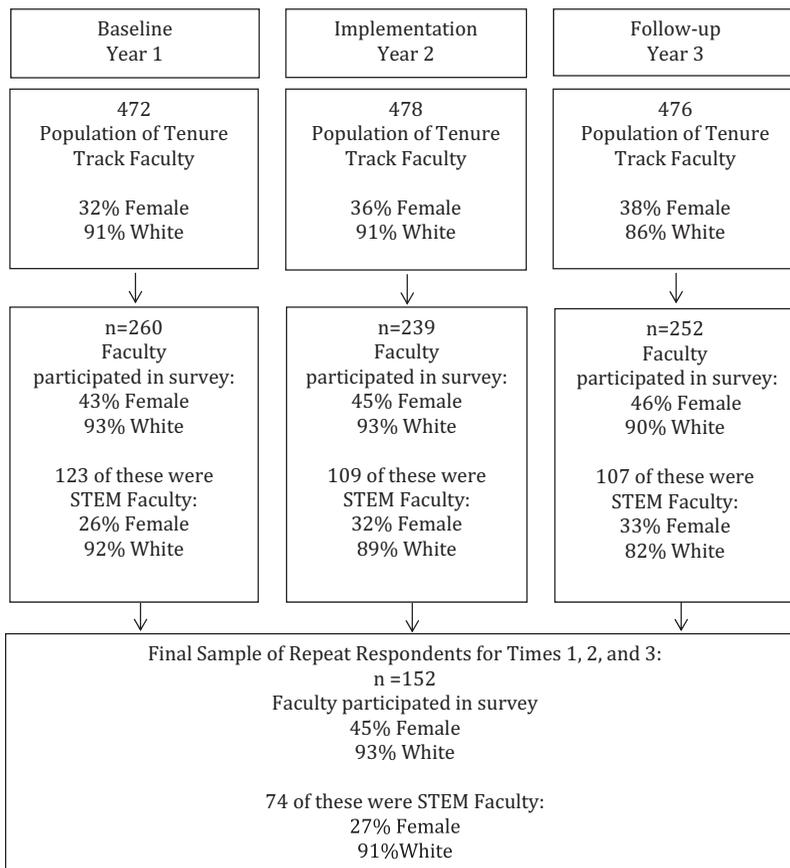
Baseline Year 1	Implementation Year 2	Follow-up Year 3
472 Population of Tenure Track Faculty 32% Female 91% White	478 Population of Tenure Track Faculty 36% Female 91% White	476 Population of Tenure Track Faculty 38% Female 86% White
n=260 Faculty participated in survey: 43% Female 93% White 123 of these were STEM Faculty: 26% Female 92% White	n=239 Faculty participated in survey: 45% Female 93% White 109 of these were STEM Faculty: 32% Female 89% White	n=252 Faculty participated in survey: 46% Female 90% White 107 of these were STEM Faculty: 33% Female 82% White

Final Sample of Repeat Respondents for Times 1, 2, and 3:
n =152
Faculty participated in survey
45% Female
93% White

74 of these were STEM Faculty:
27% Female
91%White

Figure 1. Population and participant characteristics at each time point, and for repeat respondents over time. STEM = science, technology, engineering, and mathematics.

included a $5 coupon to a local coffee shop and an opt-in drawing to win one of 25 $50 gift cards. Question order was counterbalanced and included attention check items (i.e., "respond 'neutral' if you are reading this item;" see Materials section).

We then implemented the three-initiative program for a full year and, in October 2013 (Year 2), collected data to assess perceived self and departmental involvement with the five Project TRACS activities (see Appendix). Finally, in October of 2014 (Year 3), we collected follow-up data from faculty to determine overall job satisfaction.

Measures

Job satisfaction. We asked faculty to reflect on their feelings in "the past year," then rate their opinions with 11 job-satisfaction items (sample items: "In general, how satisfied are you with your job?" "How satisfied are you with your work atmosphere?") on a 1 (*extremely dissatisfied*) to 7 (*extremely satisfied*) Likert scale. These 11 items comprise the "job satisfaction" subscale of the Work Climate Survey and show good validity in past research (e.g., Deci et al., 1989). The mean response to all items was calculated with higher scores indicating greater job satisfaction. A change score was created by subtracting the mean response for each respondent at Year 1 baseline from the response at Year 3 follow-up. Positive difference scores, therefore, reflect greater job satisfaction at Year 3 compared with Year 1. The job satisfaction measure demonstrated good internal

consistency: Year 1 Cronbach's α = .87; Year 3 Cronbach's α = .89.[2]

