Exploring faculty's explanations of enrollment issues: where does responsibility and control reside?

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This study aims to understand how physics faculty seeking guidance in making departmental changes related to recruitment and retention frame the challenges in their program. We focus our analysis on one set of applications submitted to the Departmental Action Leadership Institute (DALI) in its first year of operation. DALI is the community engagement activity of the Effective Practices for Physics Programs (EP3) initiative. It brings together a cohort of physics faculty to apprentice into strategies for sustainable institutional change and facilitation practices associated with leading change teams. Through analysis of DALI applications, we find that many applicants attribute their enrollment challenges to sources outside of their immediate control, while those that do propose solutions to these challenges primarily focus on curriculum change. By understanding how DALI applicants frame their enrollment challenges, developers of departmental change resources can better mold their recommendations and community engagement activities to what is needed, whether that be meeting faculty and departments where they are at or pushing departments to explore new strategies and frameworks for evaluating their challenges.

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I. INTRODUCTION

Faculty learning communities, and other forms of shared professional spaces, have been taken up in higher education as successful catalysts for faculty's professional development [1]. In physics, these spaces have created communities of practice, primarily centered around curriculum and instruction [2–6]. The Departmental Action Leadership Institute (DALI), aims to bring a similar approach to apprenticing physics faculty into effective change strategies. Departments become part of a DALI through an application process. Successful faculty applicants become the *change leaders* who participate in DALI. Applications for the first cohort of DALI (Jan. 2021 to Jan. 2022) were asked to describe their local context, such as, information about their department and institution, their histories of past change efforts, and their rational for participating in DALI.

The DALI application serves as a snapshot in time that gives insight into how faculty within physics programs conceptualize the challenges they face and potential projects that may address those challenges and improve their programs. In this study, we aim to understand applicants' framing of challenges through discourse analysis techniques, such as genre analysis and the stance framework. Through these frameworks (explained further Sec. II) we are able to analyze DALI application text as the techniques explicitly acknowledge the context surrounding the writing of the applications.

The first call for DALI resulted in 18 applicants, with five programs being accepted into the cohort. The breakdown of applicant characteristics can be seen in Table I. Within this application pool, 15 of the 18 applications discussed challenges related to the overall enrollment numbers of the undergraduate physics program. The enrollment challenges refer to both recruitment and retention of physics students. This was by far the most widely shared concern among the applications, consistent with an APS report that found more than 70% of surveyed departments faced top or moderate challenges related to recruitment and retention [7].

A. Enrollment challenges in physics

Enrollment has been described as an issue by many of DALI applicants, as well as by physics department chairs nation-wide [7]. In PER, a growth in the number of studies on community and identity in recent years shows a desire to better understand how people experience being a physics student [8]. The studies directly related to recruitment and retention focus on how socio-cultural aspects of teaching and learning have implications for the academic paths of students. Course reform efforts [9, 10], Learning Assistant programs [11], inter-institutional partnerships [12], and long term peer groups [13, 14] have been identified to be factors in student enrollment and continuation in physics programs. These are all areas in which DALI applicants may choose to focus their work.

B. Responsibility and control

We are particularly interested in how faculty position themselves with a sense of responsibility and influence toward enrollment issues. In order to operationalize *responsibility* and *control*, we lean on the organizational change literature. We define control as the influence expressed by applicants over the future of their programs. Responsibility is the acknowledgement of their own contributions and influences, positive or negative, to the current state of their programs. Control and responsibility have been understood through models such as stewardship, collective leadership, or a culture of assessment [15–17]. We aim to explore how these constructs emerge within the DALI applications. While the applications may flatten complex stories, understanding the way in which applicants frame their responsibility and control is valuable when planning future change processes.

