ADVANCE Catalyst:

Organizational Change for Gender Equity in STEM Academic Professions*

(Year 1 Evaluation Report)

Jianjun Wang

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Contents

Abstract

California State University, Bakersfield (CSUB) was awarded a two-year NSF grant, "ADVANCE Catalyst: Organizational Change for Gender Equity in STEM Academic Professions", that began in Fall 2022 to examine potential systemic barriers against female faculty of science, technology, engineering, and mathematics (STEM) in recruitment, retention, and promotion. In the first year, the grant team has made satisfactory progress in the preparation of an organizational self-assessment for identifying STEM faculty inequities. More specifically, the team modeled after the best practice in the instrument design and worked with the Fresno State colleague on dashboard creation. Accompanied by the external partnership building, the grant team made internal adjustments to minimize the impact of an unexpected personnel change. The report concludes with three recommendations for project improvement. The overall evaluation design is guided by a well-established model of Results-Based Accountability and conforms to the utility, feasibility, propriety, and accuracy standards of program evaluation.

ADVANCE Catalyst:

Organizational Change for Gender Equity in STEM Academic Professions

On August 9, 2022, the National Science Foundation (NSF) awarded California State University, Bakersfield (CSUB) a two-year grant, "ADVANCE Catalyst: Organizational Change for Gender Equity in STEM Academic Professions," to investigate potential career barriers against female faculty of science, technology, engineering, and mathematics (STEM) across the process of recruitment, retention, and promotion. While the issue is systemic in nature, institutional factors rarely act in isolation. With the NSF grant support, intersectional approaches are taken to disentangle this multidimensional problem, and thus, configure strategies for bettering the career experiences of women of color, LGBTQ+ women, and other marginalized groups.

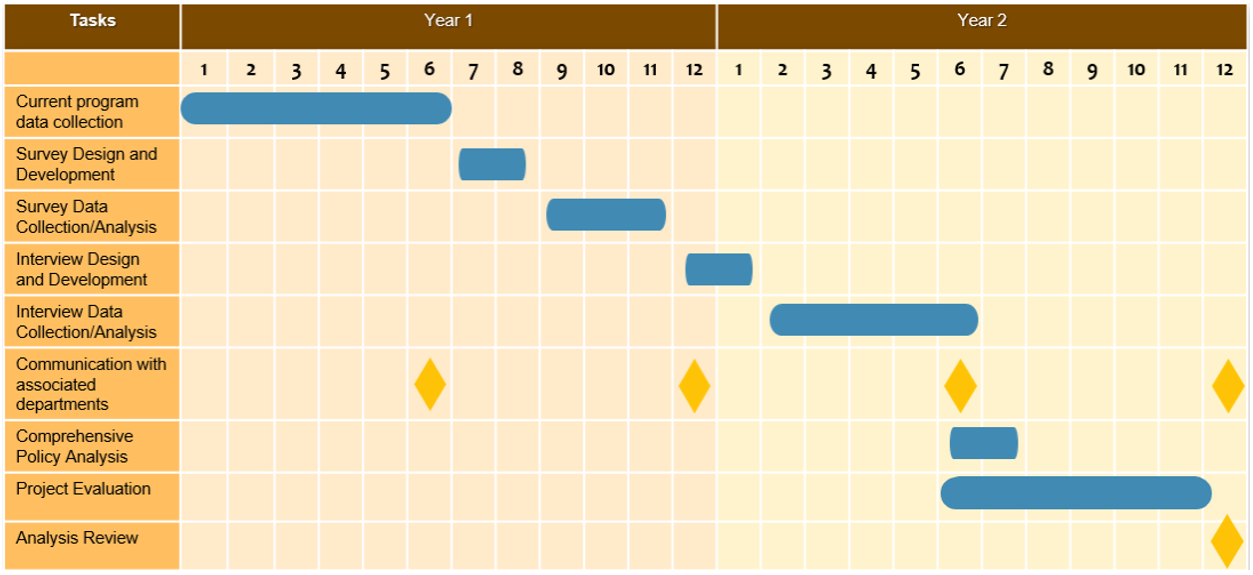
The ADVANCE program contributes to the NSF goal of achieving a more diverse and capable workforce in higher education. To broaden the impact, NSF has extended its STEM subject definition to include *Social Behavioral and Economic Sciences*, as well as *Education and Human Resources*[1]. In this context, the grant team works toward identifying amendable factors to support the professional careers of female faculty across these academic departments. As Dr. Lynnette Zelezny, CSUB President, clarified,