Psychological need satisfaction at work. Faculty were asked to rate "how true" each of 9 items were on the Basic Need Satisfaction measure validated by Deci et al. (2001), using a 1 (*not at all true*) to 7 (*very true*) Likert scale. Sample items included: "I feel like I can make a lot of inputs into deciding how my job gets done" (autonomy) "I do not feel very competent when I am at work," (reverse scored, competence) and "I get along with people at work" (relatedness). This composite measure also demonstrated adequate internal consistency: Year 1 Cronbach's α = .72; Year 2 Cronbach's α = .76. The mean response to all items was calculated with higher scores reflecting greater psychological need satisfaction. The three needs were positively correlated at each measurement point (ranging from a low Pearson $r(278) = .44$, $p < .001$ between Year 1 competence and autonomy; to a high of $r(239) = .53$, $p < .001$ between Year 2 competence and relatedness). As in other work that considers overall psychological need satisfaction as a composite variable (e.g., Baard et al., 2004; Deci et al., 2001; Gagne, 2003; Trépanier et al., 2015), we also focused our primary analysis on the composite measure. As noted in the results section, examination of the needs separately did not change the interpretation of the findings. Finally, a change score was created by subtracting the mean response for each respondent during baseline from the response during implementation. Positive difference scores, therefore, reflect greater psychological need satisfaction at Year 2 compared with Year 1.

Involvement with Project TRACS. At Year 2, after one full year of possible involvement with the program initiatives, faculty reported on their perceived (self and departmental) involvement with the 5 Project TRACS activities (the grant coordinator; the family advocate; cultural attunement workshops/lectures; equity advocate program; and faculty search broadening participation training). People answered two items for each of the five activities: ("This past year, how much have you been involved with ___?" and "This past year, how much has your department on the whole been involved with ___?"). The order of programs presented in the survey was counterbalanced. Participants rated the programs on a scale from 1 (*not at all*) to 6 (*extremely*), with an added option to indicate if they were unaware of a given program. Self and departmental involvement ratings were highly correlated with Pearson's $r(170) = .53$, $p < .001$. Items were averaged together to form an overall "involvement with Project TRACS" mean summary score, with higher scores indicating greater perceived involvement. This measure showed satisfactory internal consistency (Cronbach's α = .80) and although face-valid, there is no past research to support its validity.

Results

Analyses Overview

First, we conducted correlational analyses among the study variables with the full data available at each time point. The correlations across time points were necessarily calculated with data from repeat responders. Second, we conducted analyses of variance to examine potential between-groups differences in the study variables at each time point, using the full data available at that time point. Of primary interest, however, were *changes* in overall psychological need satisfaction as measured by autonomy, competence, and relatedness, from baseline to a full year after the program was in place, and changes in job satisfaction from baseline in 2012 to the follow-up 2 years later in 2014. Although the use of difference scores has been criticized as a measure of change (Cronbach & Furby, 1970), there is emerging agreement that change scores can, and should, be used (Allison, 1990; Gollwitzer, Christ, & Lemmer, 2014; Rogosa, 1995). To test this change, we conducted analyses with maximum likelihood estimation and estimated indirect effects using bootstrapped *SE*s; this procedure for testing indirect effects is now recommended over a causal steps approach (MacKinnon & Fairchild, 2009) and provides a better test of mediation than the Baron and Kenny (1986) procedure. This technique (see Preacher & Hayes, 2004) allows a

[2] Job satisfaction was also assessed at Year 2 (Cronbach's α = .89) during the implementation year. It was not ideal to consider this measurement of job satisfaction as a predictive outcome, given it co-occurred in time with the implementation process measurements. As such, Year 2 job satisfaction is included only for descriptive purposes.

simultaneous test of our hypothesized effects through mediators in the specified sequence. Bootstrapping involves repeatedly resampling from the data, with replacement, and produces a confidence interval to determine if the indirect effect is zero (no mediation) or if the indirect effect does not include zero (significant mediation). We used Mplus (v. 7; Muthén & Muthén, 2012) for these analyses.

Relationship among the variables. We first ruled out the possibility that perceived involvement with ADVANCE Project TRACS differed depending on initial levels of job satisfaction or psychological need satisfaction. Initial levels of job satisfaction and psychological need satisfaction were not correlated with subsequent involvement with Project TRACS (see Table 1), suggesting no meaningful preexisting differences.

