

Guiding principles for change in undergraduate education: An analysis of a departmental team's change effort

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The practices of a departmental action team (DAT) are examined to characterize their change effort in their undergraduate program. The DAT's effort was guided by the DAT model's six core principles. The core principles are grounded in best practices for higher education and organizational change literature. Meeting minutes, facilitator journal entries, and exit interviews are analyzed to identify ways in which the core principles influenced the change effort. This analysis provides insight into how the core principles can be leveraged to enact positive change in education. Furthermore, this work provides a method for researchers to characterize other complex change efforts.

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I. INTRODUCTION

Higher education is under pressure to adapt to the changing needs of its students. The changes required at higher education institutions to create an inclusive, supportive environment in which students are successful span a wide range, such as implementing new instructional practices, boosting the involvement of marginalized groups in core decisionmaking, or reworking degree programs in response to student input. While such changes may seem straightforward to implement, in practice, these changes are not frequently sustained [1–4].

Researchers investigating organizational change suggest that these types of transformations require systems-level change and shifts in culture [4–8]. For this manuscript, we use Schein's [9] definition of culture: “a pattern of shared basic assumptions learned by a group as it solved its problems...which has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems” (p. 18). This definition emphasizes shared learning and community experiences among a group that leads to shared implicit and explicit assumptions. Change theories indicate that these underlying aspects of culture (assumptions, beliefs, and values) generate patterns of behavior. Therefore, culture must be taken into account when designing and implementing change efforts [5,10].

While a university has many coherent cultural elements, culture also varies between its different units. For example, the unique culture of a department is influenced by its academic discipline, as well as the university context. Departmental culture includes norms that influence how

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department members interact and communicate and values that promote certain types of activities (e.g., conducting research, publishing and applying for funding) over others. Culture is typically more consistent within a department than between departments. Further, some department members can influence cultural and structural changes. Therefore, change efforts focused at the department level are better positioned to attend to culture [11].

A. Departmental action team model

The Departmental Action Team (DAT) model provides a method for attending to culture while implementing departmental change related to undergraduate education [12,13]. A DAT is a working group of 4–8 students, staff, and faculty that is guided by 1–2 external facilitators. Through a shared visioning process, the DAT identifies changes they would like to see occur within the department’s undergraduate program. Most DATs meet every other week for 2–4 semesters, and external facilitators (who typically have been part of a campus teaching and learning center) organize and guide the DAT. Facilitators support the DAT in planning and implementing change projects that align with visions and outcome goals that are valued by the department. Change efforts from past DATs have included increasing inclusion, diversity, and equity in the department, creating long-term program assessment plans, and implementing peer mentoring programs.

B. DAT model core principles for change

Change projects are often informed by principles that provide guidance on connecting practices to theory and values [14–16]. Effective principles are general enough to adapt to different contexts yet can be used to guide interactions and decisions that will lead to a desired outcome [14]. Articulating principles can enable others to understand the logic behind a project and apply features of the change effort to other contexts [16,17], utilize the principles for evaluation [14], and gain a deeper understanding of how change occurs in different contexts [18]. The DAT model for effective change in undergraduate education is guided by a set of six core principles grounded in research from the fields of organizational change and higher education [15]:

Principle (P1—students):	1	Students are partners in the educational process.
Principle (P2—outcomes):	2	Work focuses on achieving positive outcomes.
Principle (P3—data):	3	Data collection, analysis, and interpretation inform decision making.
Principle (P4—collaboration):	4	Collaboration among group members is productive, enjoyable, and rewarding.

Principle (P5—continuous improvement):	5	Continuous improvement is an upheld practice.
Principle (P6—equity):	6	Work is grounded in a commitment to equity, inclusion, and social justice.

While the efforts of facilitators are often implicitly guided by the core principles, it is typical for facilitators to engage DAT members in conversations about how the core principles influence group interactions, thinking, and decision making. In this manner, the DAT’s culture and products are informed by the core principles.

C. Characterizing department-level change

Department-level change efforts in STEM disciplines have increased over the past several years. Current departmental change efforts specific to physics include the APS-IDEA project [19] and the Effective Practices for Physics Programs (EP3) project [20]. These projects and others have adapted or adopted components of the DAT model to guide their change efforts, including the core principles. At this time, however, most of the department-level change efforts and their mechanisms for success have not been investigated. This may be due to the challenge of studying cultural change, as culture is often loosely defined and hard to operationalize [21]. With an increasing number of department-level change efforts that include a focus on culture, there is a need for methods that can be applied across projects to articulate important features of such change efforts and investigate the mechanisms that support or hinder their success.

In this paper, we offer a way to characterize a departmental change effort through the lens of the culture of the team catalyzing the change effort. We claim that a departmental culture aligned with the core principles will better support positive and sustained departmental change. We acknowledge, however, that such change is a highly complex and nonlinear process that is difficult to characterize. The DAT core principles provide a theoretical justification for why certain behavior may lead to positive change. Thus, using the core principles as a framework to characterize a change effort can lead to a better understanding of the practices that led to observed outcomes. To investigate this claim, we asked the following research questions:

1. In what ways does a DAT that has achieved their identified goals practice the core principles?
2. What kinds of activities, behaviors, and outcomes are associated with evidence of DAT members embodying the core principles?

Our findings from this investigation include evidence of each principle from the featured DAT to illustrate the ways in which the principles were enacted, suggestions about how principle-aligned DAT activities influenced the

outcomes of their work, and implications for change facilitators and researchers.

II. METHODS

To better understand the relationship between practices aligned with core principles and departmental change, we chose to investigate a single DAT through the lens of the DAT core principles. We qualitatively analyzed several sources of data that were collected during the lifespan of the DAT to triangulate our findings. The following sections outline the context of the featured DAT, our data sources, and our analytical methods. For readers who are interested in methodology and additional context for this work, we have provided a detailed accounting in the Supplemental Material [22] of our analytical process as recommended by Hammer and Berland [23] so that others may understand, critique, and replicate our process.