C. Research questions

The DALI applications give a unique window into how faculty within physics programs conceptualize challenges related to enrollment, as well as what responsibility and control they have over the sources of and solutions to these challenges. Better understanding how DALI applicants are thinking about the state of their programs can better inform developers of resources in molding their recommendations and community engagement activities to what physics programs currently need—whether that be meeting them where they are at, or pushing programs to explore new strategies and frameworks for evaluating their challenges. These written narratives provided by applicants are influenced both by the ongoing discussion of enrollment within the physics academic

TABLE I. Applicant program and institutional characteristics[a]

	All	Accepted	Rejected
Total	**18**	**5**	**13**
Inst. Char.			
Public	13	5	8
Private	5	0	5
R1+R2	7	3	4
MSI	6	1	5
Phys. Deg.			
PHD	4	1	3
MS	3	1	2
BS/BA	11	3	8

[a] Doctoral universities of very high (R1) and high (R2) research activity as defined by Carnegie classification; Minority Serving Institution (MSI) as defined by the U.S. Department of Education; highest physics degree awarded (Phys. Deg.) as reported by departments in their applications and confirmed via public department websites.

community, the ways in which DALI was advertised to them, and what the application form explicitly asked of them. In order to answer the following research questions, we must consider each of these external factors as well. The research questions we will be addressing in this paper are as follows:

- What sources of enrollment challenges and opportunities for change are described in DALI applications?
- What forms of responsibility and control are expressed within the DALI applications in relation to enrollment challenges?

II. CONTEXT AND ANALYTICAL APPROACH

Our analysis of DALI applications borrows from genre analysis methods [18, 19]. This approach, was chosen due to the nature of our data—written text of a particular type that is created for a specific purpose—and situates our analysis in the intertwined contextual features of the particular *genre*. Here, a genre is a distinct form of communication that shares common styles, purposes, and communities of practice [20, 21].

Setting: Each application comes from physics faculty who desire changes in their undergraduate program. The size and type of each department plays a role in determining who is writing the application and the way in which they view challenges related to enrollment.

Focus and Purpose: The focus is on the undergraduate physics program—its history, current challenges, and future—with the goal of being included in DALI. It is guided by the application form, which determines what type of narrative is told. In the email announcement, EP3 and DALI are framed as groups of experts in departmental change that plan to help programs build "sustainable improvements to undergraduate education." Based on this framing, the applicants must show that the program is a good fit for DALI.

Applicant-Audience Relationship: The applicants are faculty from physics programs. The audience is the facilitators who decide admittance to DALI. This relationship motivates the applicants to write to gain favor with the facilitators. While the applicants are faculty members, exactly who is writing the application is left up to applicants and is not specified by the DALI application materials.

Community Values: All applicants are assumed to be members of the larger physics academic community, with shared values around the continued improvement of undergraduate physics programs. In the email announcement and application form, an expectation is set that the DALI is an ongoing and intensive process that values self reflection and sustainable change. While the applicants may not share these exact values, the related texts expect them of successful applicants.

In our analysis of the application text, we use the discursive framework of *stance*. Stance is the ways in which writers convey their attitudinal voice, their judgements, and commitments [22]. Stance includes four main features: hedges (indicating hesitancy), boosters (expressing certainty), attitude markers (conveying affective attitudes), and self-mentions (presenting personal or communal statements). Through investigating stance within the applications, we identify what level of responsibility and control applicants see themselves as having over their enrollment challenges.

Dalka performed the early analysis of this cohort of applications in the steps described below. Turpen provided feedback on methodology and in-process results, helping to shape emerging themes. Corbo and Craig served as the facilitators of DALI and did not directly contribute to analysis, but gave insight into the application process and feedback on results.

First, we identified the different challenges and opportunities for change that are described in the applications. Next, we used excerpts related specifically to enrollment to create a narrative summary for each application. In these summaries, we use the contextual features of the genre to situate the ways that applications frame their enrollment challenges, historical change work, and proposed solutions. From these summaries, and using direct excerpts to ground the findings, we identified themes that address the first research question related to sources of enrollment challenges and opportunities for change. Finally, we investigated the use of stance within the particular excerpts that speak to each theme to understand how applicants orient themselves to the attributed sources of problems and proposed solutions.

III. RESULTS

In this section, we present each theme identified within the discussion of enrollment challenges. We unpack the excerpts cited here through analysis of stance while using the context of each application to frame our interpretation. We find that most applicants attribute their challenges to sources outside of their immediate control. Additionally, applications that propose specific projects and outline current efforts focus on changes to curriculum. Excerpts are tagged by a indicator of "accepted" or "rejected" along with a numerical id associated with that application.