Between-groups analyses. Separate 2 (men vs. women) $\times$ 2 (STEM vs. non-STEM) factorial analyses of variances (ANOVAs) were conducted on each of the dependent variables. At Year 1 (Baseline), there were no main effects or interactions involving gender and type of field on job satisfaction (all ps > .09; see Table 2). However, faculty in STEM fields reported greater psychological need satisfaction (i.e., the composite index of autonomy, competence, and relatedness) compared with faculty in non-STEM fields, $F(1, 257) = 3.07$, $p < .05$, $\eta_p^2 = .02$). No other statistically significant differences emerged. This shows that women in STEM were not starting off at lower levels of job satisfaction than other people and allows us to test for changes in job satisfaction with everyone starting at (statistically) similar levels of job satisfaction.

With these assumptions confirmed, we were positioned to test H_1, which predicted that women faculty in STEM would feel more involved with Project TRACS than men. Results showed that at Year 2 (Implementation), women did report greater involvement with ADVANCE Project TRACS than men, $F(1, 212) = 15.11$, $p < .001$, $\eta_p^2 = .07$). Further, a significant interaction between gender and field of study indicated that this gender difference was particularly prominent within STEM fields, $F(1, 212) = 14.49$, $p < .001$, $\eta_p^2 = .06$). This finding is consistent with H_1, and was expected given that women in STEM were the target of the program. The Year 2 data also illustrated that faculty in STEM reported higher job satisfaction than non-STEM faculty, $F(1, 235) =$

7.17, $p < .01$, $\eta_p^2 = .03$). The analysis of psychological need satisfaction showed no other significant effects (all ps > .20; see Table 2).[3] At Year 3 (Follow-up), STEM faculty continued to report greater levels of job satisfaction compared with non-STEM faculty, $F(1, 248) = 10.69$, $p < .01$, $\eta_p^2 = .04$ (see Table 2; no other effects were significant for this measure).

Indirect effects model. We next set out to test for possible *changes* in job satisfaction among faculty from baseline to the follow-up as a function of reported involvement with Project TRACS and changes in psychological need support as measured by the composite measure of autonomy, competence, and relatedness. Analyses were repeated separately for each psychological need of relatedness, autonomy, and competence and for involvement with each of the five activities separately. Results showed no one psychological need was uniquely impacted, nor was one initiative more or less important. Data are thus reported only for the overall composite variable, in line with other SDT research (e.g., Baard et al., 2004; Gagne, 2003). To test our main hypotheses, we only conducted analyses on faculty who reported complete data all 3 years ($n = 152$), rather than estimating missing data. This allows for a strong test of change over time among the same set of faculty.

Standard β coefficients calculated from multiple regression analyses are included in Figure 2 to illustrate the strength and direction of the relationships. We also provide the R^2 variables below as descriptive effect size indices to interpret the significant path associations.

> H_1: We found support for H_1 whereby there was a significant indirect effect from the interaction of field of study and faculty

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[3] An exploratory analysis of the mediation model predicting overall job satisfaction measured at Year 2 showed a significant indirect effect between field of study and faculty gender predicting Year 2 job satisfaction: (bootstrapped, 95% CI .003 to .12) and between ADVANCE involvement and implementation year job satisfaction: (bootstrapped, 95% CI .008 to .12). Although these measurements co-occurred and directionality cannot be determined in the implementation year, results suggest that when taking into account field of study and faculty gender, 17% of the variability in Year 2 job satisfaction was accounted for by changes in psychological need satisfaction from baseline. These changes in need satisfaction significantly mediated the association between Project TRACS involvement with implementation year job satisfaction.

Table 1
Pearson Product Moment Correlations Among the Variables Across Time

Variable	1 (n)	2 (n)	3 (n)	4 (n)	5 (n)	6 (n)	7 (n)	8 (n)
Year 1: Baseline								
Psychological need satisfaction (1)	—							
Job satisfaction (2)	.73** (259)	—						
Year 2: Implementation								
Involvement with ADVANCE (3)	−.01 (142)	.13 (142)	—					
Psychological need satisfaction (4)	.78** (152)	.68** (152)	.06 (216)	—				
Changes in psychological need satisfaction from baseline (5)	−.29** (152)	−.02 (152)	.19* (142)	.38** (152)	—			
Job satisfaction (6)	.47** (152)	.72** (152)	.21** (216)	.69** (237)	.31** (151)	—		
Year 3: Follow-up								
Job satisfaction (7)	.47** (152)	.67** (126)	.14 (136)	.53** (151)	.16 (100)	.75** (149)	—	
Changes in job satisfaction from baseline (8)	−.20* (126)	−.27** (126)	.21* (90)	−.07 (99)	.38** (99)	.21* (97)	.54** (126)	—

