

## Instructors' Vulnerability, Curiosity, and (Dis)trust of Data Informing Critical Transformations in Mathematics

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*This preliminary report examines the reactions of mathematics instructors in Networked Improvement Communities as they engaged with student experience data to inform critical transformations within mathematics. Data-driven decision-making is promoted for improving equity; however, without a specific critical focus such efforts will likely fail. Examining data critically requires instructors to grapple with, at times, painful experiences of students, and their role in shaping these experiences. Using critical ethnography, we analyzed field notes to identify ways that instructors responded to data in meetings held from Spring 2023 to Summer 2024. Findings show that instructors' reactions to data often fall into two categories. Ego threat, characterized by reactions such as discomfort and defensiveness, effectively delegitimized student data. In contrast, some instructors exhibited curiosity and vulnerability, viewing students as experts of their experiences. Ongoing research will explore how ego threat shapes critical efforts and how fostering openness can enhance critical data-driven decision making.*

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Although the term “data-driven” is prevalent in research, data do not drive themselves (Bensimon et al., 2007); data are collected and analyzed by people with their own experiences, perspectives, agendas, and biases. In the context of education, instructors and institutions hoping to engage in data-driven decision making (DDDM) may inadvertently reinforce ideologies that perpetuate existing inequities in education (Datnow, 2017; Dodman et al., 2021; Taylor Jr., 2020). As such, Dodman et al. (2021) argue that a critical approach to DDDM is necessary in equity-focused transformation efforts. However, because a critical approach requires challenging dominant practices and interpretations, educators may struggle to enact a critical approach to DDDM. The purpose of this study is to examine the data use practices of mathematics instructors as they worked within Networked Improvement Communities (NICs) that specifically encouraged DDDM to identify critical transformations needed within their mathematics programs (Hagman et al., 2024). NICs (Martin et al., 2020) are networked communities of people using data to work toward a common improvement goal. For this preliminary report, we asked: How did mathematics instructors respond to data about student experiences in the context of making critical transformations in mathematics?

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## Theoretical Perspectives

Dodman et al. (2021) argue that a critical approach to data-driven decision making practices (CDDDM) is necessary to help achieve social justice and equity aims. Within their framework, a teacher's data use practices are viewed to be a function of their identities and beliefs about data, students, and their own agency or efficacy to address inequity in and outside the classroom. As such, CDDDM demands that educators reflect upon and challenge their identities and beliefs; this can be a vulnerable and uncomfortable process, similar to the process that educators must go through when learning to engage in equitable teaching practices (e.g., Tuitt et al., 2018). Indeed, engaging in critical transformation work demands vulnerability (Gilson, 2011). Drawing from work on whiteness and emotional politics, we view vulnerability as the capacity for "hearing, seeing and feeling (being affected by and affecting) experiences of oppression" (Wale, 2019, p. 1194). In the context of this study, we specify that vulnerability may come into two forms: (a) pedagogical vulnerability is the capacity to be open with a group of peers collectively engaged in critical transformation efforts informed by data and (b) emotional vulnerability is the capacity for being affected by and affecting the experiences told by students through data. Both forms of vulnerability necessarily require understanding one's own role (and at times complicity) in these experiences: people have to be in a "brave space" (Brown, 2017) of admitting the status quo is not good enough to themselves and to each other--their teaching is not good enough, their department is not good enough--to engender more equitable mathematics teaching and learning.

Pedagogical vulnerability resides in the interactions among instructors (Mangione & Norton, 2023). Due to the vulnerable nature of critical work, effective NICs must foster a culture that supports vulnerability and encourages critical action. NICs do not automatically result in pedagogical vulnerability; such a state is achieved only when the members intentionally build a space of trust where they have a willingness and openness to explore their vulnerability with others (Kelly, 2013). Within the NIC literature, relational trust is a strong indicator of health of a NIC, and crucial to supporting exploration, experimentation, and change (Henrick et al., 2017).

Because engaging in CDDDM may bring discomfort, some people may experience "ego threat", a threat to one's self-image or self-esteem, (Gregory & Mebane, 2020) when they encounter data or situations that challenge their professional self-efficacy or teaching identities as "good" teachers. Common responses to ego threat are denial (devaluing the meaning of the data), avoidance (ignoring or dismissing data), defensiveness (making excuses for the discrepancy between role expectations and the data outcome), or attack (challenging the validity of the data or confronting the person sharing the conflicting opinion). Within a community of fellow mathematics instructors, discomfort may also bring about efforts to comfort one another or absolve each other's role in the negative experiences of students - we view this as similar to what Applebaum (2017) describes as the practice some teachers engage in of comforting discomfort students may face in a social justice classroom.

