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Learning to subvert: How online learning communities can promote acts of creative insubordination

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Abstract
Social media is an increasingly prevalent informal learning site for mathematics teachers. These platforms offer an emotionally and philosophically supportive space for teachers who seek to address oppressive teaching practices within their school communities. In this paper, we examine interactions in a Facebook group with over 14,000 members to understand how a social media platform can be used by teachers to develop professionally. In our analysis of interactions within the Facebook group, we found teachers often use this space to seek support in combating the negative effects of tracking while also seeking support to better implement mixed ability learning opportunities. Through comments, community members encourage rehumanizing mathematics classrooms by promoting practices of creative insubordination (Gutiérrez in Teach Excell EquityMath 7(1):52–60, 2016).

Keywords Social media · Teacher learning · Tracking · Ability grouping · Heterogeneous grouping · Creative insubordination

Introduction

The negative effects of tracking are clearly articulated within the National Council of Teachers of Mathematics' publications *Principles to Action* (2014), *Catalyzing Change in High School Mathematics* (2018), and more recently in position statements of multiple mathematics education organizations (see example NCSM, 2020). Yet the practice of tracking continues to dominate K-12 schools, especially those within the United States. Choices made based on ill-informed assumptions about students' academic ability (Ladson-Billings,

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1997) have led school systems to track students into mathematics classrooms that often do not prepare students for futures in STEM fields (Oakes, 1990). Course sequencing (e.g., school-level tracking practices within secondary schools) and perceived ability-grouping (e.g., classroom-level tracking practices in elementary schools) continue to have negative effects on students such as the continuation of social reproduction (Reichelt et al., 2019), lack of student motivation (Lessard et al., 2018), and lower beliefs about one's mathematical ability (Mijs, 2016). Tracking also has a negative effect on teachers, especially new teachers (Achinstein et al., 2004). As teachers become more aware of the effects of tracking on both their students and themselves, some teachers are attempting to change the system from within their schools and classrooms.

The purpose of this paper is to investigate how teachers use social media to discuss and propose acts of creative insubordination (Gutiérrez, 2016) to address issues related to grouping students for mathematics instruction within their classrooms and schools. In what follows, we review the literature on tracking and creative insubordination, then elaborate on a model of teacher learning that highlights the necessity for teachers to enter social media for support. This work is guided by the following research questions: (1) As it relates to grouping students for mathematics instruction, what propels teachers to seek support online? and (2) What practices of creative insubordination are discussed within a mathematics education Facebook group?

Tracking and ability grouping

At the school-level in the United States, the way students are sorted by perceived ability is known as ability grouping (within classrooms) or tracking (between classrooms). For the purposes of this study, tracking will be used to refer to the general practice of organizing students based on their perceived academic ability, both within (ability grouping) and between (tracking) classrooms, and mixed ability will refer to detracked or heterogeneous student groupings or classrooms. The perceived academic ability used to track students into groups is often complicated by external factors outside of the students' control, often perpetuating racialized stereotypes about students' ability (Wells, 2018). Once students get to high school, tracking often occurs along racial lines (Oakes et al., 1992). Black and Latinx students are disproportionately tracked into less challenging courses taught by less qualified teachers using fewer resources.

Tracking also happens earlier in a student's academic career, sometimes occurring as early as elementary school. Dustmann et al. (2017) note that there is no evidence that early tracking leads to more favorable outcomes for students, and students who did not get tracked early were able to attain academic success without the early placement into an advanced track. Tracking exacerbates social inequities and creates artificial divides among cohorts of students.

The controversy over tracking students based on perceived ability has been a long-standing debate in education. While many oppose the use of this practice arguing that it fuels inequities in our school system, others perceive this practice as an effective way to bolster achievement gains (Hornby & Witte, 2014) and cite the benefits it has for students of all levels (Gentry & Owen, 1999; Neihart, 2007; Nomi, 2010; Pierce et al., 2011; Slavin, 1987). For instance, Kulik and Kulik (1992) provided a review of literature on ability grouping and found that students in both high ability groups and low ability groups increased academic achievement. In another study, Kalogrides and Loeb (2013) found that

"rigorous studies on the effects of tracking on student achievement have found little evidence that tracking hurts lower ability students" (p. 314). When teachers implement ability grouping, they have more time to prepare for instruction and more time to spend interacting with students performing at different instructional levels (Matthews et al., 2013). This also allows teachers to differentiate instruction in a smaller learning environment to meet their student's individual learning needs (Garrett & Hong, 2016).

While teachers identify the use of tracking as a way to cater to their students' diverse learning needs and raise student performance (Hunter et al., 2019), such practices continue to fuel narratives about who can and cannot do mathematics. It has become commonplace to use labels to categorize students based on their standardized test performance; these particular labels have contributed to the specific language that teachers use when talking about students (Datnow et al., 2018). Teachers often use words such as "high" or "low" when referring to students. These labels communicate the belief that students have fixed mathematical abilities. The use of labels oversimplifies a student's ability and are associated with negative stigmas (Link & Phelan, 2001). While tracking does provide academic advantages to students within the top groups (Parsons & Hallam, 2014), it attributes to a lack of opportunity for students not within those groups, thus increasing the achievement gap between these grouped students (Jorgensen et al., 2014; Marks, 2014). Early in a student's academic career, the knowledge of labels makes them more inclined to experience symbolic violence by feeling out of place, ashamed, anxious, and stupid (McGillicuddy & Devine, 2018).

The impact of tracking is often studied at the student level, with particular attention given to secondary students. While research has looked at the impact of working conditions of new teachers (Goldhaber et al., 2016), few studies have specifically looked at the impact of tracking on the teacher. Just like students, teachers are negatively affected by tracking. When students are tracked, teachers of the lower tracks often have less access to resources necessary to do their jobs and become segregated from their colleagues (Achinstein et al., 2004). Teachers within lower track classrooms tend to develop classroom cultures that are reliant on norms that lower expectations of students and provide less support (Mayer et al., 2018). Tracking also disproportionately affects Black teachers as they often get placed in schools with struggling students (D'Amico et al., 2017). To combat the negative effects of tracking on their students and themselves, some teachers are actively working to dismantle these practices through creative insubordination (Gutiérrez, 2016).

