#DisruptJMM: Online Social Justice Advocacy and Community Building in Mathematics

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Abstract

In 2019, #DisruptJMM, a Twitter hashtag, began circulating after an Inclusion/Exclusion blog by Dr. Piper H pointing to the need to make commonplace conversations about human suffering in the Joint Mathematics Meetings (JMM). While the #DisruptJMM hashtag has been used since 2019, the vast majority of use was in the JMM 2020 meetings. Twitter hashtags are used by activists

to push forward conversations, join communities around a single idea, and create change. In this article, we draw on frameworks from community building seen in other equity and inclusion advocacy hashtags such as #GirlsLikeUs [7] to qualitatively code and analyze tweets which used the #DisruptJMM hashtag. This analysis gives us a glimpse into the evolving conversations on social justice, equity, diversity, and inclusion in the mathematical community. We see an emergence of community around recentering humanity in mathematics. This community supported each other's efforts, reflected on who is represented, and amplified discussions of power and privilege with a particular emphasis on bringing visibility to colonialism and sexual harrassment.

1. Introduction

> ... I will challenge ALL OF US to #DisruptJMM. They have decided that allowing us our own sessions and panels is sufficient, as though the issues of oppression are only relevant to a small portion of us. All of us must face the ways our incentivized indifference is hurting others and ourselves. Since the mainstream mathematician has repeatedly refused to hear our voices where we're allowed to be, we must bring our voices to them, wherever they are. We must let AMS/MAA know that we are highly dissatisfied and that the way to maintain "order" will be to take on our fight.

Piper H, "A Challenge for 2020." *Inclusion/Exclusion Blog*, April 30, 2019

[In the quote above, and in the rest of this paper, JMM refers to the Joint Mathematics Meetings, a joint annual convening of mathematical professional societies typically held in January.]

In April 2019, the planning of JMM was primarily influenced by two mathematics professional societies: the American Mathematical Society (AMS) and the Mathematical Association of America (MAA). The AMS has traditionally focused on mathematics researchers at the graduate student level and above, and the Mathematical Association of America focuses on serving the undergraduate mathematics education community. Soon after the release of the blog post, the first #DisruptJMM post appeared on Twitter, sharing a link to Dr. H's article. This was followed by a handful of tweets over the next month. The #DisruptJMM hashtag made only eight appearances on Twitter over the eight months through the end of 2019.

However, the hashtag peaked in popularity at the subsequent JMM in January of 2020, as many mathematicians heeded Dr. H's call to include conversations on equity and inclusion in their research talks.

The call to #DisruptJMM came at the beginning of a period of change in the mathematics community, as more and more mathematicians have called for our professional societies to make long overdue systemic changes to be more inclusive (see Figure 1). A primary driver of these conversations has been the Inclusion/Exclusion Blog, which featured Dr. H's aforementioned post. This blog began in 2017 [21] as a blog hosted by the AMS. The prolific presence of many of the Inclusion/Exclusion Blog's editorial board members on Twitter, including its founder, Dr. Adriana Salerno, and #DisruptJMM post author, Dr. Piper H, likely contributed to the way that the blog has regularly sparked conversation on equity and inclusion in mathematics on Twitter [10, 23]. In 2018, the MAA released a list of four "Core Values" for the organization, one of which was Inclusivity [18]. Later in 2018, the AMS and MAA announced that they would no longer cooperate in hosting the JMM as they had for many years. This raised concerns about how AMS would address conference activities that MAA members had formerly planned which had emphasized core values of the MAA such as inclusion and teaching.
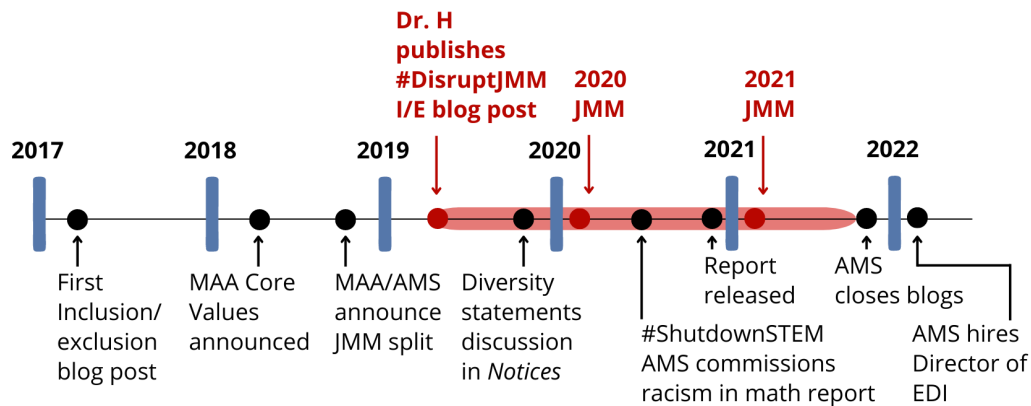

Figure 1: Timeline of major events in the JMM community related to diversity, equity, and inclusion in the last five years, with an emphasis on AMS as the lead JMM organization. The portion highlighted in a thick red indicates the period of Twitter data collection for this study.

Nationally, by 2019, the conversation on equity and inclusion in Science, Technology, Engineering, and Mathematics (STEM) and in particular the STEM professional society meeting experience was emerging across disciplines [12]. Mathematicians in particular engaged in spirited public debate (through op-eds in the *AMS Notices*) on the appropriateness of using diversity statements in the hiring process [22, 25]. Early in 2020, the AMS created a Committee on Equity, Diversity, and Inclusion.