$* p < .05.$ $** p < .01.$

Table 2
Descriptive Institutional Data by Participant Gender and Field Type Across Time

Variable	Women in STEM M (SD)	Men in STEM M (SD)	Women in non-STEM M (SD)	Men in non-STEM M (SD)	Faculty total M (SD)
Year 1: Baseline (N = 260)					
Overall psychological need satisfaction	5.26 (.79)	5.49 (.72)	5.12 (.96)	5.16 (.97)	5.28 (.88)
Job satisfaction	5.02 (.92)	5.18 (.90)	4.81 (1.16)	4.90 (1.26)	4.99 (1.08)
Year 2: Implementation (N = 239)					
Involvement with ADVANCE	3.18 (1.20)	2.18 (1.15)	2.54 (1.29)	2.20 (1.21)	2.45 (1.26)
Overall psychological need satisfaction	5.32 (.73)	5.23 (.86)	5.27 (.87)	5.17 (1.04)	5.24 (.89)
Job satisfaction	5.30 (.75)	5.09 (.89)	4.94 (.98)	4.71 (1.27)	4.98 (1.02)
Year 3: Follow-up (N = 252)					
Job satisfaction	5.28 (.99)	5.20 (.98)	4.76 (1.15)	4.81 (1.10)	4.97 (1.09)

Note. STEM = science, technology, engineering, and mathematics. All measures scored on 1 (*not at all*) to 7 (*extremely*) except for *Involvement with ADVANCE* that was scored on a 1 (*not at all*) to 6 (*extremely*) scale. Between-group differences each year were analyzed with analysis of variance (ANOVA) and are reported in the text.
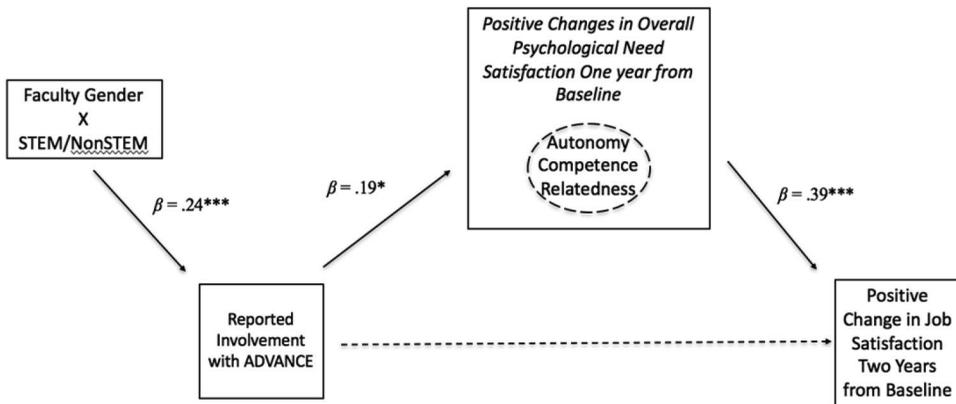
Figure 2. The indirect effect of involvement with Project TRACS on changes in job satisfaction among faculty over time. Standardized β coefficients are included to depict the strength and direction of the association of the given direct pathway (solid line). The greater the Beta value, the greater the impact of the preceding variable on the following variable, with $^*p < .05$ and $^{***}p < .001$. Faculty gender was coded as $1 =$ female, $0 =$ male and STEM field was coded as $1 =$ STEM and $0 =$ non-STEM. Results show a significant indirect effect between Project TRACS involvement, no matter the person's gender or field of study, and Job Satisfaction (dotted line, bootstrapped, 95% CI .0006 to .108). STEM = science, technology, engineering, and mathematics; TRACS = *T*ransformation through *R*elatedness *A*utonomy and *C*ompetence *S*upport; CI = confidence interval.

gender on ADVANCE involvement (bootstrapped, 95% confidence interval [CI, unstandardized] .005 to .105; see Figure 2). These results confirm the implementation year group-level data reported above.