Creative insubordination

Schools and districts adopt and mandate policies and practices that individually can be frustrating (e.g., high-stakes and standardized testing, strict pacing guides, expectation to produce answers quickly, and tracking), but through twelve to thirteen years of repeated implementation, these practices ultimately dehumanize the schooling experience (Gutiérrez, 2017). These policies and procedures make broad assumptions about learners without appreciating the individual strengths learners bring with them to these experiences. The dehumanization of mathematics classrooms has removed the individual diversity associated with culture, dis/ability, and gender identification by requiring learners to learn content in specific ways, at a defined pace, within particular groups of students (Yeh et al., 2020). Teachers are starting to subvert these harmful school and district mandates by changing classroom practices to rehumanize the mathematics learning spaces.

Subversive rehumanizing practices are examples of creative insubordination (Gutiérrez, 2013). Creative insubordination leverages teacher agency as a way to subvert harmful norms, rules, or standards within the realms of schooling (Lopes & D'Ambrosio, 2016). Creative insubordination occurs when "teachers find loopholes in policies or interpret rules and/or procedures in ways that allow them to advocate for historically underserved and/or marginalized students" (Gutiérrez, 2013, p. 14). More specifically, creative insubordination refers to subversive acts by teachers that: (a) decenter the achievement gap, (b) question the forms of mathematics presented in school, (c) highlight the humanity and uncertainty of mathematics, (d) position students as authors of mathematics, and (e) challenge deficit narratives about students of color (Gutiérrez, 2016, p. 54).

While creative insubordination took root in mathematics education in the 2010s through the writings of Rochelle Gutiérrez (2013, 2016), the concept of professional subversion has been discussed earlier in relation to the work of nurses (Hutchinson, 1990) and principals (Haynes, & Licata, 1995). Nurses, principals, and teachers have become "street-level bureaucrats" through their interpretation and subversion of formal policies and procedures for the betterment of those they serve (Lipsky, 1980, p. 3). As noted by Rosa and Orey (2019), creative insubordination, "responsible subversion (Hutchinson, 1990), and positive deviance (Zeitlin et al., 1990) are equivalent as they relate to the adaptability of rules and regulations in order that the welfare of the members of distinct cultural groups can be achieved" (p. 193). In some instances, the act of changing rules and regulations are ethical imperatives for teachers as they navigate the complexities of schooling in pursuit of rehumanizing mathematics education.

The Association of Mathematics Teacher Educators (AMTE) Standards (2017) emphasize creative insubordination as a strategy for student advocacy rooted in ethical practice. The Standards call for mathematics teacher preparation programs to develop advocacy-oriented teachers.

> Teachers who successfully advocate for students realize that teaching sometimes requires acts of creative insubordination (Gutiérrez, 2015). That is, driven by higher ethics, successful beginning teachers are prepared to re-interpret school rules and practices that are not in the best interests of providing their students meaningful and humane mathematical experiences. (p. 24)

As teachers enact practices of creative insubordination, they rehumanize mathematics learning by creating meaningful experiences for students, which challenge the assumed "political passivity" of mathematics (Souza et al., 2020, p. 88). Specifically, Gutiérrez (2016) outlines six practices mathematics teachers can employ to enact creative insubordination (see Table 1 for practices and examples).

Teachers practice creative insubordination as they collect standardized assessment data (*using the master's tools*) around the implementation of ethnomathematics, which can be "a tool to combat the dehumanizing effects of curricular and bureaucratic authoritarianism, and as a tool for peace" (Rosa & Orey, 2019, p. 205). *Using the master's tools* can also refer to the use of formalized mathematics language to support play in mathematics classrooms (Dickman, & Nauman, 2020). Through the practice of mathematical code-switching (using mathematically precise language to describe play), Dickman and Nauman provide an example of *using the master's tool* of academic language to respond to pushback against a non-standard way of doing mathematics. The change in curricular practices can also be supported by other forms of teacher collected data (*counter with evidence*) to build a case for rehumanizing curricular practices (Lopes & D'Ambrosio, 2016). Subverting widely accepted norms, rules, or standards by changing curriculum is one way to rehumanize

Table 1 Creative Insubordination Practice Examples

Creative Insubordination Practice	Example from Gutiérrez (2016)
Press for Explanation	Example phrases such as "Say more" or "I'm not sure I fully understand. Can you give me an example?" (p. 54)
Counter with Evidence	"…examples of students' work (e.g., assessments; classwork; homework) or instructional strategies I use in my classroom others say will never work …When sharing these samples with others, it is important to highlight how they are not unique, thus preventing them from being placed into, "That's an exception" box." (pg. 55)
Use the Master's Tools	"…if we are required to do "test prep" and we don't believe in taking away teaching time to do so, we might give students the answers first. Then have them work in groups to discuss how an individual could have gotten the "wrong" answers." (p. 55)
Seek Allies	"We can rely on our colleagues to restate our points/concerns during faculty meetings so that the burden does not fall completely on our shoulders." (p. 55)
Turn a Rational Issue into a Moral One	"Some language to consider is, "Regardless of what the data suggest or what has been done in the past, is this what we want to stand for (or be remembered by) as a department/team/school/teachers?" (p. 56)
Fly Under the Radar	"… having our students work in groups when no one in our department does; trying out a new homework policy in a class…The motto to this strategy is Ask for forgiveness, not permission." (p. 56)

mathematics classrooms by "questioning the forms of mathematics presented in school" (Gutiérrez, 2016, p. 54).

There are often few opportunities for teachers to engage in learning communities that support their efforts to use creative insubordination to address the negative effects of tracking at their school. As a result, teachers must actively seek out opportunities beyond school-level learning communities to work within a community of mathematics teachers to support their practice. Informal learning environments within social media have become particularly appealing as teachers solicit knowledge regarding tracking. These environments offer flexible spaces for teachers to collaborate, advocate, learn from one another, share ideas or resources, seek information or support, and reflect on one's own knowledge or practice with teachers from around the world (Macia, & Garcia, 2016).

