Counterspace Games for BIWOC STEM Students

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ABSTRACT

Black, Indigenous, and other Women of Color (BIWOC) studying STEM are underrepresented in STEM and subject to its “chilly” climate; it is unsurprising that BIWOC STEM students report weaker senses of belonging and higher rates of attrition. Counterspaces, or spaces for mutual support for BIWOC at the margins of STEM, have long combated dominant STEM culture to support BIWOC to thrive and persist in STEM. Digital game design and playful interactions to counter oppression can be leveraged to create digital games that function as counterspaces for BIWOC STEM students to playfully cultivate their belonging and persistence. Our exploratory game design research aims to co-design counterspaces games with BIWOC STEM students, and here we present our initial focus group designs centered on exploring existing BIWOC counterspace practices, preliminary data and insights, and promising directions for developing game design strategies to support BIWOC belonging and persistence in STEM.

CCS CONCEPTS

• **Human-centered computing** → HCI design and evaluation methods; • **Applied computing** → Computer games; • **Social and professional topics** → Race and ethnicity; Women.

KEYWORDS

game design, co-design, STEM, counterspaces, belonging, persistence, women of color

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1 INTRODUCTION

Black, Indigenous, and other Women of Color (BIWOC) continue to be significantly underrepresented in most STEM academic contexts [17]. Moreover, BIWOC students in STEM are often subjected to an unwelcoming, “chilly” climate, exacerbated by frequent experiences with microaggressions and other manifestations of implicit and explicit biases and a lack of formal support mechanisms to challenge these cultural dynamics [9],[23]. It is thus not surprising that BIWOC students in STEM report weaker senses of belonging [4], lower levels of satisfaction, and ultimately, higher rates of attrition in STEM majors and programs [10]. This complex problem, perpetuated by both unjust, historically-rooted institutional inequities and occurrences of interpersonal racism and sexism, requires large-scale social and institutional reform.

Such sweeping changes are, predictably, slow to occur, necessitating the creation of more immediate interventions to address experiences of isolation and promote greater psycho-social well-being for BIWOC students. One particularly impactful intervention is the creation of *counterspaces*, safe spaces that support marginalized individuals at the periphery of a dominant culture, which research has found support BIWOC to thrive and persist in STEM [9]. Counterspaces provide a context for members of marginalized groups to celebrate and express their identities [2], to develop bonds of interdependence that reinforce a sense of belonging [22], and to challenge dominant narratives that perpetuate stereotypes about underrepresented groups [18].

In our work, we are using participatory design and focus group methodologies to co-create digital games that can function as counterspaces for BIWOC students in STEM. These counterspace games aim to fulfill the goals of existing counterspaces — to increase a sense of identity affirmation, belongingness, and resistance — while additionally leveraging the affordances of games and play to cultivate a sense of psychological safety, interdependence, and collective joy.

In this paper, we describe the first phase of our exploratory game design research approach and introduce a novel protocol for conducting remote co-design focus groups with BIWOC participants to explore how digital games can be created to function as playful counterspaces. We also present preliminary insights from our initial focus groups that are yielding promising directions for the next phase of our co-design of counterspace games. We close by discussing our next steps to further develop and evaluate our game

co-design strategies, and to produce and playtest digital prototypes of counterspace games for BIWOC STEM students.

2 LITERATURE REVIEW

2.1 Supporting Belonging and Persistence via Counterspaces

Counterspaces are created to challenge unwelcoming STEM culture and often exist at the margins of STEM, comprised of marginalized group members (and often their allies) [9]. They often center on interdependent practices, which reinforce mutual emotional support and resource-sharing [9], and serve to strengthen a sense of shared identity and belonging [21]. Counterspaces exist in many forms, such as campus-affiliated affinity or interest groups, and sometimes even entire STEM departments [9]. Prior research has shown that counterspaces provide a safe space for validation, recovery, and community [18]. Our work aims to pair these capabilities of counterspaces with playful interactions to design digital games that function as playful counterspaces to support BIWOC belonging and persistence in STEM.

