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Bumping into Each Other Online – The Gradual Process of Building Meaningful Connections in Online Contexts for Underrepresented Groups in STEM

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Abstract

Building meaningful connections in online contexts became a necessity in 2020 when the covid-19 pandemic forced people to rely on virtual means for their interactions. As Zoom Meetings became the common method of participating in work and school, institutions scrambled to create an enriching and meaningful environment for their members. This transition has been challenging, and work organizations have reported increased conflict and 'zoom-fatigue' whereas educational institutions have experienced increased disconnectedness and attrition (e.g. Leal Filho 2021 et al; Galanti et al. 2021). In this study, we ask: How can individuals form meaningful connections in the context of fully remote professional environments? In particular, we focus on the processes with which gradual familiarity is created in online contexts. In the physical domain, we take the gradual nature of friendship building for granted; people run into one another in the midst of daily activities and through repeated opportune encounters they begin to form deeper ties.

This is challenging in online environments, where interactions are predominantly intentional and designed. There are few opportunities for people to "bump into each other" and engage in casual conversations in passing. While the importance of making meaningful connections in professional contexts has been effectively linked to several positive outcomes, such as motivation, learning, innovation, sense of belonging and professional identity formation. We examine these processes in the context of first-year STEM (Science, Technology, Engineering, and Math) students within their first and entirely remote year of instruction on a university campus. We examine the mechanisms that enabled students to feel connected to other students, supported by the university, and experience an overall sense of belonging while coping with an unprecedented time in higher education.

Background

How do we connect without casual/ informal interaction?

Impacts of virtual education and work in the COVID 19 Pandemic: Educational institutions experienced increased disconnectedness and attrition (e.g. Leal Filho 2021 et al; Galanti et al. 2021) Negative impacts on employee's well-being, productivity and sense of belonging are substantial (e.g. Shamsi et al., 2021; Van Zoonen et al., 2021;Vyas and Butakhieo 2020; Waizenegger et al. 2020). WFH further increased unequal conditions for women, people of color, and those of low socioeconomic status

What do we already know about virtual environments?
Social support for remote workers reduces emotional exhaustion (Sardeshmukh, Sharma, & Golden 2012; Vander Elst et al. 2017) and increases worker satisfaction and organizational commitment (Fay & Kline, 2012; Golden, Veiga, & Dino 2008), all elements critically related to organizational belonging.
However, there is little research that explores how and what types of social support best increase belonging for remote workers—especially in organizational contexts that rely heavily on social connection (such as first year of university).Covid eliminated the ability to Opt-in to WFH

Research on Belonging:
In education, it is defined as: "Whether or not students feel respected, valued, accepted, cared for, included, and that they matter, in the classroom, at college, or in their chosen career path" (Strayhorn 2018).
Organizationally defined as: "An acknowledgement of one's talents, interests, and experiences, and finding whole acceptance of one's self expression of these" (Belle, Burley, & Long 2015)

For underrepresented groups in STEM—Belonging is especially critical to persistence and success.
 Conforming to Stereotypes (Cheryan et al 2015 & 2016; Metaxa-Kakavouli et al 2018)
 Group Membership (Dortch and Patel 2017; Johnson et al 2020; Rodriguez and Blaney 2020; Lewis et al 2016)
 Strong Interpersonal Connections (Johnson 2012; Rainey et al 2018; Apriceno et al 2020)
This model seeks to explicate mechanisms and processes of belonging for these groups

Belonging in Virtual Contexts are created through Interactional Practices!
 • Virtual communities established through interaction are more successful than those founded on common interests (Tardini and Cantoni 2005)
 • Commonality + Uniqueness (Hughes 2017)
 • Voluntary Mutual Disclosure (Soraker 2012)
 • Activities that "get everyone on the same page" (Peacock et al 2020)
 • Collaborative tasks for the benefit of the organization (Bryer 2019).
 • Practices of discussing team membership "onstage" with clients and "offstage" with team (Hafermalz and Riemer 2021).
 • Belonging for virtual workers creates deep identity fulfillment (Belle, Burley and Long 2015) and contributes to organizational identification and commitment (Fay and Kline 2012)

Why does this research matter? We know belonging and connection are important for academic motivation, success, psychological adjustment, and persistence to degree (Freeman, Anderman, and Jensen 2007; Hausmann, Schofield, and Woods 2007; Pittman and Richmond 2008; Hoffman, Richmond, Morrow, and Salomone 2002).
COVID eliminated many "normal" mechanisms of belonging

Data and Methods

Research Question: How can STEM students form meaningful connections in the context of fully remote professional environments?

AKA: What replaces the Water Cooler Chat? What makes them feel connected and like they belong to the larger community when isolated and geographically disparate?
We know that spontaneous communication, shared identity, shared context play a role in geographical disparate teams (Nurmi & Hinds, 2020; Hinds & Mortensen, 2005) but what is the process? Does it happen naturally and gradually like in "real life"?