> Research shows that girls and women have been discouraged from pursuing careers in the sciences, which deprives them of the opportunity to follow their dreams. We want to reverse that trend, and when we have a greater representation of women faculty members in the STEM disciplines, they will become role models for girls throughout our region. (see Ardis, 2022)

[1] https://www.nsf.gov/pubs/2021/nsf21579/nsf21579.htm

Rectifying the issues of gender inequity requires a well-designed assessment of the profound barriers that hinder career advancement for female faculty (DeAro, Bird, & Mitchell, 2010). In particular, "Systemic (or organizational) inequity may exist in areas such as policy and practice as well as in organizational culture and climate" (NSF Pub No. 20-554, p. 5). Thus, the grant team proposed an analysis of institutional policy and program practice to identify the systemic factors. Furthermore, survey and interview data are to be collected to evaluate the academic climate. These findings will support a five-year plan for promoting positive culture changes at CSUB (see pages 6-8 of the original proposal). To articulate these tasks, the grant team highlighted the sequence of grant work in Table 1 for the entire funding period.

Table 1: Task Sequence of the Grant Administration



Source: Proposal 2200323 responses to an NSF review panel

It is stipulated by the NSF Program Solicitation (NSF publication number 20-554) that "All ADVANCE proposals should report impacts on gender equity." In compliance with this mandate, this report is developed to evaluate the project accomplishments in Year 1. As pledged by the grant proposal, "The internal evaluator will provide useful formative findings each year that can be used by the Project Director and key personnel for the preparation of annual reports

and a final summative project evaluation for submission to the project participants and the NSF" (Proposal 2200323, p. 38). To streamline the result presentation, this report is divided into four sections. Section 1 provides an overview of the evaluation framework for the evidence-based impact assessment. Section 2 is devoted to a summary of the grant activities in Year 1, as well as unexpected challenges encountered during the grant setup. Section 3 delineates the creation of a data repository for progress tracking and/or record keeping. In the *Conclusion* section, three recommendations are adduced to support project improvement next year.

Theoretical Framework for Project Evaluation

Identification of the evaluation framework is guided by the proposal solicitation. In particular, NSF announced that "In this solicitation, the NSF ADVANCE program seeks to build on prior NSF ADVANCE work and other research and literature."[2] In alignment with the consistent undertaking, the current research literature has been reviewed to guide the evaluation design. The outcome expectation, including the completion of a five-year strategic plan, matches "the [NSF] program goal of broadening the implementation of **evidence-based** systemic change strategies that promote equity for STEM faculty" (Ibid. 2).

Watts (2015) linked the evidence-based pursuit to a well-established Results-Based Accountability (RBA) model, also known as the Outcome-based Accountability (OBA) model, for grant evaluation. One unique feature of RBA hinged on its differentiation between *performance accountability* and *population accountability* (Davern, Gunn, Giles-Corti, & David, 2017). As Chamberlain, Golden, and Walker (2010) pointed out,

- Population accountability is about improving outcomes for a particular population within a defined geographical area;

[2] https://csub-my.sharepoint.com/personal/amedina4_csub_edu/Documents/20-554%20NSF%20ADVANCE/nsf20554.pdf

- Performance accountability concerns the performance of a program in specific service delivery.

Both accountabilities are important for the Catalyst grant evaluation. At CSUB, Ardis (2022) reported that "female-identifying faculty members in ADVANCE-supported areas of STEM make up just 34% of total faculty. Of those, more than half are not tenure/tenure-track faculty, which also means they are not eligible for leadership positions like departmental chair" (p. 3). Thus, *population accountability* should be addressed to support the career development of female faculty across the STEM departments.

Meanwhile, *program accountability*, as a vital component of RBA, deals with evidence of *what works* (Browne, 2022). For instance, Yusef, Nelson, and Dix-Richardson (2019) successfully employed RBA to evaluate STEM program accomplishments at minority-serving colleges and universities. CSUB is a Hispanic-Serving Institution (HSI), which fits the RBA application to support women of color and other marginalized groups from the intersectional perspective. Based on the literature review, RBA is chosen as the guiding framework for this report because it "ensures accountability for both the wellbeing of people and the performance of programs" (Davis, Allen-Milton, & Coats-Boynton, 2019, p. 52).