H_2: Results showed a significant effect between Project TRACS involvement and changes in job satisfaction (bootstrapped, 95% CI [unstandardized] .006 to .111; see Figure 2), supporting H_2.

H_3: Results revealed that the interaction between field of study and faculty gender predicted greater reported involvement with ADVANCE Project TRACS ($R^2 = .056$), which subsequently predicted positive changes in overall psychological need satisfaction ($R^2 = .036$), supporting H_3.

H_4: Results also showed that positive changes in overall psychological need satisfaction predicted positive changes in job satisfaction ($R^2 = .155$), supporting H_4.

H_5: Results show a significant indirect effect between Project TRACS involvement, no matter the person's gender or field of study, and positive changes in job satisfaction (bootstrapped, 95% CI .0006 to .108),

supporting H_5. An overall multiple regression analysis performed for interpretation purposes, showed that 21% of the variance ($R^2 = .207$) of the positive change in job satisfaction was accounted for by the variables (see Figure 2). The more any faculty member felt involved with Project TRACS, the more they reported experiencing positive changes in their psychological need satisfaction that in turn was associated with positive changes in their job satisfaction over time.

Discussion

Results show that a diversity supporting program targeting women in STEM can benefit everyone who feels involved. As hypothesized, our programming did successfully target women in STEM, as they reported the greatest involvement with Project TRACS. Yet, even considering the different levels of involvement across groups, our results also reveal that the more a faculty member felt involved with Project TRACS, the more he or she reported positive changes in psychological need satisfaction. Such psychological need satisfaction was, in

turn, associated with positive changes over time in job satisfaction among all faculty.

Improved job satisfaction is critical not only from a retention and economic standpoint but is paramount to attracting the next generation of scholars (Beckerle et al., 2011). Indeed, while the national conversation about gender disparities in STEM focuses on *recruiting* more women researchers from all backgrounds, broad participation in STEM will not be achieved until institutional cultures and practices change in ways that also focus on *retention* vis-à-vis "creating a workplace where all scientists and engineers want to be" (Mitchneck et al., 2016, p. 148). Our study suggests one way to start this change process is by focusing on ways the university can meet women faculty's psychological needs of autonomy, competence, and relatedness in the areas of research opportunities, work-life integration, and a culturally attuned workplace. Importantly, our results reveal that diversity programs like ours targeting women in STEM can be implemented in a way that indirectly benefit everyone who engages and feels involved—no matter their gender or discipline.

One innovative appeal of Project TRACS was the use of SDT (Deci & Ryan, 2000, 2012) in driving the design of the initiative components, as well as providing a theoretical pathway to study the *process* of the program impact. Our findings illustrate an "additive process" such that the five activities embedded in the three initiatives contributed to overall need-satisfaction and together had an additive positive association with changes in job satisfaction over time. Our results support other SDT research that demonstrates the utility of a composite conceptualization of psychological need satisfaction (e.g., Baard et al., 2004; Trépanier et al., 2015) versus a focus solely on autonomy support (Chang et al., 2015) or autonomy and competence support (Williams, Levesque, Zeldman, Wright, & Deci, 2003). Indeed, relatedness as a unique psychological need is understudied (Sansone & Smith, 2000).

Limitations and Future Directions

Our research is met with some limitations. For one, we did not employ random assignment in our research. Thus, it is possible the changes we observed in job satisfaction resulted from factors independent of Project TRACS. How-

ever, this possibility is unlikely as participants served as their own controls over time. We also know our study results are bound by our selected measurement of constructs. For example, participants reported their perceived level of involvement with the program. We argue that actual involvement would be difficult to assess and does not capture the experience of feeling involved. Thus, it is a question for future research to determine if a faculty member's precise level of involvement with the various program initiatives (e.g., hours of contact) is a similar marker of job satisfaction over time. Moreover, our analyses plan included calculating change scores. The very good internal reliability of the individual scales at each time point provide confidence in the published instruments, and there was no reason to expect that regression toward the mean would happen between groups (for women but not men or for those who felt or did not feel involved with Project TRACS). Nevertheless, using change scores is a matter of debate (e.g., Allison, 1990; Cronbach & Furby, 1970; Gollwitzer et al., 2014; Rogosa, 1995) and future research might consider replicating results with alternative instruments and analysis techniques.