Initiating teacher learning: a conceptual model

This study is situated with one Facebook group where teachers network together to build a community focused on mathematics education. To better understand why teachers might leave their school community and enter online spaces to learn, we draw upon complexity theory (Opfer & Pedder, 2011; Weaver, 1948). We note that teachers are members of a complex learning system and many factors (see left rectangle in Fig. 1 for examples of factors) within that system influence their learning opportunities. We then propose that teachers leave their school-level learning community due to a chaotic moment (indicated by the arrow in Fig. 1). That chaotic moment occurs when tension

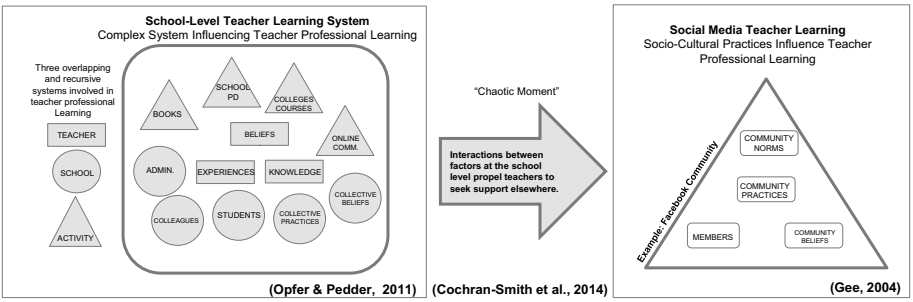

Fig. 1 Initiating teacher learning: a conceptual model

between factors arises in the school-level teacher learning system. In what follows, we elaborate on these two parts of our conceptual model of teacher learning.

Conflicting factors initiating teacher learning: a complexity theory approach

Teacher learning is influenced by multiple factors within a school. These factors might include the needs of individual students, curriculum guided by content standards, contextual needs of the local community, and the deeply held beliefs of teachers and administrators, to name a few. These factors are highly interconnected, where a change to one factor could create a cascade of changes to others. Strom and Viesca (2021) argue for the necessity of a "complex turn" in the way teacher learning is conceptualized because a rational humanistic approach (e.g., process–product, either/or) does not fully account for the "dynamic, multiplicitous, ever-shifting nature" of teacher learning (p. 210). As factors interact, they influence each other, producing new instantiations of the factors. Take, for example, two factors within a school-level teacher learning system–teacher beliefs and classroom practices. As classroom practices unfold, the beliefs teachers hold (e.g., how students learn best, grading practices) have the potential to change due to the result of the enacted classroom practice (e.g., group work, test retakes). Because these factors are mutually influential, the converse can also occur: the beliefs a teacher holds could directly impact classroom practices. By embracing perspectives like complexity theory (Opfer & Pedder, 2011) the study of teacher learning can account for the complexity within and between factors that affect teacher learning.

To explore the patterns that motivate teacher learning within the system, one must first look at what is causing the system to necessitate change. It could be argued that when the factors within the system are complementary, change is not necessary due to the factors being mutually reinforcing. Cochran-Smith, et al. (2014) note that disequilibrium and the misalignment of two or more factors powers teacher learning within a complex system. Thus, for teachers to be motivated to learn, there must be a disequilibrium between two or more factors within the system. These are the chaotic moments within the teacher learning system, where intersecting factors do not mutually reinforce, but rather are at odds with one another and cause enough conflict in the system to necessitate change. As chaotic moments drive teachers to alleviate tensions between factors, some teachers seek support outside their school through social media.

Sharing practice in social media: an affinity space approach

As teachers seek support within online communities to address these chaotic moments, our conceptual model moves from the school-level to social media facilitated opportunities. Grounding our work within the context of socio-cultural learning offers us a lens to examine the shared practices discussed between members within an online learning space. We adopt the theory of affinity spaces to describe learning within social media (Carpenter et al., 2021). Affinity spaces are characterized by the organization of and the interaction with content (Carpenter & Krutka, 2015). Gee (2004) argues that instead of Communities of Practice (Wenger, 1998), which relies heavily on designation of membership within the community, spaces like Facebook could be described as affinity spaces. The designation of an affinity space focuses on interactions within the space, specifically around what is being discussed rather than position within the hierarchy of membership. We adopt the version of socio-cultural learning because we are more concerned with what is exchanged within the Facebook group rather than how individuals become active members within the group.

In this study, we examine how teachers seek support in social media to address issues at their school sites. We seek to analyze the chaotic moments (e.g., the conflicting factors within the left rectangle of Fig. 1) that propel teachers online (e.g., the community practices in the right rectangle of Fig. 1) and what support is offered. Therefore, this study is guided by the following research questions:

1. As it relates to grouping students for mathematics instruction, what propels teachers to seek support online?
2. What practices of creative insubordination are discussed within a mathematics education Facebook group?

Methods

In this qualitative study, a grounded theory approach (Charmaz, 1983) was employed to conceptualize the nature of the interactions in a mathematics education Facebook group. This paper reports on one theme (tracking/mixed ability) that emerged from the larger data analysis.

Context

This study examines participant interactions in a closed mathematics education Facebook group. This group was started in the summer of 2017 by a mathematics education research group at a private university on the West Coast of the United States. It was created to provide a space where teachers, and other individuals interested in mathematics education, could create an online learning community. Facebook considers a group "closed" if content in the group is not accessible to non-group members. When individuals entered the group, they were required to consent to research by agreeing to the following statement, "By joining the group, you have access to resources, and act as a participant in our research of online learning networks. Type "YES" to agree to participate in the research." All members of the Facebook group consented to the research project.

The group is moderated by staff members of the research group. Moderators approve membership and infrequently hold scheduled events to discuss the teaching and learning of mathematics. Moderators rarely participate in conversations but do so when they feel their expertise in mathematics education would be helpful. The authors of this manuscript were not moderators of the Facebook group. The lead author was a graduate student within the research group at the time of data collection but did not actively moderate the group. The other authors have no affiliation with the sponsoring research group.

The group has new, member-generated content daily. Members of the group often post questions about mathematics education, share struggles and success stories, and less frequently post links to articles around mathematics education. On average, the group has seven original posts a day, 95 comments on previous original posts (original posts could have been posted that day or previous days), and 209 reactions. Reactions are the way group members can interact with a post or comment without writing anything. Members can react by clicking the like, love, haha, sad, or angry emojis at the bottom of the post or comment. In general, activity in the group occurs daily through multiple forms of participation.

The data was gathered from the first year of the Facebook group's existence and included 3,092 original posts with comments. Data was collected in the summer of 2018. The entire data set included 42,401 interactions (original posts plus comments).