## Methods

This study uses data from the ACT UP Math project (NSF DUE-2201486) involving university mathematics departments with NICs engaged in critical transformation efforts. Kappa University, a private doctoral-granting institution in the Southeastern United States, and Tau University, a public doctoral-granting institution in the Southern United States, are the two institutions of focus for this analysis. Our research utilizes critical ethnography (Palmer & Caldas, 2015) as its methodological approach. As part of a research-practice partnership (Coburn et al., 2021), we are deeply immersed in the data, acting both as ethnographic researchers and participants. Since Fall 2022, we have collaborated closely with the NICs to gain insights into

their institutional environments and objectives concerning critical transformations toward diversity, equity, and inclusion, while systematically documenting all interactions. While NIC membership evolved over two years, the Kappa and Tau NICs maintained 8-11 members each composed of mathematics instructors, administrators, and students.

To determine the critical transformations needed to make their introductory mathematics programs more equitable, each NIC explored institutional data and engaged in a critical, data-driven decision-making process. The NICs began collecting new institutional and classroom-level data in Spring 2023, and continued to discuss data collection and analysis as they met in subsequent semesters. For this analysis, we initially reviewed the structured field notes from all monthly NIC meetings between Spring 2023 and Summer 2024 to identify instances in which data about student experiences were explicitly discussed. We engaged in multiple rounds of open and theory-driven coding (Maxwell, 2005). Each of the field notes were initially open coded by two researchers; then, we independently aligned our open coding with the theory referenced above and met to discuss salient themes. The themes of instructor responses included: curious, vulnerable, reflective, questioning, devalue/dismiss, defensive, doubt/skepticism, attack, disappointment, (un)surprise/shock, and planning/action. We sorted the themes into larger categories and discussed the wide range of responses and the multiplicity of particular codes. We present these themes in our findings and later discuss multiple avenues for continued analysis. All names used in the following sections are pseudonyms.

### **Findings**

We sorted our themes of NIC members' responses to data into two categories. Several of the reactions of NIC members to data could be classified as responses typical of ego threat (Gregory & Mebane, 2020) and other reactions of NIC members conveyed open dispositions (curiosity and vulnerability) toward the data. We elaborate on these two overarching themes below.

#### **Related to Ego Threat and Comforting Discomfort**

We first present two conversations among members of the Tau NIC and the Kappa NIC that illustrated doubt, dismissal, and devaluing of the data. The first exchange occurred during the Tau NIC's first summer meeting in 2024, as members viewed the survey data collected from their students in the spring semester. The survey included items about engagement during and outside of class, sense of belonging, expected final course grade, and demographic information.

*Jordan (Instructor):* If we look at the average [of student engagement data...], it seems to contradict what we see from final exam grades. Students say, "We are engaged. We are doing the work." I put some questions in the [review] that are the same as the final exam, and I was surprised to see that the majority of students failed those questions on the final. So this contradicts what I see. This [data] is aspirational, not real.

*Olivia (Admin/Instructor):* It's our data!

*Jordan:* Students are not giving their true data.

In this conversation, Tau NIC members expressed distrust, either of the students providing the data or of the representation of the data. Viewing the quantitative data as "not...true" or "aspirational" justified their responses to dismiss the student feedback presented.

The second conversation occurred among Kappa NIC members in Fall 2023 as they examined institutional data about student experiences in mathematics courses gathered through a large-scale survey. Senna questioned how useful or legitimate the data were:

I'm not saying it's invalid data, but I think we've tried—made a lot of efforts since then to try to fix things? Obviously, they're still not where we want them to be, but I wonder if [...] student morale was even worse then.

The discussion continued as other instructors asked when the data were collected and suggested that they administer the original survey again, since “that was all pre-COVID” and “a long time ago.” When presented with data that indicated low student morale, the Kappa NIC dismissed this finding by acknowledging the data was older and possibly not reflective of more recent reform efforts. Senna, an instructor, implied that student morale has improved in light of their efforts, while also admitting that their efforts are “still not where we want them to be.”

In both the Kappa and Tau NICs, there were instances where data from student focus groups were dismissed due to assumptions about students. During one Kappa NIC meeting in Spring 2024, one member described students' perspectives from a student focus group as “ridiculous” and not valuable when those suggestions advocated for dispelling certain normative practices in mathematics education, such as administering exams or collecting homework. Some of the Kappa NIC members continually asserted that “students love to complain,” and in turn, they dismissed some of the focus group students' experiences and ideas. Similarly, during a Tau NIC meeting, one NIC member (an instructor) shared that “students said that other students should take easy classes along with mine,” other NIC members consoled him that “students always complain” that their class is too hard. We found these instances noteworthy as both NICs pushed back on the suggestions from students and sought to comfort each other when facing critiques.