2.2 Social Support via Game Design

Prior research in HCI has investigated how digital games can engender and cultivate social support and belonging in genres such as massively multiplayer online games (MMOG) such as *World of Warcraft*. This work has shown that MMOG players often report experiencing a culture of mutual care and resource-sharing with others within their MMOG-based communities [8]. Conversely, research on occurrences of harassment experienced by players from minority groups while playing online multiplayer games like *Call of Duty 4* has included the development of design principles for fostering equity and inclusion across axes of gender and ethnicity. These efforts have included new frameworks for designing inclusive social (outside-of-game) networks around games to mitigate players' vulnerability to negative experiences through practices like strict moderation against harassment [15]. Also, research on the positive gameplay experiences of Black women in college has generated insights for creating a more inclusive gaming subculture, including recommendations that multiplayer online game designers create environments in which negative social interactions are reportable, blockable, and have clear, concrete consequences [14]. Our research works to build from these insights to design playful counterspace games with the main function of cultivating BIWOC belonging and persistence in STEM by cultivating positive, interdependent interactions to counter negative aspects of dominant STEM culture.

2.3 Playful Counterspace Potentials

We aim to design digital games that can function as playful counterspaces to which BIWOC STEM students can turn whenever they need them. We take inspiration from elements of playfulness that already exist in some traditional counterspaces. These practices include the interactive traditions and methods cultivated by the Theatre of the Oppressed, which combines social issues with theatrical characters in scenes where spectators can interrupt and change the narrative, making it "just theatre" (e.g. a spectator can stop an actor from beating his "wife" and shape the narrative by getting

on stage and beating him with a broom instead) [13]. Additionally, using humor and laughter as nonviolent strategies against oppression has been integral to various revolutionary movements [19]. More recently, humorous practices on Black Twitter for coping with injustices and the COVID-19 pandemic have also exemplified playful practices that counter damaging, dominant culture [11]. Our research aims to leverage these potential powers of play in combination with the positive effects of counterspaces to meaningfully support BIWOC STEM students' sense of belonging and persistence through digital gameplay.

2.4 Assets-Based Game Co-Design

We aim to co-design [16] digital games that function as counterspaces centered on interdependence, joy, and play using an assets-based approach [6] that builds upon existing practices for resilience and persistence in STEM. This approach runs counter to a deficits-based approach, which attempts to improve sense of belonging by trying to "fix" how students experience central STEM spaces [21]. This can be demoralizing to the people the work is supposed to be for [1]. A hypothetical example of a deficits-based approach to addressing weak senses of belonging and their predictably negative consequences for persistence among BIWOC in STEM would be a game-based intervention that encourages BIWOC players to mentally reframe microaggressions as learning experiences from which they can improve. An assets-based approach instead recognizes no "fixing" is needed (unless it is directed at broken systems that perpetuate inequities and injustices) and instead focuses on strengths of the target population [1]. Adopting an assets-based approach means recognizing that BIWOC are already incredibly resourceful and resilient [3]. Building from these strengths, we aim to explore the practices BIWOC already employ to cultivate their own senses of belonging and persistence and support (and perhaps augment) such practices with digital game design.

2.5 Facilitating Exploration of Existing Practices of BIWOC

As a first step in co-designing games with our BIWOC participant collaborators that leverage existing counterspace practices, we first needed to explore these practices, acknowledging that our collaborators' experiences are likely to be personal and/or private. In devising our research methodology, we were guided by prior work by Rankin and Han (2019), who investigated the plurality of Black college women's play experiences. Specifically, Rankin described her decision to be transparent about her intersectional identities (i.e., as a Black woman who plays video games but does not label herself as a gamer) and the purpose of her research while conducting this work in order to build rapport with her participants over the course of several campus game nights. In doing so, she minimized the power imbalance between researcher and participant and invited them to share their personal narratives and expressions with her [14]. In our work, we faced the additional challenge of building rapport with BIWOC participants within a limited amount of time and in a single session, as we were constrained by limited funds with which to compensate participants. To this end, we drew from the Fast Friends procedure in prior research by Page-Gould and colleagues [12]. This procedure, which involves