A. Student-associated sources of problems

Low enrollment in the physics major is a common challenge across the DALI applications. Many applications frame students as the cause of low enrollment. The demographics of students are used to explain their levels of preparation as well as their orientation towards physics as it relates to future careers. When this is done, students are framed by a deficit lens, which takes responsibility for low enrollment away from the department and places it onto the students. This can be seen in the following excerpt:

> Student enrollment and retention has always been and remains one of these challenges. Much of this challenge is driven by socio economic background of

> many [institution] students who often come to college substantially underprepared. Weak math skills prevent these students from entering [the] physics program on time to graduate in 4 years and often lead students to failing their first math/physics course and dropping from a physics major. – *Rejected-9*

Here, the demographics of students who attend their institution is used to explain a perceived lack of math preparation, which impacts their retention numbers. Boosters are used throughout the argument to center the source of the problem on students, placing them as the problem to be solved. The application form asked applicants to describe "how many and what kinds of students, faculty, and staff do you have". They connect the source of their enrollment challenge with the kinds of students outlined in their narrative rather than place responsibility on the small group of faculty.

Some applicants also see students' views of physics as a discipline as leading to enrollment challenges:

> The reasons for the low enrollments are no doubt complex. We believe the main problems have to do with a general lack of visibility among prospective students in the sciences generally, not just physics. As such, we feel that most of the problem is beyond our control. [...] We are in a paradoxical situation in that we are offering a very high quality program in a field that has seen a sustained rise in demand over the last two decades, yet not enough students are applying for our programs. – *Rejected-11*

In the above excerpt, visibility is used as a reason for low enrollment. In this application, the faculty describe their physics major program as being under a major threat. In this setting, faculty must defend their program, and in doing so could contribute to placing the source of the problem on student choices rather than the department. The reasons for students' choices are not explicitly explored in this application.

Student demographics are also used to explain student mindset and choices concerning their major:

> However, at [institution] the problem [of recruitment] is exacerbated by the fact that many of our students come from underprivileged backgrounds and many of them are first generation college students. Our students are understandably focused on improving their lives and the lives of their families by getting a good job. Students do not see a physics degree as something that is immediately valuable in the job market. – *Accepted-1*

The demographics of students are connected to the ascribed belief that majoring in physics does not lead to an immediately successful career, which is presented as logically desired by those from "underprivileged backgrounds." This connection is made through the use of "understandably," an attitudinal marker that shows that the applicants see their students as justified in their decision making process with regards to choosing a major.

Many applicants discuss students themselves—their backgrounds, preparation, and choices—as being the reason for low enrollment in the program. However, a subset of these applicants, typically those that were accepted into the first cohort, reflect on what their students need and express control over the solutions to their challenges, as seen in Sec. III C.

B. Organizational challenges and competition

Other than students themselves, applicants also attribute their current enrollment challenges to organizational changes and competition for students. Each of these sources are also presented as out of the applicants' and departments' control. These types of narratives place the program as a victim of circumstance that originates outside of the department.

The organizational changes that are outlined by applicants are unique to each institution; however, they all involve a reorganization that makes the position of the physics department uncertain and is seen to have been detrimental to the recruitment and retention of their students. For example,

> Historically, the [d]epartment was housed in the College of Engineering [...]. As part of an academic revitalization program, Physics was moved into a new College of Natural Sciences [...]. Since the move from Engineering about ten year[s] ago, enrollment has steadily declined. – *Rejected-12*

Connecting the historical account of the department to the current challenges facing the program is expected of applicants in the application form. In this account, the author describes the organizational changes with a detached tone, avoiding any use of first-person pronouns. This separates the author from what is happening to the department, indicating a perceived lack of control.