A. Author positionality

All authors contributed to the DAT project as a facilitator, researcher, or both. C.N. was a facilitator for this DAT, collected and analyzed data, and was a major contributor in writing the manuscript. M. E. P. analyzed data and was a major contributor in writing the manuscript. K. F. and C. G. were facilitators for this DAT and contributed to data collection, data analysis, and writing the manuscript. J. C. C., D. L. R., C. E. S., A. S. J., and S. B. W. contributed to data collection, analysis, and writing the manuscript. While all authors were already familiar with the DAT model and the core principles, applying them as an analytical lens led to deeper exploration and articulation of the principles. This manuscript captures the nuances that were revealed in this investigation so that others may come to a deeper understanding of the core principles and how they can be used to guide research and practice.

B. Context of the featured DAT

The DAT featured in this paper is situated in a STEM (science, technology, engineering, and mathematics) department at a large, public, R1 university and has been given the moniker the divination DAT. The divination DAT was formed to prepare for departmental accreditation. To accomplish this, the DAT met with 2–3 external facilitators over the span of four semesters and held 1–2 hour meetings every other week. In total, the DAT met 32 times. During this time, the DAT revised its student learning outcomes (SLOs) for one of the department’s undergraduate programs, received approval for these revised SLOs from the rest of the department, and developed a robust assessment plan to collect and report data related to the revised SLOs.

Over the course of two years, the divination DAT membership remained fairly stable (see Table I). DAT membership reflected the diversity of the department’s stakeholders in terms of the position held in the department, race, and gender at the time the DAT was meeting.

Three external facilitators worked with the divination DAT for four semesters. For the first three semesters, they facilitated the DAT and in the fourth semester, they guided two DAT members in taking over facilitation responsibilities.

Seventeen DATs were facilitated over the lifetime of the project. The divination DAT was chosen as a good candidate to examine for evidence of the DAT core principles due to its successful implementation of the DAT model. We consider the divination DAT to be highly successful because it reached two key milestones: making significant progress toward a complex goal and achieving independence. While it is not necessary for a DAT to reach this stage in order to enact meaningful change in undergraduate education, it does indicate that a DAT has the capacity to continue making meaningful changes. Most of the DATs facilitated during this project made significant

TABLE I. Roles of the DAT members. Note that UG = undergraduate student, G = graduate student, S = staff, F = tenure-track faculty.

Year(s) DAT member participated		DAT member information	
Year 1	Year 2	Role (role abbreviation used throughout the paper)	Pseudonym
X	X	Undergraduate student, 3rd/4th year (UG)	Marley
	X	Undergraduate student, 3rd year (UG)	Carrie
X	X	Graduate student (G)	Peyton
X	X	Student success advisor (S)	Kendall
X	X	Undergraduate program coordinator (S)	Morgan
X	X	Graduate program coordinator (S)	Skylar
	X	Assistant professor (F)	Taylor
	X	Assistant professor (F)	Alex
X	X	Associate professor (F)	Spencer
X	X	Full professor, department chair (F)	Riley
8	9	Total members in DAT each year	

progress toward achieving their identified goals, but only 11 achieved independence. The divination DAT had a more thorough accounting of their activity than some of the other DATs that achieved independence and thus was an ideal candidate for this study.

C. Data sources

The sources of data for this study include minutes from the DAT meetings recorded by the facilitators and/or DAT members, journal entries recorded by facilitators after each meeting, and exit interviews with DAT members. Except for the exit interviews, these data were collected to provide a detailed history of the divination DAT and not for the sole purpose of capturing evidence of core principles. Thus, it is likely that the scope of the dataset is greater than the concept under investigation [24]. Minutes were composed mostly of verbatim statements identified by the speaker, some paraphrased conversations, and embedded links to relevant materials. Facilitator journal entries were written shortly after each meeting and contained facilitators' impressions of the meeting's most important and interesting moments, as well as thoughts about how the facilitators might guide future meetings. Exit interviews were conducted by a DAT project team member who was not a facilitator of the divination DAT shortly after external facilitators exited the DAT and focused on collecting feedback from DAT members about facilitators and the DAT's culture. The facilitator journals and exit interviews were explicitly structured to prompt reflection on the core principles. While some agendas were structured to prompt DAT members to reflect on the core principles, not all meetings included this component.

D. Data analysis

Both inductive and deductive methods for analysis were used in a process to progressively refine our conceptual categories of interest, similar to strategies suggested by Engle *et al.* [25] and Morse and Mitcham [24]. The conceptual categories (DAT core principles) were initially deconstructed and developed by Quan *et al.* [15] based on existing literature. This knowledge of the core principles served as the foundation for the subsequent data analysis [24]. We used this foundational concept of the core principles to analyze our data sources for evidence of practices aligned with the core principles. We first analyzed the meeting minutes from the divination DAT. A single meeting's minutes was chosen as the unit of analysis for coding, meaning that each meeting was coded for the presence of each principle or lack thereof. Two authors (C. N. and M. E. P.) jointly coded 10 of the 31 meeting minutes. For each meeting, these two authors discussed which of the core principles were evidenced in the meeting minutes and came to a consensus on whether a core principle was or was not present during a meeting. This process was documented and used to build out a codebook containing descriptions of how to identify instances of each

principle, following the general codebook structure recommended by MacQueen *et al.* [26]. These authors then continued to code meeting minutes separately but met regularly to discuss any discrepancies in coding and come to a consensus for all meeting codes. As part of this process, they compared the new instances of the core principles in the meeting minutes to those already recorded in the codebook. Since the codebook was iteratively refined while coding the other 21 meetings and the definitions of the codes were expanded, the authors returned to the first 10 meetings that were analyzed to double-check their codes and revise them if the original codes no longer applied.