having participants respond to sets of rapport-building questions that entail increasing levels of self-disclosure, has been shown to reduce anxiety and increase comfort and rapport in interpersonal and intergroup contexts [12]. To further facilitate our participants' comfort with discussing personal and potentially private practices with strangers some degree of comfort, we drew from an element of Psychologically Embedded Game Design: psychological distancing, which creates a buffer between players and uncomfortable themes explored in a game [5]. Specifically, we use collaborative fictional storytelling in our focus groups to create this distancing for our BIWOC participants. Our work adapts these methods to explore existing counterspace practices of BIWOC in STEM by rapidly facilitating our participants' comfort with sharing their personal practices with us in our single, 1 hour remote focus groups.

3 REMOTE GAME CO-DESIGN FOCUS GROUPS

We initiated our game design process with recently-completed focus groups that aimed to identify which game elements and practices for mutual support are most valuable and desired by BIWOC as they continue to work to cultivate their own sense of belonging in STEM. We conducted 2 virtual 1-hour focus groups [20] with a total of 6 STEM student BIWOC participant collaborators from our university to learn more about their current counterspace-related practices, with the intent to later translate these insights into game design strategies. 2 were graduate students, 4 were undergraduate students; 1 identified as Black, 1 as Nigerian-American, 1 as Black/Afro-Caribbean, 1 as Latina, 1 as Asian/South-Asian/Indian, and 1 as Asian/Chinese and Filipino. 4 of the participants identified as Female, 1 participant identified as Demifemale, and 1 participant identified as Femme Non Binary. 2 indicated that they study Human-Computer Interaction, 1 studies Information Security Policy, 1 studies Dramaturgy with plans to pursue STEM-related graduate education, 1 studies Electrical and Computer Engineering, and 1 studies Information Systems.

3.1 Creating Counterspaces Within the Focus Groups

For all study activities, we employed Zoom video conferencing software. Zoom was chosen for its ease of use, ubiquity, and ability to record video and audio footage to the cloud for later retrieval and analysis. To make the focus groups function as counterspaces in which our collaborators could feel comfortable exploring counterspace practices, we played lo-fi hip hop beats softly via Zoom audio sharing, and ensured that facilitators exhibited genuine warmth, from greeting collaborators as they entered to encouraging their input on the Miro board (a web-based visual collaboration platform) and thanking them for their time and energy during goodbyes. Although all collaborators had previously consented to being audio- and video-recorded during the focus group, we also encouraged them to turn their cameras and/or microphones if and when they wanted/needed. In the same spirit, we encouraged all collaborators to participate however they preferred, even if that was solely via the Zoom public chat or even private chats to facilitators (which Zoom does not record). Furthermore, all collaborators were required to

sign consent forms in which they agreed to not share anything they saw or heard during the focus groups.

Scaffolding Self-Disclosure: During the first 5 minutes of the remote focus groups, those of us facilitating introduced ourselves and the basics of the collaborative storyboarding activity. We disclosed our BIWOC and STEM student identities and the purpose of the research project to encourage comfort and sharing [14]. We conducted a brief ice breaker and then created space for collaborators to introduce themselves for another 5 minutes. Our brief ice breakers questions were adapted from the Fast Friends procedure [12] (i.e., 3 levels of ice breaker questions of increasing self-disclosure) to further ease collaborators into discussing their counterspace practices with strangers. Introductions and ice breaker components were framed as response-optional and answerable via any method (i.e., chat or voice).