Since the 2020 JMM, the country has experienced renewed national conversations on racism in the United States. In the summer of 2020, the #ShutdownSTEM movement was founded in the wake of George Floyd's murder as a hashtag associated with a pause to reflect on one's role in the toxicity and racism which has been ingrained in the STEM disciplines [17]. The AMS, after much prodding from a subset of its members, commissioned a task force to engage with the conversation on equity and inclusion during the Summer of 2020. The resulting report of the Task Force on Understanding and Documenting the Historical Role of the AMS in Racial Discrimination entitled "Towards a more inclusive mathematics profession" and published in December 2020[1] informed the hire of the first Director of Equity, Diversity, and Inclusion in 2022. In tension with this progress by some of the AMS membership since the call to #DisruptJMM, all AMS blogs were discontinued and archived at the end of 2021; the Inclusion/Exclusion blog, where Dr. Piper H posted the original #DisruptJMM call, is now run independently [29].

Our team, which includes several mathematicians active in many of these conversations, was interested in studying the #DisruptJMM movement as a grassroots community building movement which used Twitter as a conference backchannel to advocate for and encourage action towards social justice within the mathematics community [4]. The #DisruptJMM hashtag was primarily used during the 2020 JMM meeting, which was the last in-person meeting until 2023 due to COVID. However, the hashtag did persist to a lesser extent during the virtual 2021 meeting and throughout the span of our data collection. This paper focuses on the following research questions:

1. What discourse is occurring in #DisruptJMM about social justice, equity, diversity, and inclusion (hereafter referred to as SJEDI)?

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[1]This is available at http://www.ams.org/about-us/understanding-ams-history, last accessed on July 30, 2023.

2. What other discourse is happening in #DisruptJMM that creates a social organizing movement?

3. What is the evidence that #DisruptJMM has made an impact?

To answer these questions, below we develop a qualitative analysis framework by which to analyze Twitter #hashtag movements calling for SJEDI in STEM.

2. Twitter use for mathematics community building and advancing equity and inclusion

Twitter is a social media platform centered on the use of short "tweets" of less than 280 characters and a network of accounts users follow to which creates a tweet feed. While original content tweets can be authored, it is also common for other tweets to be reshared or "retweeted" either as-is or as a "modified tweet," which adds some additional context or commentary. In order to develop community conversation on Twitter, #hashtags are often used, which allow users to see only the tweets which incorporate the #hashtag into an original tweet or into the modified tweet.

Among academics, an early widespread use of #hashtags was to create "conference backchannels" [20, 28]. For example, the official conference hashtag of the 2020 Joint Mathematics Meetings was #JMM2020. A conference hashtag allows the conference organizers as well as attendees to make announcements, drum up excitement for talks, share resources, and interact with conference participants. More importantly, because of the tendency for Twitter accounts to be public, #hashtags can facilitate the engagement of individuals and organizations with the conference even if they are not attending in person.

Utilization of Twitter conversation, however, goes beyond conference hashtags. Many academics utilize social media platforms, and Twitter in particular, to network and advance research, as a professional learning network to develop new skills, and/or to build community through continued discourse with one's intellectual and disciplinary community, particularly between professional society meetings [11, 13, 15, 19].

Twitter has been well known as a platform for social change movements, gaining particular attention during the Arab Rising [27]. To organize for change, marginalized communities form counterspaces to engage in discourse

to challenge norms [24]. Twitter acts as a public counterspace where a network can engage in discourse, a "networked counterpublic" [8]. Hashtags allow for connection of both diverse people and ideas across the digital world. Notable hashtag-driven social change movements for equity and inclusion in the United States include #Ferguson, #GirlsLikeUs, #GeorgeFloyd, and #BlackLivesMatter [7, 8, 9, 16, 30].

There is no one way that equity and inclusion advocacy happens on Twitter and no one way that advocacy turns into a movement; however, the book #HashtagActivism offers a glimpse into the tools and conversations that may occur in networks for racial and gender social justice hashtag advocacy in the United States [8]. Key ideas include (1) bringing awareness to issues with an emphasis on amplifying the voices of those affected, challenging stereotypes or current mindsets and practices, and increasing visibility, (2) organizing, building and activating community, and (3) leveraging hashtags and allies to broaden the conversation and the counterpublic.

Twitter #hashtag analysis can be quantitative, qualitative, or both. Typically quantitative analysis involves computational analysis of the structure of the network, identifying key users or tweets and patterns in the connections between them. Qualitative analysis can include analyzing sentiments, themes of the discourse, the users, and the context. Because of the sheer number of tweets often involved in a widespread hashtag, often a subset of tweets are considered and computational text analysis is employed in order to understand the sentiments or themes [1].

In this paper, we use the thematic features noted by Jackson and coauthors [7] in their analysis of community building in #GirlsLikeUs, a trans advocacy movement, to build a qualitative codebook and framework to help understand community building in the hashtag #DisruptJMM. While the two movements have different content foci, both focus primarily on social justice movements in the United States, and both have a strong community building and support emphasis. Building this framework will allow us to understand how Twitter is used by the math community as a public counterspace to advance social justice in the mathematics community.

3. Methods

3.1. Researcher positionalities

Our positionalities with respect to the community under study in #Disrupt-JMM and the methodology used in this study vary. However, the diversity of expertise, experience, and familiarity with the community under study strengthened the research.

Roca is a Ph.D. student in computational mathematics, science, and engineering at Michigan State University. Thus she is currently in training, which is focused on topological data analysis, education, and mixed methods data analysis with a focus on social good. She has only attended the 2021 JMM, which was virtual due to Covid. The majority of the data in the dataset comes from when Roca was still an undergraduate. She is a Twitter user, but does not appear in the #DisruptJMM dataset.