The authors tested the robustness of this codebook in the facilitation journals. For the divination DAT, there were a total of 25 journal entries. The authors coded each entry in the facilitation journal for evidence of the principles. Although most of the evidence came from the section of the journal dedicated to reflecting on the core principles, the authors were also able to find evidence of the core principles in other sections related to facilitators' observations and reflections. The facilitator journals did not substantively change the codebook but did contribute to their nuance and provided a way to check what principles the authors thought emerged in the meeting minutes.

The finalized codebook was used to analyze exit interviews with DAT members. The exit interviews asked DAT members for their perspectives on whether the DAT applied the core principles. This provided triangulating evidence of the application of the core principles during the DAT's work. The authors coded the interviews separately and then met to discuss the codes and insights from the data. The other coauthors examined the final codebook and applied it to several excerpts from the data to test its robustness, resulting in additional clarity and detail. In addition, the final analysis was shared with the divination DAT members for their feedback.

During this process, we encountered several challenges regarding the complexity of coding and mitigating bias. We outline these challenges and our approach to them in the more detailed methodology section included in the Supplemental Material [22]. We share the results of this analysis in the following sections.

III. RESULTS & DISCUSSION

We found evidence of each core principle in the behavior and practices of the divination DAT. Figure 1 shows the frequency with which each principle was identified in the meeting minutes and facilitator journal entries for the divination DAT.

Here we present evidence of the core principles from our data. For each core principle, we provide theoretical grounding, results, and discussion. In the discussions, we interpret how behavior aligned with each core principle may have contributed to the DAT's success.

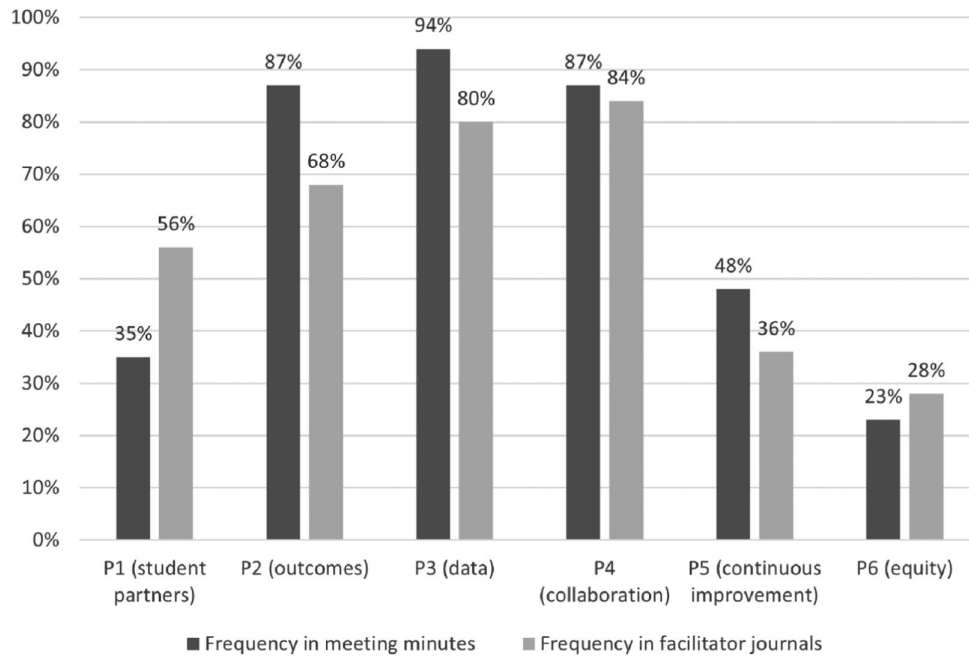


FIG. 1. Coding frequencies for meeting minutes and facilitator journals. The unit of analysis for coding the meeting minutes and facilitator journal entries was a single DAT meeting. For 32 meetings across four semesters, there are 31 corresponding meeting minutes entries and 25 corresponding facilitator journal entries. The frequencies in this chart represent the percentage of the total number of entries that contained evidence of each principle.

A. Principle 1: Students are partners in the educational process

Enacting change in undergraduate education requires an understanding of student experiences. Students bring “a unique expertise” [15] to education reform and are the ones best positioned to speak to their own needs and specific experiences at a particular institution [27,28]. Students also have current and relevant knowledge of what it means to be taught and learn specific content [29–31]. Engaging students in change efforts aligns with design research predicated on the idea of products and relevant changes being designed for their users [32,33]. However, the hierarchy and tradition in the academy are not conducive to students having a role in decision-making regarding their education. Thus, purposeful efforts to create authentic partnerships that engage students in developing ideas and making decisions are necessary [29].

1. Evidence for principle 1

The divination DAT included students from the start of their work together (in contrast, a number of other DATs delayed adding student members or did not include students at all). The DAT included undergraduate students Marley (all four semesters) and Carrie (fourth semester only), who were each in their junior year when they joined the DAT, and graduate student Peyton (all four semesters), who was in the final two years of a doctoral program. We present evidence of ways in which the students were treated as partners within and beyond the DAT.

In meetings, the undergraduates described student experiences with the divination program. As their work progressed, DAT members more frequently sought the undergraduate student perspective, with a faculty member once saying, “We keep looking at you, Marley!” to which Marley responded, “I feel so credible!” A typical exchange about including student perspectives occurred during the third semester when the DAT discussed a prompt for a writing activity. The DAT intended to use this writing activity to gather data related to the student learning objective (SLO) they were developing related to communication.

- Riley (F): Marley, how would you feel about this prompt as an underclassman?
- Marley (UG): I think that a more general prompt would be a better way to go. The second part was a bit confusing to me.
- Facilitator: What was confusing?
- Marley (UG): What exactly are we doing with the resources?
- Facilitator: Are you saying that students would be unclear about the meaning of what to do with resources?
- Marley (UG): Yes, I’m seeing students not seeing the range of possibilities with resources.