Data analysis

The constant comparative elements of grounded theory (Charmaz, 1983) warrant the use of inductive content analysis (Roller & Lavrakas, 2015) to identify themes and patterns within the data. The initial coding process took place across three phases. In phase one, each author open-coded a subset of the data to form emergent themes (Creswell & Poth, 2018) and generate an initial codebook. The research team met to discuss the 49 initial codes and identify broad themes that would encapsulate the initial codes. The initial codes were collapsed into 12 overarching themes. These themes included: teacher beliefs, demographic information, collaboration, challenges, seeking support, community, class activity, students, [Research Group Name], share, broker, and cross-curricular. In phase two, the research team drew on these 12 themes to analyze a different subset of data. They met to discuss and further refine the definitions for each theme and finalized the codebook. To establish intercoder agreement (Creswell & Poth, 2018), the research team analyzed a final subset of data and achieved an 84% agreement score. In phase three, all original posts were hand-coded using the 12 broad themes.

For the purposes of identifying chaotic moments in a teacher learning system, we adopt the Cochran-Smith et al. (2014) assumption that disequilibrium is required for teacher learning and change. We go further to assume that disequilibrium occurs when teachers experience cognitive dissonance (Festinger, 1957), or the misalignment of their beliefs about teaching and external factors. Thus, we believed the overlap of the following three broad themes captured the chaotic moments in the school-level teacher learning system that would propel teachers to seek support within the Facebook group: (1) teacher beliefs, (2) challenges, and (3) students. While other overlapping themes might have also captured chaotic moments, we limited our analysis to specific instances where teachers' beliefs and student experiences were explicitly discussed. This intentional choice should be seen as a limitation and will be discussed further in the concluding remarks. A total of 147 posts were included and further analyzed.

The research team employed a second round of iterative analysis to surface themes within this subset of data. Tracking students for mathematics instruction emerged as the most discussed theme within this subset of data, 71 of 147 original posts. To better understand the factors within the school-level learning system that influenced the chaotic moments around tracking students, the posts were coded in two ways. First, a code was applied to indicate whether the disequilibrium was caused by a school-level policy or classroom-level practice. A second code was then applied to describe whether the type of tracking was mixed (students had varying levels of perceived academic abilities) or similar (students had similar levels of perceived academic abilities) when described by the original poster. See Table 2 for a summary of 71 posts based on these distinctions.

Example posts and their associated comments were selected based on purposive sampling for each cell in Table 2. Examples were chosen to represent the cell based on the following criteria: (1) the topic surfaced in multiple posts in that cell, (2) there were comments on the post, and (3) the factors within the school-level system that caused the chaotic moment could be described.

The final step in data analysis was to identify practices of creative insubordination that were discussed within the Facebook group. The four representative posts and their associated comments were deductively coded using Gutiérrez's (2016) six creative insubordination practices (see Table 1).

Findings

In what follows, we report on four interactions within the Facebook group. One example from each of the cells in Table 2 is presented. We organize each example first based on whether tracking or mixed ability was present, then present examples at each level (school and classroom). Each example is first summarized, then the factors within the school-level learning system involved in the chaotic moment are identified, and finally, the creative insubordination strategies discussed in the comments by group members are described. These four interactions were selected because they illustrate four different tensions that arose when teachers discussed organizing students for mathematics instruction (e.g., tracking or mixed ability) within the Facebook group: (1) instructional challenges of tracking, (2) negative school culture through tracking, (3) school policies that oppose mixed ability grouping practices, and (4) curricular constraints in mixed ability classrooms.

Tracking

Some members of the Facebook group teach in schools that utilize tracking to organize students for mathematics instruction. This means students are grouped for instruction based

Table 2 Chaotic moment distinctions

	School-level	Classroom-level	Totals
Tracking	14	15	29
Mixed Ability	14	28	42
Totals	28	43	71

on perceived mathematical ability, either within homogeneous groups in a class or separated between different classes. The first example presented explores classroom-level challenges of tracking, while the second example presents school-level issues brought to the Facebook group.

Instructional challenges of tracking

Grouping students within classrooms based on perceived academic ability was often discussed in the Facebook group. In one post, a teacher was seeking support from the group after sharing feelings of being overwhelmed by their school's testing culture and expectation to instruct students based on their perceived ability level. They write, "I teach second grade, so for my high group, I teach 3rd-grade curriculum. Medium group 2nd- grade curriculum. And low group 1st-grade curriculum." They also shared, "I don't believe this is best practice, but I don't know what else to do."

This post demonstrates how teachers utilize the Facebook group to learn how to address challenges brought on by teaching mathematics to students tracked into ability groups within one classroom. This teacher experiences a chaotic moment when they feel unable to meet the school's instructional expectations. The school's testing culture, students' perceived ability levels, the use of three different levels of curriculum, and the teacher's beliefs present multiple layers of misalignment between factors that create the chaotic moment that propelled the teacher to seek support in the Facebook group. As a result of the chaotic moment, the teacher appears discontent with the practices enacted in their classroom and voices their frustrations to elicit support from the group.

In response to this post, 15 members left 28 comments. Some replies offered general comments, arguing that the "whole system needs to change" and encouraged the original poster to become a change agent within their school. While others provided emotional support and shared how they, too, were disheartened by classroom teachers' reality. These respondents wrote posts like, "it's [the expectation] insanity" and "My heart goes out to you! I would be at a loss." In addition, a few posts offered specific suggestions to subvert the overwhelming curriculum requirements between the ability groups. For example, some comments suggested that the original poster enacts the creative insubordination practice of *flying under the radar* by changing their curriculum to allow for more students to access high content. They suggested incorporating "low floor, high ceiling tasks" so that mathematics instruction was accessible to all learners another teacher provided a picture of an infographic that gave strategies to reframe remediation by providing all students acceleration (Rollins, 2014). These suggestions to *fly under the radar* encouraged the original poster to incorporate rigorous tasks for all students instead of providing "high" students with acceleration and "low" students with remediation. One poster also suggested "leaving a copy of Jo's *Elephant in the Classroom* (Boaler, 2010) on the desk of your school leader". This practice of creative insubordination aligned with *seek allies* by sharing a book that promotes detracking with administrators in the hopes of getting them to agree with their position.

The chaotic moment experienced by this teacher occurred when their beliefs about working with students across varying levels of mathematical proficiency conflicted with schoolwide pressures and accountability demands. Consequently, the teacher appeared pressured to conform to the school norms and was limited in controlling their own classroom's learning environment. Some group members encouraged the original poster to practice creative insubordination within their school, while others provided emotional support

through agreeing with the overwhelming challenge faced by the teacher and three different ability groups within one class. The original poster continued to engage in the conversation by answering follow-up questions and saying "thank you" to posters who provided concrete ideas. They did not share whether they implemented any of the recommendations. While implementation is unknown, the original poster's continued engagement provides possible evidence of the value of the interaction among teachers within the group.