Diaz Eaton has been working for over a decade in mixed methods and data-driven research in interdisciplinary STEM education and equity and inclusion in STEM. Diaz Eaton was the second person to tweet about #DisruptJMM. They also authored six of the eight initial #DisruptJMM tweets in 2019 and attended the 2020 JMM. During this time Diaz Eaton was the Chair of the MAA Committee on Minority Participation in Mathematics and identifies as someone who shares identities of marginalization in mathematics, for example as a queer Latinx and mother.

Lewis was trained as a pure mathematician and began his career working in algebraic geometry, but has more recently shifted to working in educational research and the scholarship of teaching and learning. He has not attended the JMM in over a decade, but is active among the community of mathematicians on Twitter, and is the author of one tweet in the data set.

Hibdon is an Indigenous mathematician, trained as an applied mathematician in combustion modeling. Much of his recent work has been in mathematics education and diversity in STEM. He usually attends JMM and was in attendance in 2020. He is currently a member of the AMS Committee on Equity, Diversity, and Inclusion. He is a Twitter user that has had active conversation with those in the data set, however he was not active in the #DisruptJMM conversation on Twitter.

Marshall is a social scientist who examines organizational questions in regards to achieving equity in science education. She is a Twitter user, but not a
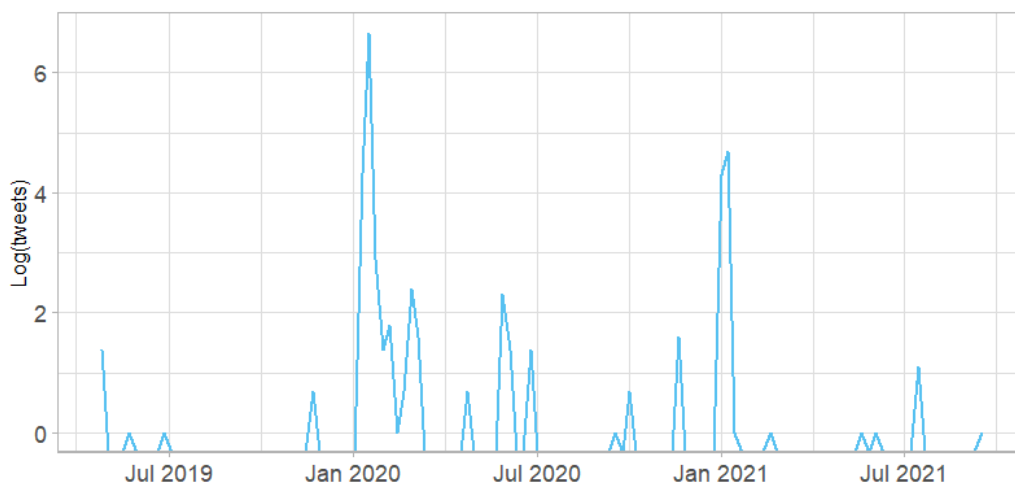
Figure 2: Time series plot of all #DisruptJMM tweets in our dataset on a weekly basis. Counts have been log scaled to better visualize ongoing activity and variability. Notice the spike in tweets during JMM 2020 in January 2020. There is also a notable second spike two orders of magnitude lower during the JMM 2021 meetings in January 2021.

member of the JMM community and therefore has not attended meetings nor has she participated in #DisruptJMM. She came to work with this team after a professional learning experience with Diaz Eaton.

3.2. Qualitative Analysis and Frameworks - Girls Like Us application and modification

We used tweet data collected and cleaned by Dr. Bork Rodriguez as part of an earlier stage of this study [4], publicly available on GitHub [3]. This dataset includes every tweet which used #DisruptJMM, up to the date September 21, 2021 when the first study was completed. Of the complete set of 1129 tweets, 299 were original tweets (including replies and quote tweets); the remainder were retweets. We also used Twitter search functionality when close-reading tweets to better understand a tweet's context as necessary.

We used an inductive coding approach to create a codebook, available in Appendix A. Two researchers (Diaz Eaton and Roca) independently reviewed the original tweets in the data set, and each constructed a set of codes. With a preliminary code list in hand, they observed the emergence of three themes: self-organizing, community building, and social justice, equity, diversity and inclusion (SJEDI). After a review of qualitative analysis of social justice movements on Twitter based in community-building, we added three

additional themes based on the work of Jackson and coauthors in #Girls-LikeUs: creating change, celebrating lives, and broadening the counterpublic [7]. Then the entire research team discussed final reconciliation and code consolidation of both the broad themes and the codes. This resulted in a codebook with 36 codes under five themes: "Self-organization," "Building Community", "Broadening the Counterpublic", "Creating Change in Math", and "SJEDI" (Table 1). We decided to incorporate the theme of celebrating lives from [7] into the emergent theme "Building Community".

Table 1: Grouping of codes into themes. A full codebook describing these codes is in Appendix A.

Theme	Description	Codes	
Self-Organization	Recruitment, activation, and initiation of hashtag. Includes backwards looking comments on the history of the hashtag, as well as forward looking discussions of how the hashtag might be used in the future to promote the community's goals.	• Amplification • Activation • Strategic Planning • Self-Organization Impact • Troll	
Building Community	Day to day challenges and support.	• Talk Support • Belonging • Conversation • Celebration • Emotional Support	• Expertise Support • Building Community Impact • Thankful
Broadening the Counterpublic	Includes co-occurring hashtags, tagging influencers, expanding the #DisruptJMM hashtag	• Disrupt Everything • Influencers • Beyond • Hashtags • Virtual Participation	
Creating Change in Math	Educating, sharing resources, making connections for the mathematical community	• Humanize • JMM Experience • Math Experience • Futures	• Math Practice • Current Events • Allyship in Math • Creating Change Impact
Social Justice, Equity, Diversity, and Inclusion (SJEDI)	SJEDI specific conversation shaping and education	• Representation • LGBTQ • BIPOC • Gender • Indigenous	• Power • Advocacy • Learning • Economic • SJEDI Impact

Some code choices were specific to the context. For example "talk support" describes individuals advertising their talk at the 2020 JMM, individuals responding that they would be there to show support, individuals sharing pictures of the talk on Twitter, and retweeting others' tweets related to these actions.