Of note, our research took place within a single university setting with primarily White faculty participants. Fully 93% of faculty at this university identified as White and no other information (e.g., sexual orientation) were available for analyses. Such lack of diversity in our population rendered it impossible to use an intersectional lens that considers the complexity and richness of women's multiple identities (Else-Quest & Hyde, 2016). Although decades of research support SDT in general (e.g., Deci & Ryan, 2012), it is not clear whether the benefits of our gender-diversity program would extend to other unrepresented faculty or to different academic institutions (e.g., liberal arts colleges, Historically Black Colleges). However, Deci and Ryan (2012) suggest that autonomy, competence, and relatedness are universal human needs and, thus, we would predict that broad and inclusive programming that can support these needs among an institution's faculty should benefit faculty regardless of various identities.

Our study adds to the literature showing that campus-wide diversity-enhancing programs that target one group can benefit more than just the intended audience. That said, a truly transformed higher education workplace cannot start

with women in STEM and then endure on "autopilot." Rather, to create and maintain positive changes in job satisfaction over time requires extrapolating from the lessons of a given gender-diversity program like ADVANCE Project TRACS to a framework for fostering racial and ethnic diversity, a safe and inclusive workplace for sexual minority faculty, and an awareness of how other forms of difference, including disability, socioeconomic background, and family status may impact a faculty member's psychological needs and feelings of job satisfaction. The next important research question is how to sustain the positive impact of a given gender-diversity program in ways that do not backfire (e.g., a flexibility stigma, Cech & Blair-Loy, 2014; Coltrane, Miller, DeHaan, & Stewart, 2013) or trigger resistance (e.g., Thomas & Plaut, 2008). After all, even when a university supports equity and inclusion programs and has the resources to fund them, these goals ultimately compete with the many other goals that administrators must consider.

Implications for University Personnel

Diversity improves the way people think (e.g., Apfelbaum et al., 2014; Levine et al., 2014) and is thus crucial to the core mission of most universities. Diversity, however, does not just happen on its own (Arnett, 2015) and broadening the participation of women in STEM takes a commitment to transforming academia (Mitchneck et al., 2016). Our program dedicated people to leading and implementing each initiative, and these positions are now institutionalized. University leaders can feel emboldened that an investment like this in organizational level diversity-enhancing programs can benefit more than just the targeted group. We hope that aspects of our three initiatives will be useful in other institutions, knowing that each institution and community has different strengths, concerns, and priorities. It is in this spirit, that all parts of our initiatives (see Appendix) are freely available in the form of toolkits and guidebooks on our website. With that said, it is up to other universities to assess readiness, determine an approach, and set transformation goals in a way that makes sense for the unique setting of the given academic institution, the unique identities of the people who work at the institution, and in ways that are sustainable over the long term (e.g., Ahmed, 2012; Silka, 2010).

Conclusion

We tested if a gender-diversity program designed to provide psychological need support to women faculty in STEM would result in positive changes in job satisfaction for anyone who felt involved in the program, regardless of gender or field of study. Informed by Self-Determination Theory (Deci & Ryan, 2012), we designed and implemented Project TRACS, comprised of three initiatives: enhancing research capacity and opportunity, enhancing work-life integration, and enhancing cultural attunement. We analyzed longitudinal survey data collected from tenure and tenure track faculty, from baseline in Year 1, to implementation in Year 2, to final follow-up in Year 3. Results showed women faculty in STEM, as the target of the programming, were most likely to be involved with Project TRACS. However, anyone who reported feeling involved with the program activities experienced positive changes in their overall feelings of autonomy, competence, and relatedness, and this psychological need satisfaction predicted positive changes in job satisfaction over time. In short, the initiatives and activities comprising our ADVANCE Project TRACS program show it is possible to focus on faculty diversity, equity, inclusion in ways that can and does benefit everyone.

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Appendix

Overview of ADVANCE Project TRACS Program Initiatives

1. Enhancing Research Capacity and Opportunity

Operating on the assumption that retention and advancement of STEM faculty women is enhanced when they are grant successful, ADVANCE has hired a dedicated staff person to help train and support women with the grant-proposal process. The "Grant Submission Training Coordinator" provides a range of supports to all faculty members, but gives priority to female faculty in the STEM fields. These efforts include training and assistance with: generating high quality grants, budget development, paperwork submission, responding to reviewers, researching unique circumstances related to possible grant activities and facilitating interdisciplinary collaborations. The Grant Submission Training Coordinator hosts a 6-week Grant Writing Boot Camp each semester, where a small group of faculty and staff learn about the entire grant writing process from finding and securing funding to planning for official submission, see The Grant Writing Boot Camp for University Faculty: A Facilitator's Guide (Third Edition) at: http://www.montana.edu/facultyexcellence/research/bootcamp/facilitatorsguide.html