Peyton (G) taught one of the capstone courses in the department and contributed additional knowledge about course content and how it was assessed. Peyton volunteered to pilot the rubric the DAT drafted to assess one of the

SLOs. Meeting minutes indicate that Peyton’s feedback on this experience contributed directly to rubric revisions and influenced additional conversations about assessing the SLOs. In their interviews, both Peyton and Marley indicated that they felt their opinions were taken seriously by the nonstudent DAT members.

Staff and faculty DAT members provided evidence that they considered the students to be equal and valued DAT members. In an exit interview, one faculty member stated that they would “not necessarily have thought about [including a student], admittedly, or known how to do it effectively.” This sentiment was shared by a staff member, who mentioned they were initially skeptical of how much help the students could actually provide on the project. However, both DAT members changed their perspectives as a result of working with the students, and during interviews they (separately) stated, “it turned out they were much more helpful than I expected, which was good” and “They consistently added great value.” This respect for the DAT student members was exhibited outside of DAT meetings and interviews as well, with a facilitation journal entry noting that a departmental email written by a staff DAT member highlighted the contributions of the student DAT members and praised their help with the project.

The DAT committed to maintaining student membership as well. At the beginning of the fourth semester, DAT members realized that Marley (UG) would graduate soon and made plans to invite another undergraduate student to join the DAT. When the new undergraduate student, Carrie, joined the group, she expressed that it was nice that she had been invited to “sit in” on the group, to which Skylar (S) responded, “Oh, you won’t just be sitting in!”

2. Discussion of principle 1

Evidence from all three data sources indicates that the DAT reached an important outcome: reciprocal collaborative relationships between student and nonstudent members. Faculty and staff DAT members came to value student perspectives and actively sought them out, which resulted in an environment where students felt they were taken seriously. The reciprocal relationships had important implications for the divination DAT’s work; in particular, current students’ learning experiences and perspectives informed the SLOs and assessments they created. The DAT exhibited their commitment to authentically partnering with students by ensuring that they recruited another undergraduate member to overlap with the current student member, who could demonstrate that in the DAT students act as peers, rather than subordinates.

Looking at the frequency data (Fig. 1), we find that evidence for working with students as partners was noted more in facilitator journal entries (56%) than in meeting minute entries (35%). One possible explanation for this pattern is that signs of student valuation are often nonverbal and therefore may only appear in a facilitator reflection.

The facilitators’ experience of the divination DAT was that partnering with students was a part of the fabric of this DAT’s culture and thus was signaled in many small ways. Overall, coding of P1 was not as frequent as other principles. The coding system tends to capture exceptional instances of core principles (see the Supplemental Material [22]), so the lower frequency of this principle’s appearance in the meeting minutes may be a factor of, paradoxically, the ubiquity of its embodiment in this DAT.

B. Principle 2: Work focuses on achieving collective positive outcomes

Change efforts often target individual problems rather than long-term outcomes. When a group focuses on problems, surface-level fixes are made rather than attending to the deeper issues from which the problems stem [34], and lasting change does not occur [35]. A focus on problems typically restricts change efforts to a single approach, whereas a focus on outcomes allows for more flexibility, as there are often multiple ways in which particular outcomes may be achieved [36]. A vision that collaboratively establishes desired outcomes supports a group in focusing on outcomes rather than problems [15]. Collaboration guided by a shared vision provides the group with an opportunity to build community, generate excitement, and provide ownership of their work [35].

1. Evidence of principle 2

Within the first few meetings, facilitators guided DAT members through a visioning activity that focused on identifying desired outcomes. During this activity, DAT members collaborated on a vision of the *ideal student* in the divination program and articulated outcomes in terms of desired skills and characteristics of graduating students. Meeting minutes provide evidence that facilitators periodically referenced the DAT’s vision. For example, at the end of the first semester, the facilitators asked DAT members to reflect on what is needed to get students to their desired levels of knowledge, understanding, and skills when exiting the program. This work prepared them to discuss what types of assessment data they needed to collect.

Evidence of DAT members thinking about outcomes and their vision without prompting from facilitators appeared throughout all stages of their work. During a conversation about assessing SLOs, one DAT member reflected, “This makes us think about our SLOs and if that’s what we really want. They’re nice and I can see where they come from, but going through all this makes me go back to the outcomes.” Facilitation journal entries emphasized that DAT members considered holistic programmatic outcomes for students and used these to guide their work.

While all DAT members contributed to the shared vision, there is also evidence that the DAT members sought input from relevant stakeholders. Meeting minutes and facilitator journals indicate that in their third semester, the DAT

worked with facilitators to develop a departmental meeting agenda that would allow sufficient time for feedback and discussion on the SLOs, which they perceived would result in a positive review from department members. After the departmental meeting, DAT members debriefed about their experience. They discussed how department members recognized the positive work the DAT was doing for the program and contrasted this approach to previous attempts to revise the programmatic SLOs.

- Kendall (S): [I] talked with some faculty beforehand who were skeptical that we would get anything done, but I knew we would be productive with the two goals and knowing how the facilitation team would be dealing with it.
- Riley (F): I chatted with a couple and the tone from them was different than the last meeting of this kind. They had positive things to say.

When asked to reflect on P2, DAT members affirmed that the DAT was focused on achieving collective positive outcomes. As Kendall (S) said in an interview, “I think that was something that I could say happened every meeting. And it was very much collective. It wasn’t just one person making a decision or one person doing this.”

2. Discussion of principle 2

The ideal student activity produced a vision that reflected the voices of all DAT members and the DAT used this to anchor their work. By repeatedly connecting back to their vision, they were able to maintain a focus on what they were working toward rather than focusing on individual problems in the undergraduate program. This outcomes focus led them to frequently reflect and revise the progress they were making in developing SLOs and assessments.