We also made the intentional decision to disaggregate the code for tweets referring to Indigenous social justice issues. While we could have grouped this under the "BIPOC" code, one of the first talks of the 2020 JMM was [26] by Dr. Belin Tsinnajinnie, an Indigenous mathematician who studies settler colonialism in mathematics education. Among the co-authors, there was agreement that this significantly elevated the discourse on Indigenous issues within the mathematics community. In addition, Dr. Tsinnajinnie reminded us in his talk that often Indigenous data is aggregated or excluded in analysis due to low sample size — using a scientific method which leads to systemic erasure. We choose instead to intentionally center this data in our work.

Three researchers (Hibdon, Lewis, and Roca) then used the codebook to code the entire dataset. To establish inter-coder reliability, all three independently coded a first sample of 29 tweets. After discussion and establishing consensus codes for this sample, a second sample of 30 tweets was independently coded by each of the three coders; this led to an average pairwise agreement at the theme level of 80%. The remaining 240 tweets were then randomly assigned and coded by a single coder.

When coding tweets, the context of the tweet was considered. In particular, if a tweet quoted another tweet or included an image, the content of the included tweet or image was also used to determine applicable codes. One prominent example of this was the many tweets that included an image of a slide from a JMM presentation; in addition to being coded as "talk support" for live tweeting a JMM talk, the content of the slide in the image was also coded as applicable. Tweets were often placed in more than one theme and had multiple codes attached to them (see Figure 3).

Since retweets have exactly the same content as original tweets, we simply duplicated the codes for these. This decision has the effect of giving a weight to the original tweets in our analysis, based on the number of times it was retweeted without additional text added. Unless otherwise specified, all frequencies and percentages below will be in reference to the entire data set, including retweets.
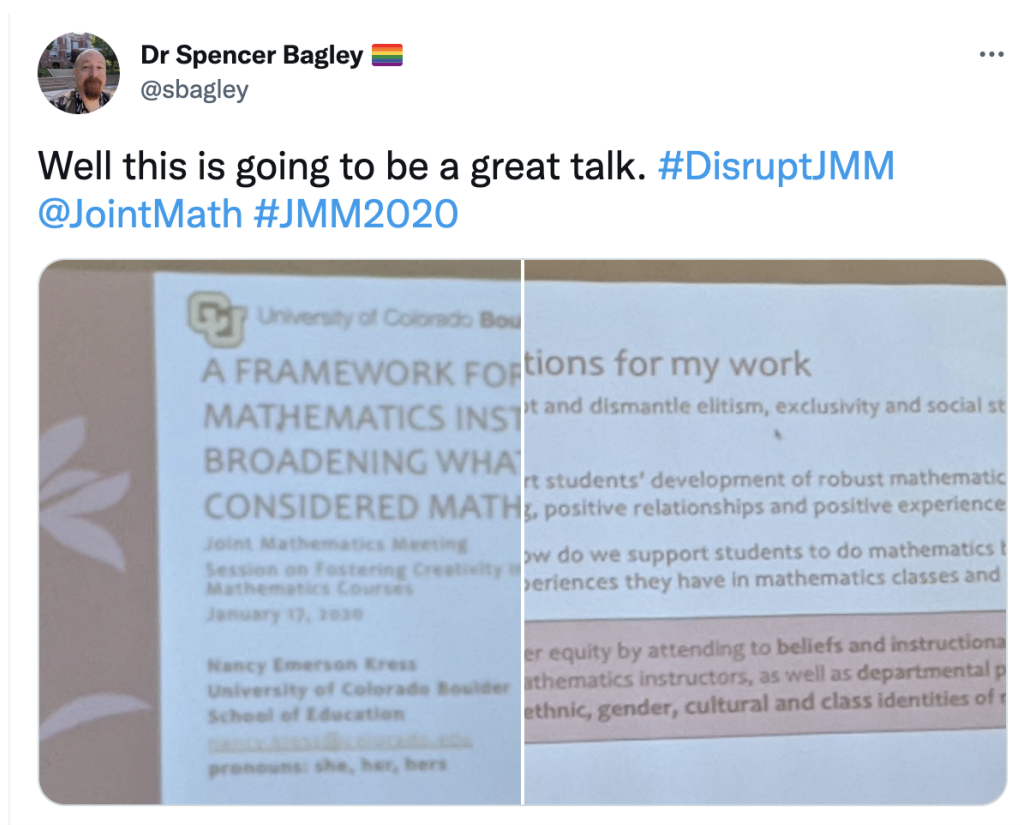
Figure 3: An example of a #DisruptJMM tweet. This tweet contains all five themes. It falls under self-organization with the code amplification, as the tweet is amplifying the talk with the #DisruptJMM hashtag. This also is an instance of talk support (under building community) for supporting this talk. By tagging JointMath and using #JMM2020, Dr. Bagley broadens the counterpublic by including influencers and hashtags. Since images were also posted we code them as well. The slide images focus on supporting students, so it is coded as math practices under the theme creating change in math. Finally, the slide describes exclusivity and elitism, which is an SJEDI issue of power.