Timely Fulfillment of Year 1 Tasks

In the RBA model, a core question is: *How much has been done*? (Friedman, 2015). At the midpoint of the grant execution, this report serves a formative function for project improvement. Hence, what is learned in Year 1 may impact the project completion next year. As Tom Angelo (1999), former director of the national assessment forum, maintained, "Though accountability matters, learning still matters most" (¶. 1).

In Year 1, the project improvement is reflected by consecutive team learning outcomes.

As a result, the proposed tasks in Table 1 have been fulfilled in three aspects:

First, Casad et al. (2020) observed a recent proliferation of research on women's underrepresentation in STEM, and "Between 2001 and 2018 the NSF awarded over $270 million to 177 institutions in the USA with the mission of increasing the participation and advancement of women in academic STEM fields" (p. 10). To engage in the ongoing progress, the grant team utilized a pre-existing campus climate survey to inform the decision-making process.[3] In addition, the baseline data collection included unit RTP guidelines, number of applicants/awardees for internal grants, and information from professional development initiatives. The learning process further expanded externally to review a pool of potential surveys from other universities. Eventually, the grant team selected the instruments from four universities[4] as the primary sources of reference to create a comprehensive survey that fits STEM faculty experiences at CSUB. The survey will be administered in Fall 2023. From the perspective of *population accountability*, the team learning process has facilitated the identification of pertinent factors behind potential barriers to female faculty recruitment and career support on this campus.

In addition, the team learned to cope with unexpected challenges. Prior to the grant funding, an NSF review panel sent the grant team a query to urge for consideration of contingency plans, i.e., "In light of potential short- and long-term effects of the Covid-19 pandemic, please describe in no more than one page your plans for adjusting this project" (supplementary responses to Proposal 2200323). Built on the learning experience, the team became adapted to developing alternative strategies for unexpected events. In Year 1, an

[3] https://www.csub.edu/equity-inclusion-compliance/great-colleges-work-survey
[4] These universities are the University of Wisconsin–Madison (UWM), Middle Tennessee State University (MTSU), University of Maryland (UMD), and University of Michigan (UM) according to a CO-PI responses on 5/2/2023

unanticipated challenge was a personnel change – One of the initial team members moved to another university. In the original proposal, he was expected to participate in the survey development. Given the intense demand of weekly meetings for that task, the grant team made a swift decision to modify his role as an instrument reviewer. Later on, he indicated that he could not continue as a team member. To fill the void, the Dean of *Natural Sciences, Mathematics, and Engineering* (NSME) has volunteered to help review the survey instrument. The timely reaction has minimized the unexpected impact, and thus, the original tasks in Table 1 remain intact. The project proceeds with two Co-PIs handling the instrument construction and the other two working on the instrument review under the new context.

In the third aspect of team learning, the evaluator learned the evaluation mechanism that seemed unique for the Catalyst program. Served on the NSF review panels for more than a decade, the evaluator became accustomed to referring to an NSF publication, *A User-Friendly Handbook for Project Evaluation* (Report No. NSF-02-057), to assume the involvement of an external evaluator. In the past, that mechanism was typically incorporated by NSF to ensure "objective and unbiased" reporting (see Frechtling, 2002, p. 11). The founding director of an NSF-sponsored listserv echoed,

> My experience in working with ADVANCE IT [Institutional Transformation], Partnership, and Adaptation grants is that those grants do need an external evaluator. I have no direct experience with a Catalyst, but I can't imagine it would be any different, especially around something as important as evaluation.[5]

Nonetheless, the general perception was corrected by a Co-PI who cited the following paragraph

[5] Personal communication from Gretal Leibnitz on 9/12/2022 through a listserv at advanceaimnetwork@gmail.com.

from an NSF *Call for Proposals*[6] during the team discussions:

> ***Catalyst:*** An objective internal evaluation that focuses on the implementation and impact of the ***Catalyst*** activities is required. This evaluation can be conducted by an institutional office or qualified individual on or off campus. An external evaluation is not required but is allowed if desired.

Therefore, a consensus was promptly established to institutionalize the mechanism of "objective internal evaluation" functioning for this Catalyst grant, as evidenced by this report completion for the first year.