Negative school culture through tracking

Members appear to come to this Facebook group to share their frustration and solicit help to initiate change in their schools and communities. Teachers recognize the negative impact tracking can have on students at a classroom and school-level; however, there is a disconnect between what they believe and the pressure they receive from colleagues, administration, parents, and district leaders to enact ineffective tracking practices. In one interaction, a teacher describes the negative impact tracking has had on their high school students and the isolation they experience within their school. They write, "I have been teaching the 'lower' track now for 4 years, and most of my students tell me they feel stupid for being in my track. Kids make fun of them and feel like they are better than them because of what track they got placed in." At a staff meeting, this teacher advocated against tracking in mathematics and suggested that teachers slow down their instruction to focus on building a more in-depth understanding. The teacher shared, "I guess I was surprised of [sic] the resistance."

This post illuminates the challenges teachers face when they disagree with the school-level beliefs about mathematics instruction. While this teacher appeared to recognize the adverse effects of tracking, their attempt to dismantle these practices was met with resistance when they advocated against tracking at a staff meeting. The chaotic moment that drove them to the Facebook group for support occurred when school-level tracking requirements, student perception of peers' mathematics ability, and their support of conceptual understanding misaligned. This teacher sought advice from the Facebook group on how to successfully advocate for change to alleviate the disequilibrium caused by the chaotic moment.

The teacher continued soliciting help by asking, "Was wondering if anyone has had any success in convincing change at their schools?" The post generated 54 replies, leading to a critical conversation around school-level tracking. Many of these replies created a feeling of connectedness among posters who shared similar beliefs about tracking. Some replies built a bond through words of encouragement, such as "You have planted the seed! You are right—all kids DO deserve better." Others shared similar experiences where they too were met with resistance and were unsuccessful in their own attempts to lead change. In one reply, a teacher writes, "I have had absolutely no luck at all. My school is very set…and I can't see anything changing not even in the medium-term future."

To mitigate the impact of school-level choices, many replies to the post suggested the original poster take on the issues within their own classroom and combat the negative effects through practices they could control immediately. One reply encouraged the original poster by saying, "You should just go all 'Stand and Deliver' on them and teach the 'lower' track so well that they surpass the other track!" Another reply shared this sentiment saying, "Keep your mouth shut and prove them wrong! Do solid teaching with your 'low' kids and let them prove that your methods work on the lowest kids. I love proving people wrong with data." Both of these replies called for the teacher to subvert the school-level

practice of tracking by using teaching practices to create noticeable change through student performance. These are examples of encouraging the creative insubordination practice of *counter with evidence* because both comments point out performance as an indicator. As Gutiérrez (2016) claims, *counter with evidence* provides a way to use examples of student work to support changes teachers are enacting within their classrooms.

While some replies encouraged immediate results through classroom-level practices, other replies provided resources to build a case against the use of tracking at the system level. For example, one response encouraged the original poster to "find as much evidence as you can around grouping by ability and how detrimental it can be." In response, other replies provided resources to help build the evidence needed, these included: *Principles to Action* (NCTM, 2014), *Held Back: Addressing Misplacement of 9th Grade Students in Bay Area School Math Classes* (LCCRSF, 2013), *The Elephant in the Classroom: Helping Children Learn and Love Maths* (Boaler, 2010), *The 'Psychological Prisons' from which They Never Escaped: The Role of Ability Grouping in Reproducing Social Class Inequalities* (Boaler, 2015a), *Learning without Limits (*Hart, 2004*), Routines for Reasoning: Fostering the Mathematical Practices in All Students (*Kelemanik et al., 2016*), What Community College Developmental Mathematics Students Understand About Mathematics (*Stigler et al., 2010), and *Mathematical Mindsets (*Boaler, 2015b*)*. Encouraged by the resource list created within the 58 replies, the original poster responded, saying they planned to share these ideas with their administration. This collection of resources and research-supported practices is an example of the creative insubordination practice of *using the master's tools* because many administrators draw from research-based practices when planning for change. By providing these resources, the teacher is able to cater to what often informs administrators when they make decisions. While forwarding the research to the administration was one step in making school-level change, one poster also suggested *seek allies* by starting a book club around *Mathematical Mindsets* (Boaler, 2015b) to get more colleagues on their side in fighting for change.

This post, and subsequent replies, demonstrate how some teachers have a desire to make a change at the school-level. The original poster looked beyond their own classroom instruction to consider the changes needed to transform education on a larger scale. With the goal to change the negative narrative around students in their lower track, this teacher looked to lobby their school to remove tracking. They turned to the Facebook group when they experienced a chaotic moment caused by a conflict between their personal beliefs about labeling students, the school's requirement to track students in mathematics, and the school's adopted negative narrative regarding "low track" students. From the group, this teacher acquired immediate strategies to practice creative insubordination both within their classroom by providing students with equitable mathematics to increase performance indicators and outside their classroom by collecting resources to mount an evidence-based campaign to convince administrators that tracking was a detrimental practice within the school.

Mixed ability

Some of the Facebook community members teach in schools that utilize mixed ability grouping, sometimes referred to as heterogeneous grouping, to organize students for mathematics instruction. This means students with different backgrounds and perceived ability levels are instructed together. Although there is strong evidence that grouping students in this manner is beneficial (Burris et al., 2006; White et al., 1996), the discussions in

this Facebook group suggest that mixed ability grouping creates challenges (e.g., chaotic moments) that cause teachers to seek support from the Facebook community. The first example presented in this section explores school-level challenges of mixed ability groupings, while the second example presents classroom-level issues brought to the Facebook group.

School policies that oppose mixed ability grouping practices

The Facebook group posts also revealed that teachers needed support when they are working in mixed ability settings. Specifically, teachers turn to the Facebook group for support when their administration's philosophy on teaching and learning mathematics does not align with the strategies necessary to support heterogenous learning. For example, one teacher sought advice on dealing with a school expectation that contradicted their beliefs. They explained that "the principal is really committed" to instruction that aligns with the mixed ability grouping "but is also influenced by others on our [school] board." This influence resulted in the schools having to implement a two-week math "boot camp" focused on computation. The teacher asked the Facebook group how they can meet the school's expectations "and, at the same time, build a growth mindset." The teacher concludes by recognizing the heterogeneity in their classroom, saying, "I know, going in, that some of the kids already have these down solidly, and I know that there are others who struggle with understanding odd and even numbers."