In alignment with their collective process, the DAT took steps to ensure the entire department could offer support and gain a sense of ownership of the SLOs. As observed in the conversation between Kendall and Riley, the DAT’s work was positively received by the department. Establishing frequent communication and opportunities for feedback with the department likely helped DAT members secure buy-in from faculty members whose courses would be impacted by the SLO assessment plan they ultimately proposed.

P2 was coded frequently in meeting minutes (87%) and facilitator journals (68%). Although the DAT often had conversations related to an outcomes focus or collective work, facilitators did not always comment on this in journal entries. This may be because the facilitators were more conservative in their perception of P2 and chose to note only the instances where the DAT moved forward with decisions and products that were clearly outcomes focused.

In the analysis presented in this manuscript, we included general conversations that were guided by outcomes and collective work as evidence of P2, which resulted in increased evidence of P2.

C. Principle 3: Data collection, analysis, and interpretation inform decision-making

Data-driven decision-making has been a growing practice in organizations [37]. Collecting data from a variety of sources is important to understand complex organizations or systems, as data collected from a single source will only tell part of the story [38]. Iterative data collection allows a group to track changes (or lack thereof) within a system over time [39]. Data can lead to different insights depending on how it is analyzed; thus, multiple methods of analysis and interpretations should be explored [37,40]. Examining data from a diverse set of perspectives provides a richer understanding of its meaning and helps mitigate bias [41].

1. Evidence of principle 3

In order to redesign SLOs and assessments for their program, the divination DAT drew upon a variety of data sources. Data they examined during their meetings included existing student surveys, course syllabi, educational literature, and practices and tools from comparable programs at other institutions. Data informed the DAT’s work in stages. First, an existing survey that was used to assess students’ progress in programmatic SLOs was reviewed by the DAT. This conversation, in which DAT members evaluated the quality of the items in the assessment, was captured in the meeting minutes in semester 1.

- Peyton (G): Many of the questions are not black and white in terms of their wording, easier for students to pick 2, 3, or 4 because they don’t know the bounds of the questions—perhaps be more specific for skills or content knowledge.
- Spencer (F): It would be interesting to know how many students actually read the question and knew that a 3 meant “uncertain” and not that they felt in the middle about their skill level.
- Skylar (S): Is there a way divination also measures students’ ability in addition to their perceptions of their ability?
- Peyton (G): Some open-ended questions might provide more insight into some of these answers, give us richer data for assessment.

Meeting minutes provide evidence that the divination DAT regularly considered the types of data they might collect to assess students’ progress in the SLOs. As they progressed from evaluating existing assessments and began

to discuss the development of their own SLO assessment plan, they also began to consider what methods would be appropriate for collecting and interpreting these data. The following excerpt is an example of this type of exchange.

- Marley (UG): If there was a way to ask opinion questions in the beginning and then a different survey at the end to assess skills, that could be better.
- Peyton (G): Could ask students questions in classes around some of these concepts, that can be graded in order to give exit data. Can do some of this in the context of classes.
- Morgan (S): The grade could be the assessment. It's more on the faculty.
- Riley (F): If a student earns an A, that may or may not reflect their comprehension or ability. Grades are imperfect.
- Skylar (S): We are not just supposed to use grades as a measure.
- Facilitator: In a perfect world, grades could be a proxy. But in reality, we need to collect additional data.

Facilitator journals provide additional evidence of DAT members considering data collection, analysis, and interpretation. In several entries, the journals record outside resources brought in by DAT members or facilitators, including information about accreditation standards, examples of assessment plans from other institutions, and resources to refine the SLO language.

When interviewed, DAT members did not consider their engagement with data collection, analysis, and interpretation to be very high. Carrie (UG) and Kendall (S) did not feel that they engaged in P3 at all, explaining that the DAT's assessment plan had not yet been implemented, so they did not have any data. Marley (G) felt that P3 was present in the DAT's work, but only in terms of the data that would be gathered as part of the assessment plan, stating, "Yes, because a lot of the time we were developing solutions to collect more data, so we believed that we were trying to follow that principle, but we were more trying to set up the structure to follow that principle."

2. Discussion of principle 3

Data supported the divination DAT in making progress toward their goals in several ways. First, the examination of a departmental student survey and its results prompted DAT members to think about data quality. This led to a discussion of ways in which the survey could be improved using best practices for survey design and better alignment with their program and SLOs. Their repeated conversations about identifying appropriate data to measure SLOs and their choice of high-quality collection and analysis methods

suggest that the DAT members were aware that bias can influence this process. Ultimately, they were concerned with collecting data that would be meaningful in improving the program and student learning.

The divination DAT relied on several other data sources to inform their work, as noted in the facilitator journals. These resources directly contributed to a more holistic development of the SLOs and the assessment plan. DAT members' willingness to use multiple sources of information to guide them suggests that they saw value in using data to inform decisions.

Since one of the DAT's goals was to develop an assessment plan for the program SLOs, it is unsurprising that the vast majority of their meetings (94%) contained some form of evidence related to P3. Despite this high prevalence, in interviews, DAT members indicated they did not consider their work to embody P3. DAT members, and perhaps even facilitators at the time, did not consider the review of data or resources that contain data to embody P3. Indeed, the researchers' conception of P3 underwent revision during the coding process as a result of this DAT's extensive conversations that illustrated meaningful preparation for the collection and use of data. The coding of P3 was expanded to include planning for data collection and analysis activities. We feel that this expanded conception of P3 allows the types of conversations and preparatory work that frequently occur during meetings to be interpreted as evidence of future data analysis, collection, and interpretation.