4. Results and Discussion

4.1. Theme and code prevalence

Among the five themes displayed in Table 1 that emerged in our work with our tweet database, the most prevalent theme was Building Community. We also examined codes within themes to understand what activities were occurring within themes; see Figure 4.
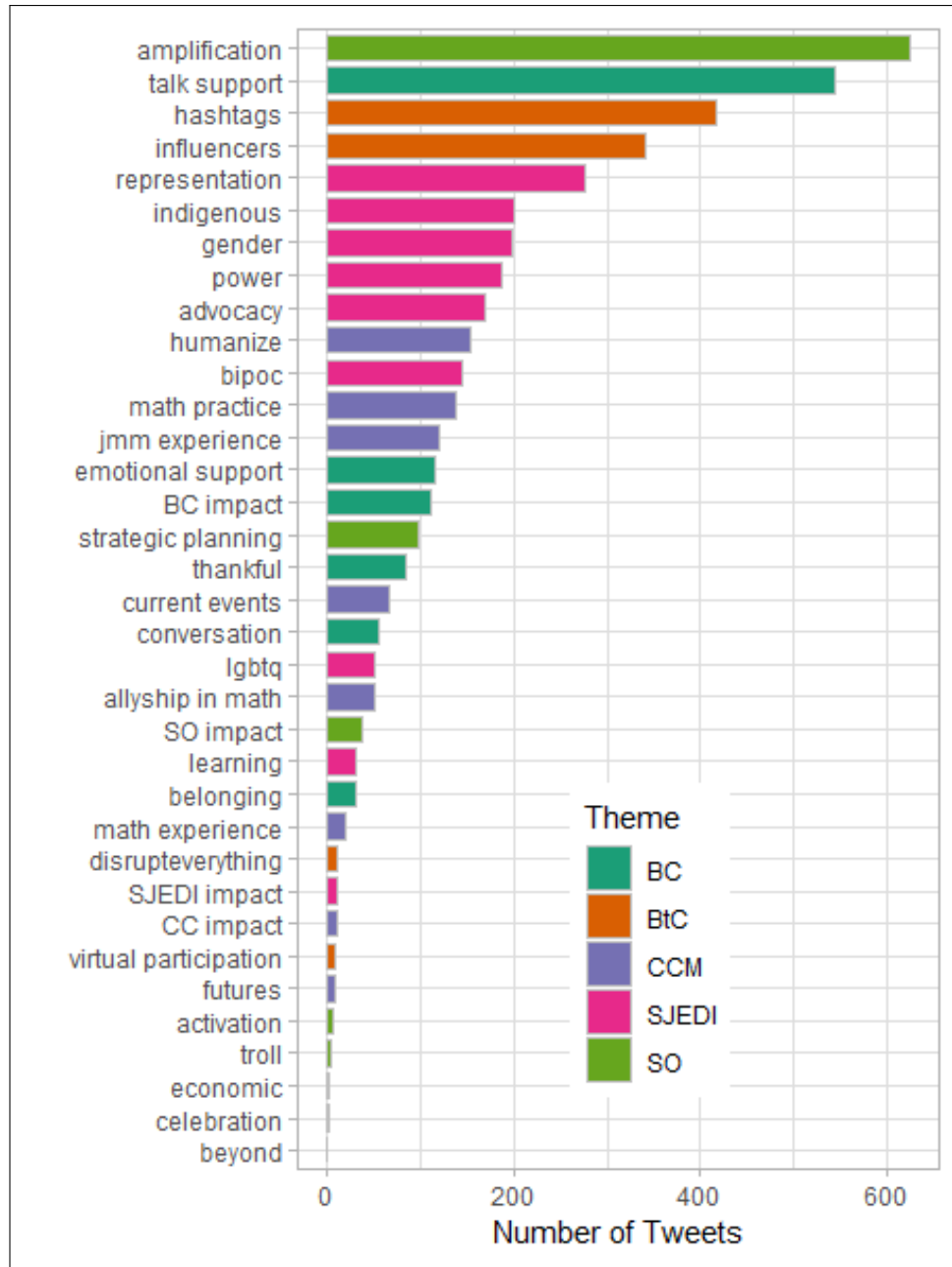
Figure 4: Bar chart illustrating the codes represented in the tweets. The color of the code indicates the theme with which it is associated.

4.2. Discourse on SJEDI in #DisruptJMM

Two of our five themes directly address SJEDI issues: SJEDI and Creating Change in Mathematics, which was the application of SJEDI issues to mathematics more specifically. Within the #DisruptJMM tweets, approximately 61% had SJEDI themes and 42% had Creating Change in Mathematics themes; see Table 2.

Theme	n	% of all tweets
Building Community	856	75.82
Self-Organization	742	65.72
SJEDI	692	61.29
Broadening the Conversation	534	47.30
Creating Change in Mathematics	470	41.63

Table 2: Percentage of tweets with themes under each of the five thematic areas in our framework.

Within SJEDI, the top code noted was "representation" ($n = 276$) which was broadly about diverse representation or the lack thereof in mathematics and or mathematics meetings. This is not particularly surprising; Dr. Piper H. originally called for increased diversity and inclusion on the mainstage of JMM, not being relegated to special sessions. There is chronic underrepresentation of race, ethnicity, and gender in the mathematics community [2]. The second most used code was "indigenous" ($n = 201$). We conjectured early in the process that Indigenous issues would take center stage due to Dr. Tsinnajinnie's talk early in JMM 2020. We were excited to see this signal as those among us involved in the #DisruptJMM hashtag had recognized a shift in visibility of these conversations after JMM 2020. Many of the tweets coded with "indigenous" were in response to the inclusion of land acknowledgments in slides; see Figure 5. The next two most used SJEDI codes were "gender" ($n = 199$) and "power" ($n = 187$). We traced much of this discussion back to a JMM 2020 talk slide [14] which discussed sexual harassment and power dynamics in the mathematics community.