3.2 Facilitating Exploration of Counterspace Practices

Outreach for our focus group recruitment highlighted that no prior game design (including storyboarding) experience was required to participate, so we designed our focus groups to facilitate our collaborators' counterspace activity exploration efficiently. Once we had rapidly established comfort, we moved onto the main collaborative storyboarding activity. As our medium for remote co-design, we used the online collaboration platform Miro. In Miro, we created a custom mini tutorial to quickly acclimate our participants to Miro's layout and tools before our focus groups. Within a few minutes prior to our designated focus group sessions, they learned how to navigate within the digital design environment, add text and media, and operate in Miro without exiting our focus group Zoom room. We also created a custom collaborative storyboarding board on which our BIWOC participant collaborators inputted facts about a fictional BIWOC STEM student character, her possible emotional responses to negative narrative scenarios, and what she could do to support her own joy, rest, and healing (i.e., possible counterspace practices she could use). To preserve collaborator privacy, our Zoom rooms and Miro boards could be accessed only via the private passwords we provided to them, and the PI hid and locked storyboards once they were completed.

We recognized that counterspace practices are personal, potentially private matters and not comfortable to discuss with strangers, even when sharing BIWOC identity, so we adapted psychologically embedded distancing [5] to serve as a buffer in the form of a narrative about a fictional BIWOC character on whom collaborators could focus their discussion of counterspace practices.

Storyboarding: Facts about Her! At the start of storyboarding, we prompted them to generate facts about a fictional BIWOC STEM student character on a collaborative Miro board for about 2 minutes. Supporting this buffer was the BIWOC Character Facts Generator, a program that one of our BIWOC undergraduate research assistants built specifically for the focus groups. The program generated playful example traits such as "One of her main hobbies is stamp collecting" and "She secretly loves reality TV shows like Love Island and The Bachelor." Although we had intentionally designed these facts to be lighthearted and non-specific to any one BIWOC identity, we encouraged collaborators to add semi-autobiographical

facts. Our aim was to encourage them to identify with the fictional BIWOC character, albeit from a safe distance.

Storyboarding: How Do You Think She Feels? Following this, we introduced one narrative scenario. We asked them to answer “How do you think she feels after this?” in response to the narrative scenario on the Miro board for 3 minutes. As they worked on editing the Miro board, including at any time we asked them to respond to a prompt on Miro, facilitators reminded them that their contributions did not have to be confined to a single bubble or section on the board, and that we in fact encouraged them to cross lines and collaboratively generate responses in shared bubbles. The key details of narrative scenarios of each storyboard, listed below, were modeled after fairly common experiences that BIWOC endure in STEM spaces, such as being told she “must” need help to pass a computing class or coping with performative emails from university leadership that do nothing to address poor campus climate. We did this so that BIWOC would readily share counterspace practices they may have enacted in response to similar negative experiences.

Scenario 1: Our fictional BIWOC STEM Student is sitting in the foundational introduction course for her STEM major...when the lecture ends, one of her classmates approaches her and without introducing himself, asks if she needs help...he clarifies that he is offering to help her so she can pass the class because she “must be having a lot of trouble”.

Scenario 2: Our fictional BIWOC STEM Student is on her way to her STEM class...as she passes through, she notices more than one person watching her, as if tracking her until she leaves the space, and it doesn’t look or feel friendly. She notices one person protectively pull their bag closer to them as she passes. She quickly leaves the space.

Scenario 3: Our fictional BIWOC STEM Student is in a group project meeting with her classmates...one member presents an idea which the rest of the team enthusiastically supports...she reflects on the fact that this idea is very similar to (if not the same as) an idea she presented at the last meeting which the team quickly rejected. When she brings this up, her team minimizes what happened and ends the meeting.

Scenario 4: Our fictional BIWOC STEM Student checks her email and sees one from the University President with the subject line “Responding to Student Concerns”. ..the President acknowledges that another prominent university official regularly demeans marginalized groups and that this “negatively impacts some students”...[the email ends] with statements regarding academic freedom and plans to form a committee...