D. Principle 4: Collaboration among group members is enjoyable, productive, and rewarding

Complex change requires a team effort [10]. For meaningful collaboration and change to happen, team members must have the opportunity for their perspectives to be heard, valued, and carry weight in decision-making [36]. The ways in which team members interact create these opportunities. Enjoyable, productive, and rewarding interactions are more likely to result in equitable ways of working and an environment that supports multiple viewpoints and constructive disagreement. Establishing and reflecting on group norms, such as collaborative norms, that guide the types of interactions team members engage in can help create productive behaviors [36]. Further, engaging in activities that build a sense of community helps the collaboration not only be meaningful and productive but also enjoyable and rewarding [42]. A sense of community among team members builds trust, further reinforcing an environment for productive interactions to occur [36].

1. Evidence of principle 4

The nonwork-related conversation was coded as evidence of P4. These types of conversations included DAT members sharing personal or department news or responding to an icebreaker prompt. Most meeting minutes included some nonwork-related conversation;

for example, a facilitator journal entry recorded that Alex congratulated Peyton on receiving a prestigious award in the field and the group celebrated his success. While not necessary to achieve P4, these conversations were one indication that enjoyable and rewarding interactions were taking place.

Conversations related to team functioning were also coded as P4. The divination DAT consistently talked about collaborative norms and chose one norm (e.g., pausing) to focus on for each meeting. The DAT members deliberately practiced this norm throughout the meeting, and one member served as the “norm checker” who reported out at the end of the meeting with evidence of ways in which DAT members engaged in the chosen norm. This was captured in meeting minutes and facilitator journals, and one facilitator entry noted that “Peyton said he was pulling his idea off the table [the chosen collaborative norm for the day] after the group weighed in on it, and the group laughed about it as he reached onto the table to physically pull it off.”

Conversations and actions related to equitable group culture were also coded as evidence of P4. Facilitators noted that during one of the meetings where the department chair was absent, the other DAT members commented on how they were still able to make progress. The diffuse power structure that resulted from the DAT’s equitable, productive culture was mentioned in other entries as well, such as noting when the DAT intentionally decided to have staff and faculty equally manage the department meeting where the DAT’s work was presented.

Interviews with DAT members provided additional insight into how the DAT embodied P4. When asked about the general feeling of the group’s interactions, Riley (F) responded,

I do think that the experience really did foster levels of respect, especially when we did the norm checking thing and people could report back out. It was a level of engagement that isn’t normal in a typical meeting. So I think it really did help build a sense of community. It was already there, but it was different. It was unique, and it was with more depth than is typical.

Riley noted how engaging in conversations about norms and other activities related to team functioning led to an increased sense of community in comparison to other departmental groups.

2. Discussion of principle 4

Engaging in behavior related to P4 benefited the divination DAT in many ways. Deliberately talking about and practicing collaborative norms enabled the DAT to communicate productively, like taking ideas that may block progress “off the table.” When Peyton did that, his

conscious display of using the norm and the resulting laughter indicates the DAT had a positive atmosphere where ideas were presented and critiqued without tension. It is also indicative that explicitly practicing collaborative norms had become an accepted part of the DAT’s culture.

The department chair also exhibited intentional behavior for the benefit of the team. By stepping away from her positional power and openly supporting other DAT members’ perspectives, she helped establish a more equitable environment where all DAT members felt comfortable contributing to decision-making. This deliberate behavior as well as other observations by facilitators suggests that a dispersed power structure existed within the DAT, where all members’ input was valued regardless of role or status within the department. Ultimately, these behaviors contributed to a sense of community that was unique to the DAT.

P4 emerged frequently in both the meeting minutes (87%) and the facilitator journals (84%). Since the facilitators developed the meeting agendas for the first three semesters, the high frequency of P4 could be interpreted as an artifact of the work of the facilitators. However, while the meeting structure was introduced by the facilitators, the DAT members displayed a high level of engagement with collaborative norms and other structures introduced by facilitators and chose to continue using this structure after they started to facilitate the DAT on their own.

E. Principle 5: Continuous improvement is an upheld practice

Since higher education institutions are complex systems undergoing constant change [39,43], solutions to educational challenges require flexibility and continuous attention [34,36]. When department members frequently reflect on the efficacy of educational structures and engage in continuous improvement processes, they iteratively arrive at better solutions [32,44,45]. These solutions are evaluated based on their impact on the system, and as relevant metrics for evaluating the solutions shift in response to a changing environment, the solutions themselves can be updated. When groups establish shorter-term goals, they are better able to report progress and build momentum for their work [46].

1. Evidence of principle 5

Principle 5 emerged in more subtle ways than other principles, such as in the following exchange between DAT members during a meeting about how faculty members may want to utilize assessment data.

Spencer (F): It’s a different question at the program assessment data and the course assessment level.

- Taylor (F): I feel that something like this can feel like a waste of time if there's no structure around it. Or it could seem different if we could share data and know how it can be used to maintain or improve the program. I would be more invested in it (if I wasn't on the committee).
- Skylar (S): How we use it may depend on what the data told us. We might need to adjust curriculum to get to the best outcomes.
- Spencer (F): It could even be flaws in our first run at assessment. Like we decided to assess this SLO in this course this way and we find we aren't quite there and someone says why don't we try to hit that sub SLO in my class...that kind of interaction between faculty.
- Taylor (F): Maybe like to use that info to improve the program but the path forward might not be obvious.

In this conversation, DAT members are making plans for the data they plan to collect, and Skylar acknowledges that they do not know what the data will tell them. Spencer builds on this idea and makes other suggestions of what they might change as a result of the data.

In addition to making flexible plans, DAT members also sequenced their efforts based on what actions would help their work gain momentum. When talking about developing assessments to collect data for the new SLOs in existing classes, Peyton (G) pointed out, "If there is clearly one course that does [cover a SLO], it seems like low-hanging fruit, we can identify the parts of the SLOs that we are assessing and we can move those aside and work on the others. Take advantage of what is clearly going to be useful."