This post demonstrates how teachers might utilize the Facebook group to learn how to address non-instructional issues (e.g., coworkers, policies) in schools that organize students in mixed-ability groups for mathematics instruction. In this example, the chaotic moment occurs because the teacher's beliefs about mathematics instruction do not align with the school board mandated policy of math "boot camp." This propelled the teacher to seek information from the Facebook group, in which six group members provided suggestions.

Four members offered justification and ideas for subverting the bootcamp-style, rote memorization of facts by emphasizing the relationship between tasks and computation. For example, one responder wrote, "Most of those concepts (adding, subtracting, multiplying, dividing, odd/even, etc.) could be built into the activities." Similarly, a second responder suggested using the Week of Inspirational Maths (WiM, Youcubed.org, n.d.) activities and added, "all involve math skills in an open way with the growth mindset embedded." Two additional responders gave more specific advice and also suggested the incorporation of WiM activities. One responder suggested using the "Four 4's Problem in Week 1" because it "lends itself really well to operational sense and builds a growth mindset." The other responder suggested "any of the WiM activities from the Tasks page on YouCubed." These suggested activities, if implemented, would be an example of the creative insubordination practice of *flying under the radar*. By implementing rich tasks that support fact fluency during the boot camp instructional time, the teacher would be supporting what is best for the students and doing so within the confines of their classroom. Guiterrez (2016) asserts, "the motto of this strategy [*flying under the radar*] is *Ask for forgiveness, not permission*" (p. 56). Gutiérrez continues that the goal of using this strategy "is to eventually share what we have been doing once we can document its success" (p. 56). This post also contained a link to *Fluency Without Fear: Research Evidence on the Best Ways to Learn Math Facts* (Boaler et al., 2015) and recommended that the teacher "share with the principal and [school] board." This is another example of *using the master's tools* to influence administration policies with research-based evidence.

In this example, a teacher came to the group wondering how to follow school expectations while still providing the type of instruction that aligned with their beliefs about teaching mathematics. More specifically, they wanted to "build a growth mindset" during mandated math lessons focused on computation. The community members offered suggestions that focused on developing computational skills and a growth mindset by using tasks.

Curricular constraints in mixed ability classrooms

According to the Facebook posts, some teachers working in mixed-ability classrooms find it challenging to engage all students through the required curriculum. For example, a fifth-grade teacher wrote about their trouble teaching the "below grade-level" students in their mixed-ability classroom. The teacher explained that the “below grade-level” students "loved" the WiM tasks (Youcubed.org, n.d.). Students felt successful when given the opportunity to engage in open, creative tasks. However, the teacher reported that when they moved on to the required curriculum, students did not seem to value "making sense of the math themselves, discovering methods through tasks, or learning from one another through discussions." The teacher explained that when they started teaching the unit on volume, students were "overwhelmed and confused" and just wanted the teacher to "teach them a procedure." The teacher shared that they do not believe this is a best practice, so they do not want to "resort" to teaching procedures. However, they admit they do not know what else to do. They came to the group looking for suggestions on keeping the students engaged while simultaneously helping them see the value in the learning experience.

This post demonstrates how teachers utilize the Facebook group to learn how to address instructional issues brought on by teaching students organized in mixed ability groups for mathematics instruction. The chaotic moments centered on the misalignment of the school’s expectation of mixed ability classrooms, the teacher’s expectation of how students should interact during instruction, the use of different curricula (WiM vs. required), and the students’ desire for direct instruction. It appeared that the teacher did not anticipate how much a students’ prior experiences and beliefs influenced how they engaged in the learning environment. Moreover, it seemed that implementing WiM lessons triggered the teachers’ awareness of student engagement, which might not have been noticeable during the required curriculum. Regardless, the teacher solicited advice to learn how others dealt with similar issues, which generated responses from 12 other group members.

In response to this post, four group members provided emotional support by relating to the problem. For example, one responder wrote, "I have the same issue with my high school students." A seventh-grade teacher with a similar issue admitted feeling "really discouraged" but decided to keep trying with the hope that "students will adapt as the year goes on." Five other group members provided general advice that aligned with the philosophical beliefs of the Facebook group. For example, one responder wrote, "When they struggle through something or are confused, make a big deal about it because it means they are LEARNING!" Another suggestion was to "Ask them what they enjoyed about WiM and show them how they learned from it."

Additionally, three other responders provided specific instructional guidance. For example, two responders recommended creating an area for students to explore manipulatives. One wrote, "Maybe have a center available for any spare time where kids can go to work with cm cubes, pattern blocks, estimating and measuring mass on a balance scale, etc." Someone else emphasized the importance of letting students develop their understanding of concepts and suggested starting the volume unit with a specific WiM task. They said,

"Have you already done Painted Cube with them? This would be a good way for students to start exploring with the volume." The post also included ideas on extending the activity by showing "students several different rectangular prisms and asking them the same question as what they explored in Painted Cube."

This teacher's chaotic moment transpired when the school's requirement of mixed-ability classrooms, the teacher's expectation of how students should interact during instruction, the use of different curricula (WiM vs. required), and the desire for direct instruction by students collided. More specifically, the teacher wanted to create a mathematical mindset classroom that supported heterogeneous students. However, the students did not want to engage in problem-solving during the required curriculum and asked the teacher to provide more traditional instruction. The Facebook group provided emotional and instructional support, which influenced the teacher's instruction. Specifically, the group offered different curriculum that did not align with the required curriculum the students were used to by recommending incorporating an exploratory center where students could do hands-on activities around volume and also the Painted Cube WiM task.

In a reply to the last respondent the teacher reported that students were successful with an open task. They wrote, "Having [the students] think about and discuss the volume of a trickier non-prism today seemed to help. That way, they couldn't just rely on the formula, and they had to really think about how to count the cubes." The Facebook group provided curricular ideas that did not cater to the students' desire for direct instruction and also went outside the required curriculum. By implementing some of the group's ideas, the teacher witnessed student success just like they saw when the students engaged in the WiM tasks prior to implementing the required curriculum. While the teacher was not explicitly coming to the group to affect change outside of their classroom, they were still able to subvert the required curriculum and *fly under the radar*, to create more humanizing learning experiences for their students through implementing open-ended tasks.