When competition between institutions is discussed as a source of enrollment challenges, the applicants present a narrative of students being recruited away from their programs:

> The [flagship state university] [...] began giving more needs-based scholarships to undergraduates than they ever had before. This may have a significant effect on where potential physics and engineering majors choose to go to school. While a high percentage of graduates from [state] high schools might be better served at an institution such as [applicant's institution], where teaching is the main focus and the environment is more nurturing, students are naturally going to be attracted to the flagship institution. I think we offer an excellent program for undergraduates, and our challenge is to "get the word out" to those who need to hear it. – *Rejected-7*

In this narrative, the author uses hedges to buffer critiques to their presented argument. The phrases, "may have a significant effect" and "might be better served" allow the author to include these statements in the application without wholly committing to this reasoning. They rationalize this framing by using the attitudinal marker "naturally" when describing students' choice to attend the flagship institution. This helps

to frame their argument as the logical outcome of their context. This framing is used when discussing competition from better funded institutions for the same students. These arguments do not acknowledge what they do have control over: appealing to the set of students that do attend their institution.

C. Curriculum change as a solution

While other possible change projects are discussed, curriculum changes are by far the most commonly proposed by applicants. In the DALI email announcement, "low enrollment" is used to define the type of challenges and opportunities that the DALI will assist in, along with "implementing evidence-based instruction." This association, as well as the current trend of course reform efforts in physics, informs how applicants frame their projects. The course reforms are mainly driven by a desire to bring in students who are framed as under-prepared in math to the physics major:

> We would like to change our first year curriculum so that incoming physics majors can start these physics classes sooner. We are also interested in adopting research-based pedagogies that have been shown to improve retention. – *Accepted-4*

As expressed in this excerpt, students are not introduced to physics quickly enough due to a lack of math preparation, and thus leave the major. This solution is proposed through the use of hedges that show an openness to DALI expertise in directing what type of specific changes should be made.

Programs that have already begun their curriculum changes look to DALI to provide ways to assess and modify the projects that are underway:

> We have restructured our curriculum to reduce barriers to entry and to sustain engagement using bridge courses. We have also incorporated multiple hands-on and computational elements into our program in an effort to appeal to a variety of interests. However, we have not been able to achieve and sustain a critical mass of physics majors. As part of DALI, we would like to get feedback and to develop better assessment tools and models to help us improve these efforts.
> – *Accepted-1*

The use of first-person pronouns in the above excerpt shows a sense of control over their efforts. This is in contrast to the source of their enrollment challenge, which was presented elsewhere in their narrative as the incoming students' preparation and background. They align themselves with the DALI philosophy of assessment and reflection and rely on the expected expertise of DALI facilitators to improve the change efforts they are undertaking. The curriculum change projects are presented as the responsibility of the faculty in the department. The applicants express control over the future of their programs, but are not completely confident in their proposed actions. In positioning themselves as the right fit for the DALI, applicants use hedging in order to leave open possibilities for reflection and modifications to their current and proposed projects.

IV. DISCUSSION

As one of the applications put it, the reasons for low enrollment are no doubt complex. Applicants must try to explain these complex challenges in a way that motivates their acceptance into the DALI. Most applicants navigate this complexity by writing narratives that avoid placing responsibility of recruitment and retention challenges on the faculty, instead putting it onto external factors, such as students and organizational structures. While this may be a small part of the full story, this selective attention can be detrimental for the students their program hopes to serve. By framing students through a deficit lens and focusing on stereotypical characteristics, the systemic issues that harm students are ignored [23]. In contrast, the *equity-mindedness* framework offers an alternative to the deficit lens, centering the responsibility of practitioners to recognize and address injustices [24, 25].

While some applications express a sense of dread and inability to control the future of their program, others—especially the accepted applicants—propose potential actions that they can take up. These proposed change projects are most often related to curriculum reform, with little mention of other possible avenues for change. A goal of DALI is to channel this sense of responsibility and control into valuing the process of understanding the sources of challenges, mobilizing collective action and reflections toward a vision of a different department that embraces multiple paths for change.

In this paper, we have only investigated one challenge expressed within one set of DALI applications. In future work, we will expand our analysis to investigate the other challenges and opportunities for change that are described in narratives throughout multiple years of applications. We recognize that our analysis relies on what applicants provide us, and the information provided is not always uniform across applications, oftentimes resulting in flattened stories. However, in basing our methods in genre analysis, we are able to uniquely recognize the social and contextual features that do influence how narratives are built in applications to identify how faculty write about challenges. DALI applicants are a unique subset of faculty looking to implement departmental change, understanding how they frame challenges and opportunities can better inform discipline-wide change efforts.

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