Other evidence of P5 centered around the DAT's future and putting mechanisms into place to sustain the work. Some conversations during the final semester focused on establishing long-term support for the DAT's work. In his interview, Peyton noted that the future of the work would depend on the involvement of crucial stakeholders and that the facilitators had helped prepare the DAT for this eventuality. DAT members also discussed continuing the DAT structure in some capacity. Two of the DAT members took on facilitation roles during the fourth semester to ensure that the DAT would continue to be facilitated, and the preparation for this transition was captured in facilitator journals.

2. Discussion of principle 5

In the case of the divination DAT, attending to P5 was a subtle practice and attitude that influenced the trajectory of their work. P5 manifested in their willingness to be flexible in their response to collected data. The exchange between several DAT members indicates that they considered change

to be an evolving process, rather than a static, predetermined plan. Similarly, Peyton's suggestion to start with identifying the course that had the most overlap with their new SLOs helped them to make early demonstrable progress, another hallmark for P5, in which work is chosen strategically to pave the way to later, potentially more difficult work.

The frequency of P5 was lower in the meeting minutes (48%) and facilitator journals (36%) than in other principles. Although conversations embodying continuous improvement were not always an explicit component of their meetings or their final assessment plan, it was clear from DAT member interviews and facilitator journals that conversations touching on this idea strongly influenced their work. For the divination DAT, the attention they paid to the sustainability of their work resulted in an assessment plan that was flexible in how it would impact the department. DAT members also considered the continuity of the team itself. By spending time planning for the future of the DAT, DAT members increased the likelihood that the community and culture they developed over the previous semesters would continue without the presence of external facilitators.

F. Principle 6: Work is grounded in a commitment to equity, inclusion, and social justice

Equity and inclusion result in part from recognizing and reflecting on systems in higher education and the ways in which they result in oppression [47] and making decisions that ensure oppressive behavior is not replicated. While it is important for groups to engage in this practice, it is also essential that individuals acknowledge their responsibility to reflect on their own behavior and further their understanding of oppression. Finally, the group itself must be comprised of diverse membership, as the inclusion of the diversity of lived experiences and the perspectives that result from them can lead to more effective solutions [48].

1. Evidence of principle 6

When asked during exit interviews whether there were any principles the DAT did not engage in as frequently as others, P6 was mentioned by multiple participants. This is articulated by Kendall (S) in the following excerpt from her interview:

- Kendall: And then the other one that I'm struggling with is "work is grounded in a commitment to equity, inclusion, and social justice." There's probably an example of that if I had a little bit more time to give it some thought. But I could see how this could be useful had our DAT formed to accomplish a different goal. I think then that might be a little bit more relevant for us.
- Interviewer: Could you say more about that?

Kendall: I guess maybe our revised student learning outcomes could maybe come up to this, because those went through a complete overhaul of what they were. And now it does, I feel like, have bits of inclusion in that every student would be able to be seen within these SLOs. I guess I don't know what other DATs are trying to do, or maybe what they're formed to do. But I feel like our goal was come up with an assessment plan, and I'm just struggling to see equity, inclusion, and social justice. I guess the people around the table would absolutely be an inclusion factor. Because it wasn't just faculty, it was all across positions within the department. So that was it, I guess, maybe.

While Kendall struggled to connect P6 to the DAT's work, she noted that they were working for all students to "be seen" in the assessment results and recognized they embodied P6 by including people on the team from "all across positions within the department." Her latter point about diversity within the DAT was also mentioned by other DAT members.

Notable examples of modeling P6 were found in the meeting minutes and facilitator journals. A conversation about appropriate measures for evaluating communication skills was recorded in the meeting minutes, which captured Skylar (S) saying, "Won't come up often, but making eye contact is something not all students will be able to do due to culture, whereas engagement with the audience is something that can be measured across the board." The corresponding facilitator journals expanded on what was captured in the meeting minutes, with a facilitator summarizing, "When reflecting on the soft skills that they had thought about for an ideal student, Skylar (S) brought up that some of these 'ideal characteristics' are biased (their example was personability, which they said sometimes we place white ideals of what personability is on everyone), this informed their conversation about how to prioritize SLOs."

2. Discussion of principle 6

Kendall (S), as well as other DAT members, struggled to see how they applied P6 while developing an assessment plan for the SLOs. In interviews, it became clear that DAT members did not feel that they were engaging in P6 if it was not the primary focus of the DAT's work, despite facilitators noting examples of behavior aligned with P6. Fewer instances of P6 (23% in meeting minutes, 28% in facilitator journals) could mean that there was room within this DAT's experience for more engagement and explicit commitment to P6. The times when they did embody P6 generally resulted in decisions that were more inclusive and equitable

for the student population, such as carefully thinking about the appropriateness of certain measures for evaluating students' communication skills. Additional attention paid to P6, however, may have led to increased attention to an inclusive design for assessments, such as considering the accessibility of the assessments.

Reflection on P6 resulted in several DAT members noting that their DAT exhibited diversity and inclusion within the team. It is possible that this reflection prompted some DAT members to expand their interpretation of P6 to include the diversity exhibited by the team itself, which may be a consideration for future teams they join. An implicit outcome of the diversity within the DAT is strengthened support for the work they are doing and a product that has been informed by more stakeholders and thus more likely to be received positively in the department.

IV. IMPLICATIONS AND RECOMMENDATIONS

Behavior aligned with the core principles emerged frequently throughout the work of the divination DAT. While the DAT originally came together to develop an assessment plan to collect data for accreditation, this work led to a deeper examination and revision of the program's SLOs with a plan for ongoing assessment and revisions as needed. Through our analysis, we identified ways in which practicing the core principles supported the divination DAT's change effort.

These findings can help practitioners, who we consider to be those facilitating and members of group change efforts, be strategic in thinking about ways working groups can engage with the core principles and can provide researchers with a new analytical lens through which to study change efforts. We would like to note that such efforts need not be employed through a DAT. One could imagine a working group of various stakeholders engaging to work on a change initiative in their "unit." The core principles provide productive guidance for such a group. In addition, there is ample opportunity for a researcher to understand how a group might engage with the core principles and how these principles could support such a group's change effort.