For more information about this position or initiative please visit: http://www.montana.edu/facultyexcellence/research/grantcoordinator.html

2. Enhancing Work-Life Integration

Operating on the assumption that work-life integration is especially difficult to navigate when women faculty are working in male-dominated fields, we expanded the role of a dedicated and trained faculty Family Advocate to provide confidential and informational support for work-life issues to current and interviewing faculty. The Family Advocate supports the goal of recruiting and retaining a flourishing university community by helping to create an inclusive campus that effectively supports diverse identities. In this role, the Family Advocate supports members of the campus community as they navigate the university system and learn about programs and policies available to meet their family caregiving needs. They act as a "first-stop" for anyone in need of direction for thinking through family caregiving options or negotiating arrangements for family caregiving

(Appendix continues)

leave, and serve on a number of campus committees advocating for the best interest of faculty's family caregiving needs. The Family Advocate serves as a knowledgeable resource on programs regarding family and medical leave across the life span, childbirth and adoption, breastfeeding, Family Care Rooms, and childcare on campus. Take a look here at the Family Advocate Facilitator Guide for more specific information regarding the Family Advocate position in terms of training, necessary resources, knowledge, and best practices: https://www .montana.edu/provost/family-advocates/docum ents/MSU%20Branded.%20FA%20Toolkit %20June%202016.Final_web.pdf

For more information about this position or initiative please visit: https://www.montana.edu/ provost/family-advocates/index.html

3. Enhancing Cultural Attunement

ADVANCE promotes sensitivity to the dynamics of relationships within a culture, and respect for the values and beliefs of cultures. Cultural Attunement comes from the active and vigilant practice of maintaining cultural humility, and represents active attention and ongoing critical self-reflection. To realize this, we engage the campus community in unconscious bias education, started an Equity Advocate program, and implemented new faculty search trainings with an accompanying toolkit.

Education/Workshops

During the first year of the program reported on here, the largest formal event was hosting the CRLT (Center for Research on Learning and Teaching) Players. With 162 in attendance, the CRLT players performed an entertaining and informational scenario about tenure meeting discussions. Faculty members were able to learn about and discuss issues of pedagogy, diversity, and inclusion. During the implementation period, we also hosted a Workshop on Faculty Recruitment for Diversity and Excellence presented by University of Michigan ADVANCE STRIDE (Strategies and Tactics for Recruiting to Improve Diversity and Excellence). Faculty members learned about best practices to maximize the likelihood that diverse, well-qualified candidates for faculty positions will be identified and, if offered a position, successfully recruited. This workshop was also made available

for those who could not attend via videotape on our web page. Additionally, in this implementation period we hosted Hastening Diversity: A Workshop with Dr. JoAnn Moody. During this workshop, Dr. Moody provided practical ways to improve faculty and staff recruitment, retention, and mentorship, especially of underrepresented women in STEM and SBS fields. For more information about our educational events and trainings visit: http://www.montana.edu/ nsfadvance/events.html

Equity Advocate Program

This program consists of (at the time, 24) trained employees from all over campus that serve as confidential and informational resources to other faculty and staff. Equity Advocates serve the campus by actively contributing to institutional transformation by promoting and enhancing fairness, diversity, equity, and inclusiveness. This program was in the very early stages during the first program year, and consisted of extensive training of the Advocates (e.g., a campus-wide media campaign advertised the program). For more information on this program, take a look at our Equity Advocate Facilitator Guide: Creating and Maintaining a Sustainable Program: http://www.montana .edu/equity/documents/equityadvocates/MSU %20Branded%20EA%20Guide%20.pdf

Faculty Search Training

Described in depth elsewhere (Smith et al., 2015), ADVANCE designed a three-step approach to changing the faculty search process. A toolkit, a training webinar, and working with the Family Advocate (described above) were put in place to assist search committee members on how to conduct a broad search and recruit and hire diverse candidates. For more information on any of our recruitment and retention resources visit our resources page at: http://www.montana.edu/ nsfadvance/resources.html. This particular aspect of the ADVANCE Project TRACS program was found to be very effective on our campus. The number of female faculty candidates both considered for and offered a position was significantly higher with this search training intervention (Smith et al., 2015).