In summary, the CSUB grant team engaged in an active learning process in Year 1 to develop the needed instrument for data collection and self-assessment according to the proposed schedule in Table 1. The grant team quickly completed the major undertakings of external literature search, internal instrument review, and Co-PI role adjustment. Per NSF stipulation, the Catalyst grant "must include all STEM disciplines at the institution" (Ibid. 2). To smooth the grant administration, the new NSME dean participated in all monthly meetings. Because only some of the STEM departments are housed in NSME, Provost Harper arranged a meeting for the grant team to clarify features of the Catalyst project for all school deans. Institutional support has played a vital role in the project's progress. As President Lynnette Zelezny reassured, "At CSUB, we are committed to diversity, equity and inclusion and will use this [NSF] support to advance that promise" (see Ardis, 2022).

Dashboard Creation for Information Tracking

It was stated in the grant proposal that "another goal of this project will be to create a transparent and free data repository, where data collected will be aggregated and available to the

[6] https://www.nsf.gov/pubs/2020/nsf20554/nsf20554.htm

campus and surrounding community" (Proposal 2200323, p. 38). As part of the systemic change, the creation of a data repository is an important capacity building from the Catalyst grant to improve the function of information entry, storing, and retrieving in the Academic Affairs, an office overseeing the faculty retention, promotion, and tenure process. According to NSF,

> The Catalyst track [of the NSF ADVANCE program] is designed to broaden the types of IHEs [Institutions of Higher Education] that are able to undertake data collection and institutional self-assessment work to identify systemic gender inequities impacting their STEM faculty so that these can be addressed by the institution. (Ibid. 2)

To support evidence-based improvement, all institutions need an easily manageable dashboard to track various indicators of gender equity, and thus, a learning community can be established to facilitate developing the data repository. At the beginning of Year 1, Dr. DeAro, the ADVANCE Program Director, informed a Co-PI that "We will be sending out a welcome email with some listservs you can join so that you can ask others in the program what they do to evaluate the Catalyst project and they may have examples for you and Dr. Wang" (Personal Communication on 8/23/2022). This advice created an opportunity for CSUB to gather new ideas from the listserv community for data repository creation.

Upon receiving an introduction message from this evaluator, the listserv director disseminated an agenda item in the AIM Network that connects ADVANCE Change Leaders from all cohorts of the NSF awardees:

> Greetings all!
>
> I wanted to bring to the top of everyone's email this question about dashboards for faculty recruitment? Do you use a faculty dashboard for recruitment? If so, would you be

> willing to share more? We could host an AIM Network meeting so that people can share what they use. Thoughts?

The query was quickly answered by a representative from California State University, Fresno (a.k.a., Fresno State). She wrote,

> We are in the process of building the dashboard, and it has yet to be ready. Also, considering the sensitivity/confidentially of the data, we plan to give access only to the administrators, such as deans and provosts of the participating campuses (participating in NSF-ADVANCE grant-'KIND' activities). I am copying this email to Kimberly Stillmaker (kstillmaker@mail.fresnostate.edu), who is developing this dashboard. She will be able to give you more details about how it works.

At CSUB, the existing dashboard is managed by an office of *Institutional Research, Planning, and Assessment*. But the faculty recruitment information is handled by the Human Resources Division, and the retention and promotion data are housed in the Faculty Affairs office. Historically, CSUB started as a division of Fresno State in the 1960s. Hence, the exploration at Fresno State can help avoid reinventing the wheel at CSUB.

In constructing a seamless data repository, Fresno State has already made progress in using Tableau for the dashboard design. Dr. Vernon Harper, CSUB Provost and PI for the Catalyst grant, envisioned, "I really hope this can be uploaded into PageUp."

> Dr. Vernon's vision was shared by the Fresno State project developer. She echoed,
>
> Our Faculty Affairs is working on incorporating it as a template in PageUP so that data can be downloaded directly into it from any CSU campus.
>
> In the coming weeks, we will be scheduling a meeting with Faculty Affairs representatives from 8 CSU campuses that are participating in the NSF ADVANCE

> Partnership grant IChange activities. At that meeting, we will be introducing this spreadsheet and explaining how to use it in PageUP. (Personal Communication on 10/14/2022)

As a result of the inter-campus networking, an invitation was extended from Fresno State to CSUB to pilot the dashboard implementation. On 10/18/2022, the *Associate Vice President for Faculty Affairs* responded from the CSUB side,

> Thank you very much for looping me in! We are in the process of adopting PageUp through the CSU Common Human Resources System (CHRS). We will be able to run queries and maintain dashboards for faculty recruitment and retention from the PageUp data, which is critically important to our goal of increasing faculty diversity.
>
> Please include me in the training if possible. This is right up our alley!