Storyboarding: What Could She Do? Once they were done, we asked them to answer “What can she do to address and/or counter these feelings? What can she do for her own rest, healing, and/or joy?” on the Miro board for 10 minutes. Again, we encouraged our collaborators to not be bound by single bubbles or sections and instead let them know they were welcome to list their counterspace practices wherever they saw fit, especially if they were building upon or were related to what their fellow collaborators had contributed. Furthermore, all cues for steps and helpful nudges for exploration were visible for each part of collaborative storyboarding. These cues included reminders to list things she could do if she had “time, energy, and resources”, along with an unobtrusive timer to help everyone stay on track.

Storyboarding: Reflections. Collaborators then spent 5 minutes sharing their reflections on their input aloud, after which we repeated this collaborative storyboarding process once more for the second narrative scenario. While collaborators talked about their own and each others’ contributions and facilitators encouraged open conversation around the presented counterspace practices, a dedicated facilitator took notes about the reflections as part of our focus group data. Throughout every part of the collaborative storyboarding activities, facilitators worked together to make sure all prompts were communicated aloud, via chat, and brought up again via nudges to help collaborators along. Genuine warmth was especially helpful in encouraging collaborators in real-time as they contributed to the Miro board and shared their reflections with the group.

3.3 Leaving the Virtual Counterspace

To close the focus groups, we created space for a 2 minute cool-down of their choice and used the last 3 minutes to sort out payment logistics, thank them all, and say goodbye. Facilitator friendliness and warmth were constant throughout focus groups, and we closed the virtual counterspace gently through our cool-down period to enable collaborators to come down from our discussion of personal counterspace practices before getting on to the rest of their days. As our collaborators left, they kindly shared with us that they had fun and were interested to see how the research would develop.

4 INSIGHTS FROM PRELIMINARY FOCUS GROUP DATA ANALYSIS

Co-creating storyboards about fictional BIWOC STEM Students by having collaborators describe “Facts About Her”, “How Do You Think She Feels?”, and “What Could She Do?” after her negative experiences in the narrative scenarios enabled us to explore the counterspace practices of our collaborators in our remote co-design focus groups. We feel our efforts to facilitate the storyboarding process and to make the focus groups counterspaces contributed to the quality of conversations that emerged during the focus groups, which we have yet to parse from our Zoom recordings and observational notes. The benefits of our focus group design can be seen in the insights we gleaned from preliminary data and analysis conducted on our Miro boards, which function as counterspace narrative design artifacts of our remote focus groups. This preliminary analysis entailed the first two authors making two passes coding the responses to the “What Could She Do?” prompt. In the first pass, we independently coded up to 5 characteristics of each shared counterspace practice, such as “venting,” “socializing,” “ignoring,” and “building positives.” In the second pass, we discussed our characteristic codes to cluster responses into themes and reached consensus on theme definitions and the counterspace practice responses assigned to them. For example, the codes “venting” and “socializing” were combined into the theme “Seeking Solidarity & Validation.” Counterspace practice responses that fell into more than one theme were included in each theme’s frequency total.

4.1 Seeking Solidarity & Validation

14 collaborator responses involved counterspace practices centered on seeking solidarity and/or validation by turning to external

sources like communities. Collaborators referenced both real communities (e.g. a school club meeting) and imaginary ones. In the latter case, in response to *Scenario 1*, one collaborator suggested watching shows on Netflix that cover similar microaggressions because “it’s reassuring to see the situation play out reasonably.” This is a potentially fruitful path of further exploration as we work towards translating this insight into game design strategies: one possible example is designing counterspace games that create an individual BIWOC’s ideal community that they could turn to for solidarity and validation, drawing inspiration from both real and fictional communities important to their lived experiences.

4.2 Self-Care & Small Joys

31 collaborator responses involved counterspace practices that were directed more inwardly by taking part in small joys to boost their overall feelings of well-being. Often, these responses were associated with the BIWOC character treating herself to good food and/or drink, such as when a collaborator listed “treat herself to some boba!” in response to *Scenario 1*. Practices also included feel-good habits like “take a nice long shower or bubble bath” in response to *Scenario 3*. These insights have the potential to be translated to especially joyful game design strategies: One possible example is designing games around enjoying small pleasures, such as hiking through a beautiful environment, hanging out with a virtual dog, or even making boba at home to cultivate self-care and small joys in the hopes of mitigating the harms of dominant, exclusive cultures like that of STEM.