Within Creating Change in Mathematics, the code used the most was "humanize" ($n = 153$) which spoke to the need to resist the separation of human issues from mathematical issues, questioning the neutrality of mathematics, and pointing out intersections between social issues and mathematical issues. These tweets often echoed themes from or explicitly referenced the work of Gutiérrez on "rehumanizing mathematics" [5]. The second most invoked code
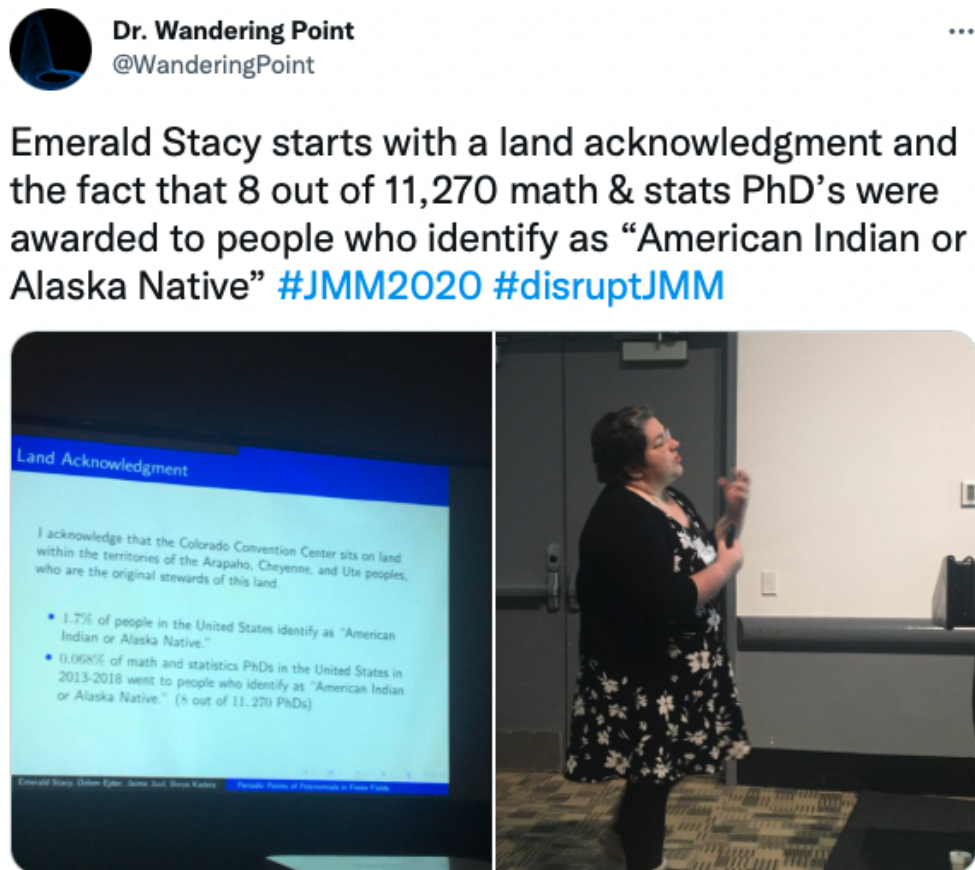
Figure 5: Example tweet coded as "indigenous", amplifying Dr. Stacy's land acknowledgment and highlighting an alarming statistic about the number of American Indian and Alaskan Native mathematics and statistics Ph.D.s.

was "math practices" ($n = 138$), which asked us what we might do differently in our mathematics research or teaching. Interestingly, discussing the JMM experience is the third most invoked code ($n = 120$). This seems to indicate that while it could be argued that #DisruptJMM was about changing the JMM experience, less than 10% of the conversation on the hashtag discussed the JMM experience explicitly, outside of sharing others' talks at JMM. We also noted that these two codes were applied frequently together to a tweet (45% of tweets coded "math practice" were also coded "humanize"); see Figure 6 for an example.
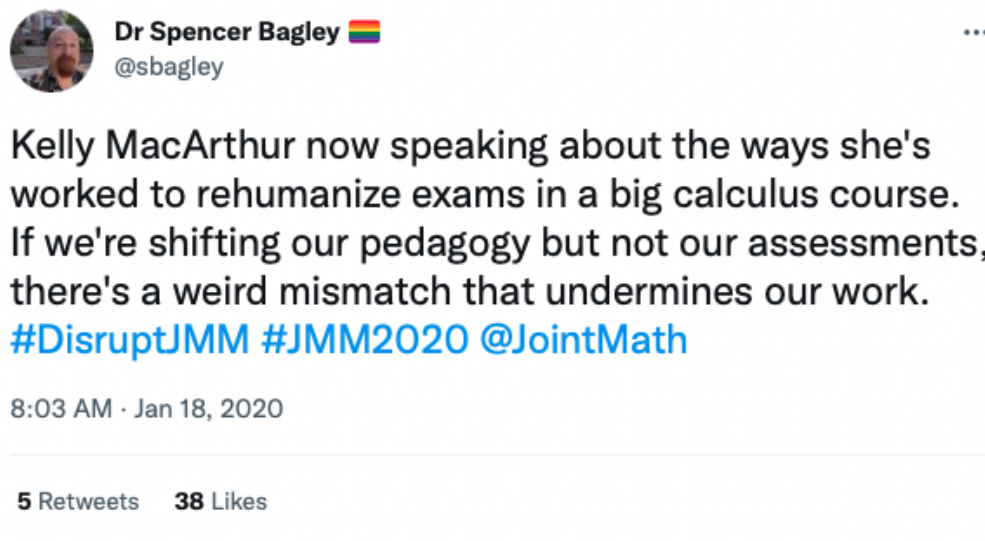
Figure 6: This tweet was coded as including both "humanize" and "math practices".