### **Related to Curiosity and Vulnerability**

In some instances, data exploration fostered curiosity about student experiences and department practices. For example, Tau members recorded their own teaching and shared their observations with the NIC. Olivia reflected on their receptivity to make data-informed changes: “I think it may be impacting the rest of the NIC to be able to see someone else [another instructor] being vulnerable and being curious and willing to try something different in practice.” Olivia noted the influence of NIC members' attitudes about the data on one another. At Kappa, student focus group data revealed that some students struggled to take calculus with peers who had already taken the course before. This prompted curiosity from instructors about department practices (e.g. “How does the department decide what to recommend students take?”).

At times, NIC members displayed vulnerability in responding to data, particularly as it connected to their own instruction. For example, during a Tau meeting, Garrett presented a qualitative analysis of his students' responses to a survey administered in Fall 2023. In response to some of the data, he shared “I got my feelings hurt.” But Garrett also shared that his approach to data had shifted from the prior semester, in which he reacted defensively to focus group data: “the purpose of this [data analysis] is not to confirm I'm doing a great job. [I] wish I had that mindset with the focus group [data collected in Spring 2023].” These quotations from Garrett represent a shift in perspective about data - from expecting that data would “confirm” his beliefs, to using data as a tool for questioning teaching practices. At Kappa, an undergraduate student NIC member shared an anecdote about the way in which students bond over “hating on math.” Skylar said that “I'm into bonding. I am happy to be the brunt of jokes for bonding.” Her sincerity in welcoming such bonding demonstrates her willingness to validate students' perspectives and experiences, even when it leaves her as “the brunt of [their] jokes.”

The following conversation further highlights how NIC members remained open to the data through receptiveness and a willingness to (re)consider their roles in conversation with the data:

*Connor (Instructor):* I don't see anything revelatory in this data. Waiting for you all to disagree with me.

*Natalie (Instructor):* I would love to. Partially using this as confirming what I expected. Not sure how this informs what we should do. Maybe we're seeing it wrong - maybe it's about us not seeing what we want in the data.

*Connor:* What did we do?

*Natalie:* This is like a control, baseline. What can we change to change these data?

*Jordan (Instructor):* I would expect the STEM students to outshine the non-STEM majors, but it's not that way.

*Natalie:* I'm going to go back to the questions - the data is not revelatory. I'm wondering about - maybe we should stop looking at the confirmation of what's working. I'm wondering if there was one thing I did, verbally or in class work, or in feedback on exams, how could I, if I intentionally went in to increase students' sense of belonging.

In this exchange, Tau NIC members exhibit curiosity about what the data are saying and even question their own assumptions. They think about how the data from students can inform their practice and seem receptive to making changes.

### **Questions for Discussion and Directions for Future Work**

Our preliminary findings illustrate how mathematics instructors reacted to data with responses characteristic of ego threat (Gregory & Mebane, 2020) and curiosity and vulnerability. One future direction of this work is to use an ego threat framework as a way to address how threats to professional self-efficacy, self-esteem, and the identity of being an mathematics instructor manifest in the delegitimization of data within equity-oriented reform efforts. There are legitimate reasons for distrusting or being skeptical of both qualitative and quantitative data; however, we wonder to what extent responses that align with ego threat hinder the progress of the NICs to make data-informed decisions. In our previous work which focused on students as experts of their own experiences and as partners in institutional change efforts (Hagman et al., 2024), we noted how some instructors easily delegitimized data about students' experiences when students were viewed as dishonest, "complainers," naive, or, in other words, not as experts. We plan to continue this work by examining how anti-deficit perspectives influence the positioning of students as partners and how that impacts the progress of the NICs. Other directions for future exploration related to CDDDM include:

1. How can instructors be supported in being vulnerable to what students share about their experiences during data collection?
2. What data do instructors find compelling or convincing and for what purposes (e.g., to inform implementation)?
3. What are the implicit arguments, beliefs, etc. shared by instructors as they engage with and make use of the data?

Dodman et al. (2021) suggested that CDDDM is influenced by an instructor's identity and beliefs. We plan to analyze other sources of data (e.g., interviews, journal entries) to study the connection of beliefs and the arguments made by instructors as they work toward CDDDM. In this proposed preliminary session, we would like to engage in dialogue with fellow scholars to brainstorm ideas for further exploring these questions.

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