In general, teachers turn to the Facebook group to find support when they experience chaotic moments in their school-level learning system. This analysis reports on the chaotic moments experienced by four teachers and the type of support offered by the Facebook group to address issues of grouping students in their classrooms and schools. Teachers came to the group with struggles related to both tracking and mixed ability groups. Teachers are met with different types of resources, such as emotional support through sharing stories, practical strategies that can be implemented immediately in their classrooms, and resources to catalyze long-term change. It is not clear that all of the chaotic moments reported above were resolved based on the shared resources and support, but there is evidence through replies and continued engagement that many of the original posters and possibly others that participated in the discussion found value in sharing ideas.

Discussion

The Facebook group in this study provided teachers with professional support. With over 14,000 members of the group and roughly 100 interactions a day, this group provided a community where teachers could solicit advice to address problems in their practice. The findings of this study provide evidence of teachers intentionally extending their learning opportunities online to address chaotic moments that arise within their school contexts related to grouping students for mathematics instruction. It should be noted that the following discussion is not intended to be generalized to all mathematics teachers or all online

spaces but rather explore possible teacher-identified areas of concern, and possible acts of creative insubordination, that are suggested within an online learning community. The two research questions will be used to frame the following discussion.

As it relates to grouping students for mathematics instruction, what propels teachers to seek support online?

The four examples above provide insight into what propels teachers to interact within the Facebook community. In their initial posts, teachers describe the influential factors in their classrooms or schools that propel them to seek support outside their school-based learning community. The misalignment between the factors creates a chaotic moment that Cochran-Smith et al. (2014) claim is required for teacher learning. Based on initial sampling of the data, we focused on three overlapping codes: (1) teacher beliefs, (2) challenges, and (3) students. We will frame this part of the discussion around how the misalignment of teacher beliefs with other factors influenced the teachers' need to seek support online.

Teachers, like all human beings, make decisions based on their belief structures. Pajares' (1992) review of literature on teacher beliefs concluded that beliefs "play a critical role in defining behavior and organizing knowledge and information" (p. 325). Therefore, when teachers' beliefs about the teaching and learning of mathematics come in conflict with other factors at their school, they look to rectify the disequilibrium through finding ways to influence one or more conflicting factors. To find these solutions, teachers in this study entered a Facebook group that was outside of their local context. Our analysis revealed that teachers enter this group with a list of the conflicting factors hoping to find ways to change those factors to match their beliefs about the teaching and learning of mathematics.

One factor often in conflict with teacher beliefs is the expectation held by school- or district-level administration. These expectations were related to the grouping of students within or between classes, or the curriculum required to meet the differentiation necessary within one classroom. Some examples presented school expectations that required teachers to teach entire classrooms of students with perceived similar mathematics ability, while other school-level requirements centered on the expectation of teachers to support mixed ability learning within their classroom. Teachers in our study share that they are often lost on how to implement administrator mandates, which supports previous studies that found teachers lack the support and resources to implement these practices (Achinstein et al., 2004; Civitillo et al., 2016). As teachers share their struggles in the Facebook group, they often associate these struggles with expectations out of their control, usually tied to a mandate from an administrator.

Another factor that propelled teachers to seek support online was the students' personal beliefs about their ability to do mathematics within low-tracked classrooms. The low personal expectations held by students and negative feelings toward doing mathematics described above show how labels (Link & Phelan, 2001) and emotions (McGillicuddy & Devine, 2018) directly related to tracking can negatively affect students' perceived mathematical ability. Teachers in the Facebook group reported that their students' personal beliefs were in conflict with their own beliefs about the teaching and learning of mathematics. As a result, these teachers turned to the group to find ways to not only change their students' perceptions of themselves as mathematicians but also look to address the larger school culture that cultivated those negative beliefs in students.

Identifying the conflicting factors within the school-level learning system provides a nuanced understanding of the needs of teachers as they struggle to implement school- or district-level mandates related to grouping students for mathematics instruction. Teacher education and educational policy can benefit from an understanding of these factors. More specifically, the tensions that arose for these teachers shed light on specific areas of support

for teacher professional learning, such as working with mixed-ability students and how to support and foster positive mathematics identities in students labeled as low performing. As policies slowly change to align with the calls of mathematics organizations to eliminate grouping for mathematics instruction (NCTM, 2014, 2018; NCSM, 2020), administrators need to be ready to offer support.

In answering the first research question, this study found that teachers seek support online because their beliefs misalign with other factors, specifically administrator mandates and students' personal beliefs about mathematics. In an effort to alleviate the tension between their own beliefs and other factors within their teaching context, teachers are looking for practical ways to make change both in their classrooms and at the school-level. Next, we discuss the strategies that were shared to both make immediate changes within their classroom and also attempt to make lasting change at the school-level. The practices shared directly relate to the subversive practices of creative insubordination.

What practices of creative insubordination are discussed within a mathematics education Facebook group?

As teachers pose their chaotic moments for discussion to the Facebook group, they intentionally seek support to help alleviate the tension caused by the misalignment between the conflicting factors within the school-level learning system. Once posed, the discussions in the Facebook group evolve much like previous research on dialogic knowledge construction in online space had found (Brown & Munger, 2010), interactions that both contained surface-level content (agreement or disagreement, sharing opinions, refer to a strategy without elaboration) and deep content (support with explanation, defend claims with theory or research, engage in dialogue to problem solve, explain strategy with evidence from experience). The resources shared in the Facebook group provided teachers with knowledge around differentiation strategies (see 5.1.1 discussion of low floor, high ceiling tasks), multiple representations (see 6.2.2 discussion of volume stations), and growth mindset messaging (see 6.2.1 discussion of growth mindset tasks). Sometimes these resources were provided on the surface level, containing just basic information or a reference to a resource, while other times, community members spent a great deal of time describing implementation or justifying why the strategy would benefit more or all students. While surface-level support often reaffirmed the shared culture within the community, the deep content is often directly related to acts of creative insubordination (Gutiérrez, 2016) by providing both resources to make immediate changes in classrooms or suggested ways to influence longer-term policy changes.