A. Implications for practitioners

There are several implications for groups looking to align their practices with the core principles. The first is that certain principles will be easier for groups to engage with than others. The frequency data indicate that for the divination DAT, P2, P3, and P4 were the "low-hanging fruit" in terms of engagement. Which principles have lower barriers of engagement for a group will be influenced by many factors, such as the composition and history of the group as well as departmental and institutional culture. However, it is likely that groups will naturally embody certain principles more than others. Explicit conversations about the principles can help groups consider what

practices may be aligned with the core principles. This can lead to future opportunities to talk about and reflect on the influence of other principles that may not naturally emerge in the group's practices.

Certain activities are likely to promote engagement with the core principles. In the divination DAT, the visioning activity anchored the DAT members' continued engagement with an outcomes focus (P2) throughout their work. Furthermore, activities that promote engagement with one principle are likely to support behavior aligned with other principles as well. For example, the repeating agenda item to talk about collaborative norms not only promoted a unique, productive culture among the team (P4) but also likely supported the equal inclusion of the student DAT members (P1). The existence of interactions between principles is further evidenced by the existence of multiple principles within an excerpt, which is not examined in this article. Since the principles naturally reinforce each other [15], it is likely that where evidence of one principle is found, the conditions are conducive for practicing other principles. For additional examples of activities and structures that are designed to support engagement with the core principles, please see Ngai *et al.* [49].

The ways in which groups embody the core principles will differ from group to group. The culture and norms associated with the department, institution, and field influence how a group behaves. Thus, the ways in which one group practices the core principles may not necessarily be the most effective way for other groups to engage with the core principles, and practitioners may need to adjust their own expectations and practices in response to each group.

B. Implications for researchers

Change efforts are complex, and the core principles provide an analytical lens through which change efforts can be studied. In particular, the core principles can shed light on goals, decision-making processes, progress toward goals, and sustainability of efforts. Because the core principles themselves are multifaceted, they provide structure for examining different ways in which a group may embody each principle as they make progress on their work. For example, in multiple meetings, the divination DAT embodied P4 by reflecting on collaborative norms and engaging in shared decision-making. Another study [50] used the core principles to characterize the experiences of stakeholders who are associated with gateway courses (college algebra, precalculus, trigonometry) at a two-year college. The researchers present evidence pertaining to P1, P2, and P3 and use the core principles to better understand how students, instructors, advisors, and administrators perceived the revised course placement practices. This suggests that the core principles can be applied to analyze and characterize change efforts beyond DATs.

In addition, analysis need not be limited to considering one principle at a time. For example, in one DAT meeting, the group reflected on their work during the first semester noting "An important goal for us is to develop the skills so that the DAT can continue to make positive changes in the department." This statement captures the focus on outcomes in P2 and connects to the continuous improvement of P5. While this paper did not explicitly focus on the blending of the core principles, we recognize that this occurrence could be studied more deeply to further characterize a change effort.

Our analysis revealed it was necessary to utilize multiple data sources to get the full picture of how the divination DAT was embodying the core principles. Interviews, meeting minutes, and facilitator journal entries were used in tandem to provide context that one source alone could not. For example, on one occasion, the DAT was examining existing SLOs, setting up a plan for revising them, and identifying SLOs that needed fewer modifications than others. While P5 was not obvious in the meeting minutes, the corresponding facilitator journal entry noted the evidence of this principle on a smaller scale as the DAT looked for "early wins because it felt good to get those done." On another occasion, meeting minutes captured evidence of P2 when the entire meeting was structured in a way to set up an action plan for the semester for working on their shared vision, whereas the corresponding facilitator journal entry focused on the conversations that occurred during the meeting, which captured other principles. Core principles would have been missed had we not used more than one data source to triangulate our findings. We recommend the use of multiple data sources to those planning to use the core principles as an analytical lens.

C. Limitations

We recognize that there are limitations to this work. First, this analysis focused on a single team's change effort. Although it is probable that other DATs and teams participating in change efforts participated in similar activities to the divination DAT (e.g., developing a shared vision), their practice of the core principles likely differed. It is necessary to apply this analytical method to other change teams' efforts to establish more generalizable implications for how teams can use the core principles to guide their work.

Although we linked behavior related to the core principles to observed outcomes, it is impossible to know if the outcomes would have happened regardless of DAT members' engagement with the core principles. Furthermore, we recognize that these six core principles are only one way to characterize productive behavior in a group and that there may be other principles or aspects of culture that we are missing in this framework that could explain the observed outcomes.

Analysis using the core principles can present some challenges. The unit of analysis for the meeting minutes and facilitator journal entries was at the scale of a meeting. This means that the frequency with which a principle is practiced during a single meeting is not captured in this paper. We also did not analyze the blending of principles, and it is likely that an understanding of the ways in which the principles appear together will contribute to a more holistic picture of the practices related to the core principles. We hope that we have provided enough of an accounting of our methods so that others can amend them to address these limitations if desired.

V. CONCLUSION

Change efforts are typically complex and difficult to evaluate, but analyzing efforts through the lens of core principles offers a method for characterizing aspects of culture that contribute to the ability of a group to enact change. In this paper, we have outlined ways in which DAT members exhibited each core principle and relate that to the observed outcomes for the divination DAT's work and team culture.

We consider the divination DAT to be an example of a team that successfully engaged in the core principles, based on the range and frequency of behavior aligned with the core principles. We feel that engaging in behaviors that reflected the core principles supported observed successes for this DAT.

The core principles provide a unique approach to understanding and enacting change. Practitioners may use the core principles in their own context to support change efforts, and other researchers may use them to study change efforts. We do not make the claim that this work could not be accomplished without the knowledge of the core principles, but rather that the ways in which this work was accomplished were different because of the attention paid to the core principles through the DAT model.

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