4.3 Distraction & Escape from Dominant Culture

27 collaborator responses purposely shifted counterspace practices away from negative aspects of dominant STEM culture, often with clear intent to ignore, forget, or simply get away from negative experiences. Some counterspace practices that served as distractions or escapes seemed to be total. For example, one collaborator wrote “dimension hop to somewhere interesting where people are nicer” in response to *Scenario 4*. Forgetting or ignoring the negative experience leaned more towards “focus[ing] on her own learning and grades/don’t pay attention to classmates like that” in response to *Scenario 1*. Distraction and escape as broader counterspace practices also have exciting potential for game design strategy development: one possible example is designing counterspace games focused on visiting other worlds that counter dominant STEM culture, perhaps even as practices to model outside of gameplay.

4.4 Seeking Justice

20 noteworthy collaborator responses were forms of direct action, engaging with authorities related to the fictional scenarios, and modified forms of activism as counterspace practices. First and foremost, while we joked with collaborators during focus groups about possibilities for petty revenge, neither the conversation nor shared counterspace practices involved violence or destructive actions to cope with marginalizing experiences. Our preliminary analysis understands them to be practices seeking some form of justice. In response to *Scenario 2*, one collaborator listed “sit in that place next time, with her friends” to reclaim that unwelcoming space.

In response to *Scenario 2*, a collaborator listed “assuming she has a high grade, sabotage the entire project so everyone gets an F on it and it doesn’t even affect her grade that badly” to address due credit for work not being given. While seeking justice is often be a heavy subject, especially for BIWOC, and is typically a path taken when relevant authorities cannot or will not address problems nor hold wrong-doers accountable, possible game design strategies derived from this insight have the potential to bring healing. One way is through counterspace game design centered on practicing scripts for necessary confrontations to normalize accountability, even within relationships with power imbalances in dominant STEM culture.

5 NEXT STEPS

From these preliminary insights, we have identified four promising directions for translating our collaborators’ counterspace practices into game design strategies. Further analysis of our Miro-related data and Zoom recordings of our remote co-design focus groups is necessary to refine these insights and possibilities for game design strategy translation. Additionally, we plan to perform a critical games analysis of existing game design strategies related to the insights we clarify, drawing from game design research as well as commercial and independent digital games by leveraging playthrough videos with commentary as qualitative sources of player experiences, as well as our own play experiences.

5.1 Remote Mini Game Jam

To continue our research to co-design counterspace games with BIWOC, we will run a participatory design workshop [7] in the form of a virtual game jam with 10-15 BIWOC undergraduate and graduate STEM students to co-create instances of the translations of clarified insights about existing BIWOC counterspace practices. With BIWOC participant collaborators acting as game designers, we aim to co-create low fidelity prototypes of counterspace games centered on their lived experiences and our focus group insights. In this remote mini game jam, we aim to carry over our focus groups design to foster another virtual counterspace during the remote event and facilitate game design activities with collaborators who have little to no game design experience. We also hope to discuss their experiences in STEM and identify and clarify what they feel they need and/or want from computer-mediated play and/or playful digital experiences intended to support them, their belonging, and their persistence in STEM higher education.

5.2 Evaluation Study

Ultimately, we as a team dominated by BIWOC STEM students will create refined digital prototypes of the co-designed counterspace games by iterating on the prototypes that are produced by our BIWOC STEM participant collaborators in the remote mini game jam. We will continue to center BIWOC STEM Student input and feedback while we conduct iterative internal remote playtests and culminate with an online study to evaluate the games’ impact and effectiveness as counterspaces for BIWOC STEM students to support their belonging and persistence.

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