The creative insubordination practices offered by group members are attempts to rehumanize mathematics learning. Teachers are coming to the group to address dehumanizing practices such as tracking students who have been labeled as "low" into one class or requiring rote practices of mathematics facts during a school-mandated boot camp. These practices remove student individuality and make general assumptions about student learning of mathematics, a deeply dehumanizing practice (Yeh et al., 2020). The interactions illustrate concern by teachers when they initially post to the group for support, but also the strategies other members offer to combat the dehumanization of mathematics learners. These practices fall outside of the standard or required practices within the school and seek to rehumanize the learning environment through subversive acts.

Once teachers enter their classrooms, they have varying levels of freedom to practice creative insubordination. The advice offered in the Facebook group was categorized as four (*flying under the radar, seek allies, counter with evidence, using the master's tools*) of the six creative insubordination practices with *press for explanation* and *turning a rational issue into a moral one* not evidenced. As "street-level bureaucrats" teachers in the Facebook group encouraged

enacting these practices to subvert or reinterpret formal policies and procedures to rehumanize the learning spaces they create (Lipsky, 1980, p. 3). Using open tasks was often offered within the responses of the Facebook group as a practice of *flying under the radar*. The use of these tasks counter the often used and less engaging rote practice and low cognitive demanding tasks (Smith & Stein, 1998) that are frequently associated with lower track classrooms (Mayer et al., 2018). Members of the Facebook group also encouraged each other to *counter with evidence* once open tasks were implemented. By comparing performance of "low" track students to "high" track students, or using mandated test scores, group members believed that teachers could influence tracking practices if colleagues and administrators saw the impact of increasing expectations and using performance data as proof of success. Teachers within the Facebook group encouraged each other to work within their classrooms to mitigate the effects of tracking through practicing teacher agency and trying subversive practices that they believed would increase student engagement in mathematics.

Some acts of creative insubordination offered support to tackle the school-level policies that required tracking. *Seeking allies* to initiate change at the school-level was another act of creative insubordination that surfaced within the Facebook group. This act occurred when a member of the group suggested that influencing change at a school requires other teachers, or school personnel, to support their ideas. To do this, some members suggested finding coworkers who would read the same book. An organized book club would allow teachers to meet frequently to discuss how the content of the book applied to their school. Another practice of creative insubordination that was offered to address the school-level practice of tracing was *using the master's tools*. This practice was offered by group members when they brainstormed research-based resources to provide administration. Administrators often call upon research-based resources to justify school-level policy changes; thus, by providing detracking research and best practices for mixed ability groupings, members of the group rely on how administrators have made changes in the past. While these acts of creative insubordination did not immediately influence the negative effects of tracking within the classroom, they were suggestions of subversive acts to tackle the school-level choice that caused the problem.

The findings of the second research question speak to the importance of online communities as spaces that provide teachers with support to rehumanize mathematics classrooms. These findings highlight the need for subversive acts in classrooms that implement both tracked and mixed ability groups of students. While there are clear messages about the negative effects of tracking, the lack of support teachers receive to implement mixed ability groups also dehumanizes mathematics classrooms. Through the interactions in this Facebook group, members share strategies that have the potential to empower teachers to become advocates for more just learning experiences. As teachers continue to use online spaces, these findings also support the cultivation of online, collective activism fostered by the exchange of practices of creative insubordination. Creative insubordination is a critical component of how teachers develop; thus, the findings of this research question support AMTE's (2017) call to intentionally develop these practices in teachers. Teachers must be supported to become advocates for their students, whether it is within the means of policy and practices or through acts of creative insubordination.

Conclusion

This paper offers evidence of social media usage among mathematics teachers, by highlighting the interactions that unfold as teachers discuss grouping students for mathematics instruction. Through the analysis of four purposefully sampled Facebook posts within a group dedicated to mathematics education, we see that teachers are entering the online community due to chaotic moments within their school-level learning system. In this space, teachers are sharing problems from their practice directly relating to grouping students for mathematics instruction and generating both surface-level and deep content to encourage practices of creative insubordination. When entering the Facebook group for support, teachers share that their personal beliefs about the teaching and learning of mathematics is in direct conflict with other factors within their teaching context, often these factors are students' personal beliefs about their ability to do mathematics, and administration expectations. This paper intentionally identified instances where these conflicts arose from chaotic moments around how students are grouped for mathematics instruction. The replies to initial posts provide differing levels of support; some comments express solidarity with the original poster, while others provide in depth strategies to address the conflict between their beliefs about tracking and other factors at their schools. A particularly important finding in this study is the discussion of practices of creative insubordination among Facebook members as ways of subverting the negative effects of tracking.

Given the nature of data collection, sampling, and interaction modality, the limitations of this study are worth noting. First, this study lacks multiple sources of data. Since the analysis relied only on Facebook posts and comments, understanding the impact of these online interactions on practice is limited. Future research should incorporate follow-up interviews and artifact analysis to better account for the impact of online interactions on practice. A second limitation of this study is the method of sampling. The authors chose to look at the co-occurrence of three broad themes; this was intentionally grounded in assumptions made about chaotic moments and how they occurred due to disequilibrium and cognitive dissonance. It could be argued that other overlaps between different broad themes could also account for these chaotic moments. Third, these interactions, often between random strangers, transpired in a voluntary Facebook group. It is important to note that the level of trustworthiness between members of the group is unknown and not a focus of this analysis. As researchers continue to develop methods to identify trustworthiness in online interactions (see review, Alkhamees et al., 2021), the research of online teacher learning in social media would benefit from adopting these methods to better understand the interactions within the online learning community. The limitations described above are offered to increase transparency in the research process while offering new directions in researching online teacher learning.

The findings from this study speak to two larger needs of mathematics teacher learning: (1) the necessity of professional learning outside of school-level opportunities, and (2) learning to subvert harmful practices through creative insubordination. The experiences presented above highlight how teachers use social media to learn when their beliefs about teaching are at odds with other factors at their schools. Within online spaces, teachers can share issues that arise in their school and find a community to support their desire to overcome contradictions and make changes through the practices of creative insubordination. Learning communities outside of traditional school-sponsored professional development must exist if teachers are to become advocates for their students by working from within their classrooms to dismantling oppressive practices. In regards to creative insubordination,

the field of mathematics teacher education must see this as a social imperative within our curriculum. We can no longer assume preparing teachers to employ equitable practices is enough, we must also prepare them to rehumanize mathematics learning spaces through acts of creative insubordination.

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