In summary, the capacity building has resulted in a sustainable mechanism of data collection to monitor gender equity at the Faculty Affairs office. The integrated data repository could not have been imagined without the NSF grant support. Under an Axiom that the whole could be larger than the sum of its parts, the institutional collaboration not only reflected the effectiveness of partnership outreach, but also strengthened the PageUp application for data access across the CSU system.

Conclusion

In alignment with the results-based accountability, NSF stipulates that "For Catalyst projects, it is understood that this data collection and analysis will be done during the Catalyst project" (Ibid. 2). While the PageUp setting has provided a feasible infrastructure for data collection, the instrument design ensured inclusion of key factors for analyzing systemic barriers against career advancement of the female faculty population at CSUB.

Throughout Year 1, the evaluator participated in the local team meetings to discuss various topics pertaining to the project setup. He also attended monthly meetings of the AIM Network sponsored by NSF to keep the team informed about additional learning opportunities, including an NSF workshop on 4/11/2023 with a special focus on the Catalyst grant accomplishment.

Through the participatory, utilization-focused, and RBA-driven approach, the grant administration conformed to the quality standards endorsed by the professional community. More specifically, the current standards for program evaluation include four components, *utility, feasibility*, *propriety*, and *accuracy* (Yarbrough, Shulha, Hopson, & Caruthers, 2010). The utility consideration is reflected by the team effort in collecting useful information for supporting womxn STEM faculty at CSUB. The feasibility criterion is demonstrated by the satisfactory project progress, including *modeling after the best practice in the instrument design* and *working with the Fresno State colleague on dashboard creation*. The propriety standard is upheld by IRB's approval of a data gathering protocol to ensure the project's compliance with federal, state, and local laws and regulations. The accuracy standards are addressed by a consistent mechanism of quality control, including designating two Co-PIs for survey development and two Co-PIs for instrument review, to eliminate inadvertent mistakes.

In combination, the project has generated adequate results to justify both the *population* and *program* accountabilities of the RBA model (see Section 1). More specifically, the needs of the female faculty population have been examined in Section 2 to fit the *population accountability* domain of RBA. In Section 3, a goal was cited from the original proposal to support the *program accountability* justification based on the data repository creation. Beyond the local settings, the project contributed to the enrichment of evidence-based practice in general

because "Peer institutions will be encouraged to do the same and place their own data on the repository, creating a network of freely available data for public consumption" (Proposal 2200323, p. 38). The accomplishments in Year 1 have laid a solid foundation for the grant completion next year. To that end, three recommendations are adduced below for project improvement.

The grant team indicated that "Our research project utilizes critical mixed methodologies of quantitative and qualitative research approaches" (Proposal 2200323, p. 31). Hence, the interview design is scheduled as an imminent task between the adjacent years of the grant operation (see Table 1). The first recommendation is for the grant team to review instruments developed at other institutions for the same purpose and use the findings to improve the local interview design. This recommendation matches the agenda of the grant funding because "The ***Catalyst*** track supports the design and implementation of an organizational self-assessment to collect and analyze data to identify STEM faculty inequities" (Ibid. 2).

Per guidance of the NSF *Request for Proposal*, "All Catalyst projects must develop a five-year STEM faculty equity strategic plan that is linked to the institution's strategic plan" (Ibid. 2). Based on the RBA framework, the second recommendation is for the project to focus on modifiable factors that can be significantly improved through systemic changes. Vital program attributes should be included to figure out what works for whom and in which context.

To sustain the impact of this Catalyst grant, the third recommendation is for the project team to pilot the equity policies and approaches from the five-year strategic plan, and use the evidence of systemic changes to further pursue a new ADVANCE grant on the **Adaptation** track. This recommendation is supported by an NSF announcement, i.e., "Prior ADVANCE IT-Catalyst grantees are encouraged to apply for an Adaptation project" (Ibid. 2).

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