4.3. What other discourse is happening in #DisruptJMM that creates a social organizing movement?

Preliminary investigation [4] had already led researchers to believe that Building Community would be a key theme. It was indeed the most common theme, with over 75% of all tweets involving this aspect. The foundation of the Building Community theme is the support of those that gave talks at JMM ($n = 545$). This included asking for support, showing up to the talk, tweeting slides of the talk, and virtual cheering and encouragement. The vast majority of solicitations for talk support were related to talking about equity and inclusion issues at JMM during their talk. It was clear that talking about equity and inclusion within the context of a mathematics meeting was against the norm, and participants sought solidarity in the effort. This also created an in-person counterpublic in companionship with the virtual effort.

The support between #DisruptJMM users went beyond the conference talks. "Emotional support" was the second most common code ($n = 117$) indicating that the support went beyond math and was about emotionally supporting people. This is similar to what is presented in the humanizing aspect of Creating Change in Math – #DisruptJMM effectively blended conversation

about the human experience with the mathematical experience and indicates a possible shift beyond slides at talks. People described that #DisruptJMM was making an impact. Speaking to this is the third most common code, "BC impact" ($n = 112$), which included testimonials about the impact of the community formed and tweets, which treated the hashtag like a listserv - advertising opportunities, seeking feedback from like-minded individuals.

The final two themes speak to strategic community organizing. Self-organization, which was 66% of the tweets in our dataset, defined the hashtag in the present and possibilities for the future. The foundation of these tweets was "amplification" ($n = 625$) which shared JMM talks using the hashtag, and also brought issues or related conversations to the attention of the #Disrupt-JMM community. Of the tweets coded "amplification", 67% were also coded "talk support"; the vast majority of these were tweets seeking to amplify ideas shared in a JMM talk. Broadening the Counterpublic was present in 47% of our tweets. Retweets were not part of the amplification only by virtue of retweeting; recall instead they were coded according to the content retweeted alone. However, quote tweets which added #DisruptJMM to an existing tweet were included. Many tweets intentionally broadened the conversation to other hashtags, using the official conference hashtag, or hashtags of related conversations. Tweets in this category also commonly tagged other handles ("influencers", $n = 341$), either users with large following, particular expertise, or the official JMM related account handle. One tweet reported on the emergence of the #DisruptJMM hashtag in the French language.

In the foundational codes for each of these themes, we see the synergistic effect between the in-person meeting and #DisruptJMM. Tweets where talk content was shared by audience members were coded as both "talk support" as well as "amplification." In addition, these tweets were also often co-tagged with other hashtags or influencer accounts (like the official JMM Twitter handle and hashtag), part of Broadening the Counterpublic.

4.4. The impact of #DisruptJMM

Within each theme, we created codes for tweets that displayed evidence of impact. In most cases, the "impact" codes were a small proportion or just emerging. The exception was impact related to Building Community; we were able to see that #DisruptJMM users were treating the hashtag like a listserv or more accurately, a networked counterpublic. Also in this theme was "thankful" ($n = 84$), in which community members expressed gratitude

to people for showing up, creating the counterpublic space, and replying to questions. This category overlapped with "Self-Organization impact" ($n = 38$) which was specifically about the impact of organizing #DisruptJMM. Within SJEDI there were a number of tweets that spoke to a general feeling of needed challenge and "learning" in SJEDI conversions ($n = 32$), or recounted what someone did differently in class or in a department meeting as a result ($n = 10$).

In particular, we want to highlight that this present work is a result of the Broadening of the Counterpublic seen in our data set. While our analysis was restricted to the #DisruptJMM hashtag, a co-occuring hashtag #Disrupt-Math was used by author Diaz Eaton to start a conversation about organizing a semester-long program at the Institute for Computational and Experimental Research in Mathematics on the theme of applying mathematical tools for social justice. This program eventually took place in the summer of 2022, and is where the collaboration that led to this paper was initiated.

At JMM 2020 Dr. Belin Tsinnajinnie's talk was the first time Dr. Joseph Hibdon, Jr. saw another Native American mathematician talk about Native Identity in the mathematical community.

> "Being at JMM is important to me but not once I have felt like the community at JMM was welcoming and open to Native and Indigenous people. Personally I have tried to connect with other Native And Indigenous mathematicians at JMM but there was never a place. The only time I get to meet other Native and Indigenous people in math and science is at the Society for the Advancement of Chicanos/Hispanic and Native Americans in Science (SAC-NAS) national conference and the American Indian Science and Engineering Society (AISES) conference. Seeing Dr. Tsinnajinnie and finally getting to meet him in person made JMM feel a little more comforting. Getting to talk about our Native history and pathways into math made me realize that there can be a place for Native Americans and Indigenous people in the mathematical community; we just have to be given opportunities to showcase that we exist."
>
> —Dr. Joseph Hibdon, Jr.

Dr. Hibdon's contributed reflection above illustrates how important the high-lighting and discussion of Indigenous scholars and authors was. In addition to Dr. Tsinnajinnie's talk raising visibility of colonialism in mathematics, the visibility of representation also made a huge impact.

5. Conclusion

To our knowledge, the framework proposed here is the first to apply #Hash-tag Activism theory to qualitative research on equity and inclusion in STEM. In drawing on work in multiple disciplines, we noticed some key similarities and differences between this type of movement and others. #DisruptJMM other #HashtagActivism movements both had strategic organizing compo-nents and discussion of issues of equity and inclusion [7, 8]. However, we noticed that in addition to general SJEDI discussion, our communities also had specific discussions on what SJEDI meant within the context of the disci-pline and what change might look like (Creating Change in Math). Also, this particular movement was about grassroots organizing within the discipline, not meant as a public movement. Therefore we did not have highlighting of diverse people and their successes generally, but rather more focused on amplifying the #DisruptJMM conversation at the meeting. Because this movement focused on a counterpublic hashtag associated with an annual meeting, it exhibited temporal spiking during the conference, with relatively little activity between the annual conferences. While there was some effort to introduce #DisruptMath as a year-round effort and the suggestion to "disrupt everything" ($n = 10$), this effort did not take off.

Despite the limitations of the engagement with #DisruptJMM in comparison to most national equity and inclusion movements, the hashtag still made an impact within the mathematics community. Because of the nature of aca-demic use of Twitter, we expect that other disciplines may have experienced similar efforts on Twitter. We would encourage collaborations exploring niche #HashtagActivism movements within other disciplines.

We also note that the present work is limited to tweets that themselves con-tain the #DisruptJMM hashtag. It is our sense as observers, and sometimes participants, that there are important conversations happening, for example, in replies to a #DisruptJMM tweet. However, if the replies themselves do not contain the hashtag, they are not represented in the data set we examined. We would welcome further study into such an expanded data set.

While [4] focused on an initial look at the network structure of this data set and exploration of themes from those involved in the #DisruptJMM conversation, here we have focused on the content of the tweets themselves. This leaves us with a natural next step of considering the two together. How do ideas move across the network? How do they propagate beyond the network? This combination of structural and qualitative work would give us the most insight.

6. Epilogue

We are finishing this paper in a time of change as we emerge into 2023. The Twitter community has been fractured by the private purchase by Elon Musk, which has caused a decline in Twitter's functionality as well as a significant decrease in the number of users. We do not know the future yet of #HashtagActivism in the mathematics community. And yet, the themes of the conversation are still important, relevant, and needed. We are also finishing this paper as the 2023 JMM is taking place. This conference is being held in-person as the COVID-19 pandemic continues, raising serious concerns about who is granted access and who is excluded. To accentuate the relevance of the activism and research of it, we close by highlighting Dr. H's renewed call to #DisruptJMM [6] below in Figure 7.
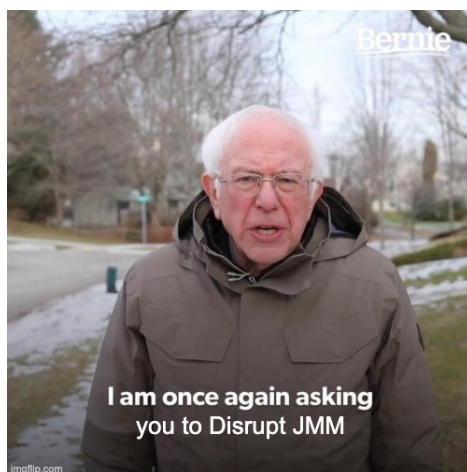

Figure 7: Meme from Dr. H's Inclusion/Exclusion post renewing their call to #Disrupt-JMM [6].

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A. Full Codebook

Self Organization	
amplification	Modified or quote tweets sharing related talks/quotes or attaching the #disruptjmm hashtag
activation	Inquiring or responding to inquiries about getting involved
strategic planning	Why the hashtag was created, defining the hashtag, planning for future use, #disruptmath hashtag use as a vehicle for year-round conversation
SO impact	General reflections on the hashtag organizing making a difference, could be troll activation
troll	Trolling or anti-movement uses of the hashtag

Building Community	
thankful	Showing gratitude to others for their support, their use of the #DisruptJMM hashtag, or their organizing relating activities
talk support	Support related to a JMM talk, including in-person support and live tweeting of JMM talks
belonging	Sense of community, belonging, meet-ups, lack of belonging
emotional support	Venting, giving or receiving emotional support
expertise support	Math or other expertise call or support response
conversation	Any reply to a tweet that engages the hashtag content
celebration	Celebrating achievements in the community
BC impact	Assuming community has been built and using it that way, i.e. just using the hashtag like a listserv, bat signal, or group chat

Broadening the Counterpublic	
disrupteverything	Adopting the model at other conferences, etc.
influencers	Tags specific people/handles, including organizational accounts such as @JointMath
beyond	Beyond US/English - tweets in other languages, references to places outside the US
hashtags	#AwkwardBoardingSelfie, other hashtags
virtual participation	References not being in-person at the 2020 conference or registered for the 2021 conference–not to be confused with participation in the 2021 virtual conference

Creating Change in Math	
humanize	Resist math-human separation, humanizing math, math is not neutral, coup, meritocracy
jmm experience	Autobiographies from marginalized groups discussing past or future JMM experience
math experience	Autobiographies from marginalized groups discussing past or future math experience
futures	Alternative realities, what if questions, too late, dreaming of future realities
math practice	Teaching math, math research practice
current events	Coup/MAA/AMS joint statement on coup, covid, george floyd, georgia shooting
allyship in math	Testimonials from people talking about their privilege in mathematical spaces, testimonials about how they are observing others' experiences in math

Creating Change in Math (continued)	
CC impact	Connecting to actual change in action employed or the effect on people, this hashtag changed your experience in math/jmm, will change how you organize future events, etc.

SJEDI	
representation	General comments on diversity and representation/underrepresentation
lgbtq	LGBTQIA+ rights, oppression, advocacy, etc.
bipoc	Black, Latinx, Asian, or general anti-racist, BIPOC issues
gender	Sexual harassment, motherhood/childcare
indigenous	Includes (de)colonizing, erasure, land acknowledgements, Hawaii
power	Power and privilege - includes calling out privilege, oppression, exploitation, equity
advocacy	Empowering advocacy in SJEDI, inclusion
learning	People expressing feelings of challenge, learning, discomfort
economic	Affordable healthcare, transparent salaries, unions
SJEDI impact	People applying what they learned at the conference, may include allyship moves, not necessarily limited to mathematics