Data: The study was conducted as a qualitative, single-case study at a medium-sized public university on the West Coast of the United States. As most institutions, the University moved its instruction entirely to online modality in March 2020. Once it became clear that Fall instruction would be virtual, the campus created the "Dens" program to support the students' learning and sense of community and belonging in an online environment. All incoming students were assigned in a Den of 20-30 students with the intention of facilitating connecting with peers in a more intimate environment. Each Den was also assigned a trained "Den Guide" who were full time staff with previous experience directly interacting with students. This was envisioned to offer students additional support both academically as well as in terms of adjusting to campus life. . Furthermore, many interconnected issues with both a sense of belonging and professional identity development have been identified among underrepresented communities in STEM, such as women, Hispanic students, and students of color more broadly. The campus in question is characterized as a Hispanic Serving Institution where more than 70% of the students are either Hispanic, black or Asian/Pacific islander. Hence, the campus and its "Dens" program offered a particularly good position to address interconnected questions regarding community, belonging and learning in the context of STEM education.

(Living Learning) Community Class (LLC)	Den Spaces	Discord Servers
• Four "houses" based around STEM topic areas • Optional 1 unit course for first year undergraduates • Graduate Student Mentor • Weekly one hour Zoom Meetings + group projects	• All students automatically placed in groups of 20-30 with similar academic majors • Participation was entirely optional • Staff member Den Guide and older student Den Assistant • Regular optional events and meetings conducted on Microsoft Teams	• Discouraged by University • Student-generated communities centered around hobbies and/or academic interests • Optional and organic participation • Self-appointed leaderships positions and community generated events and study groups
24 Interviews, 8 hours of observation	15 interviews, 5 hours of observation	5 interviews (+ some overlap with other participants from previous two groups), 25 hours of observation

Our data analysis followed abductive methodology (Dubois and Gadde, 2002) and was conducted through a detailed thematic analysis (Rice and Ezzy, 1999). We moved from open, in-vivo coding towards increasingly abstracted thematic categories. Throughout the process the two authors discussed emerging codes and insights as well as compared findings with existing theory. Through this process, focus was placed on an initial category of " accidental friendship", which was then merged with other, related coding categories, such as "building connections", "unmet attempt at a connection", "classroom environment", and "struggling together". The in-vivo codes under these categories were re-analyzed and re-categorized, which then formed the final analysis structure.

Example of Initial Familiarity:
I don't feel like I know most of them very well. But at the same time, I'm still comfortable with them. And like, I'm not afraid to talk in the class because I know there are students, other students who will talk and like add to the conversation. So yeah, I don't know them all very well. And some of them I've never talked to. But, um, for the most part, I do feel comfortable."
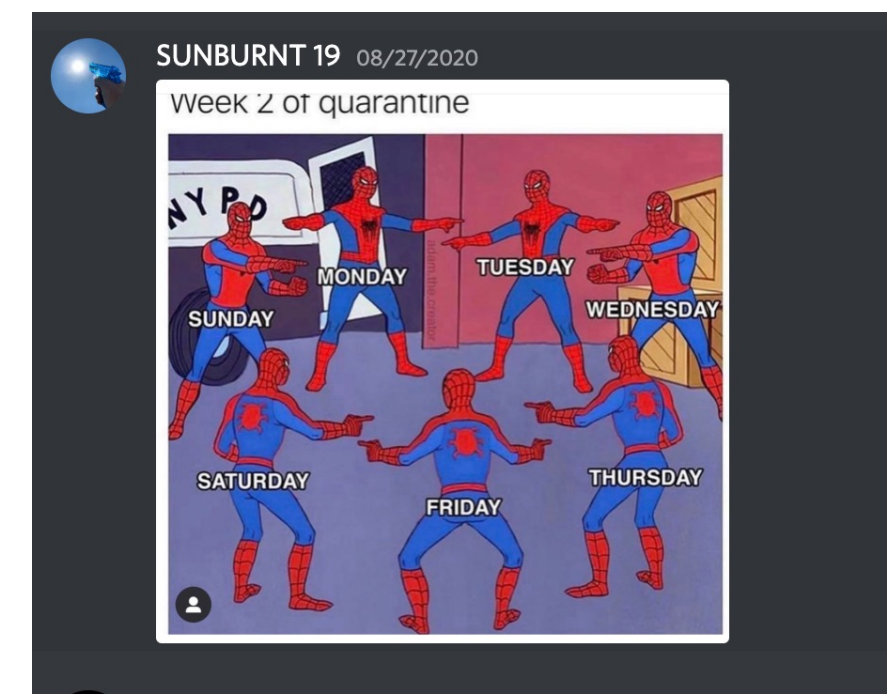
Methods of "Deepening Connection":

Discord Logo   **Post showing common interests**   **Post showing Shared Humor**

Example of Struggling Together:
"In like those times of panic or like when someone needs help you kind of just bond to survive through this pandemic class together."

Achieving Connectedness and Belonging:
" I feel pretty connected. I'm starting to make friends. And, like, last weekend, I asked for help on, like, a math problem. And I was, and I just said, you know, 'thank you for like, helping me.' And then my peer responded. 'Yeah, of course. That's what friends do'. And I was like, like, 'we're friends?' And I was like, so happy like that. Like, I kind of made friends. And I—we were friends. But like, he's, like, 'No, that's what friends are for.' And I was like, 'Oh, my God, I did it!'"

Results

Our findings indicate that interpersonal relationships were gradually built through progressively deeper and more personal engagement whilst in the process of regular work occurrences. In the context of our study, this meant that first, Initial Familiarity needed to occur, where a student would notice and feel a connection to a peer based on their sharing or behavior without direct interaction. Second, the students used routines and recurrent sharing practices to find commonality with one another; either through finding and engaging in shared interests or humor outside of the university context or engaging in the process of "struggling together" around a shared academic hurdle.
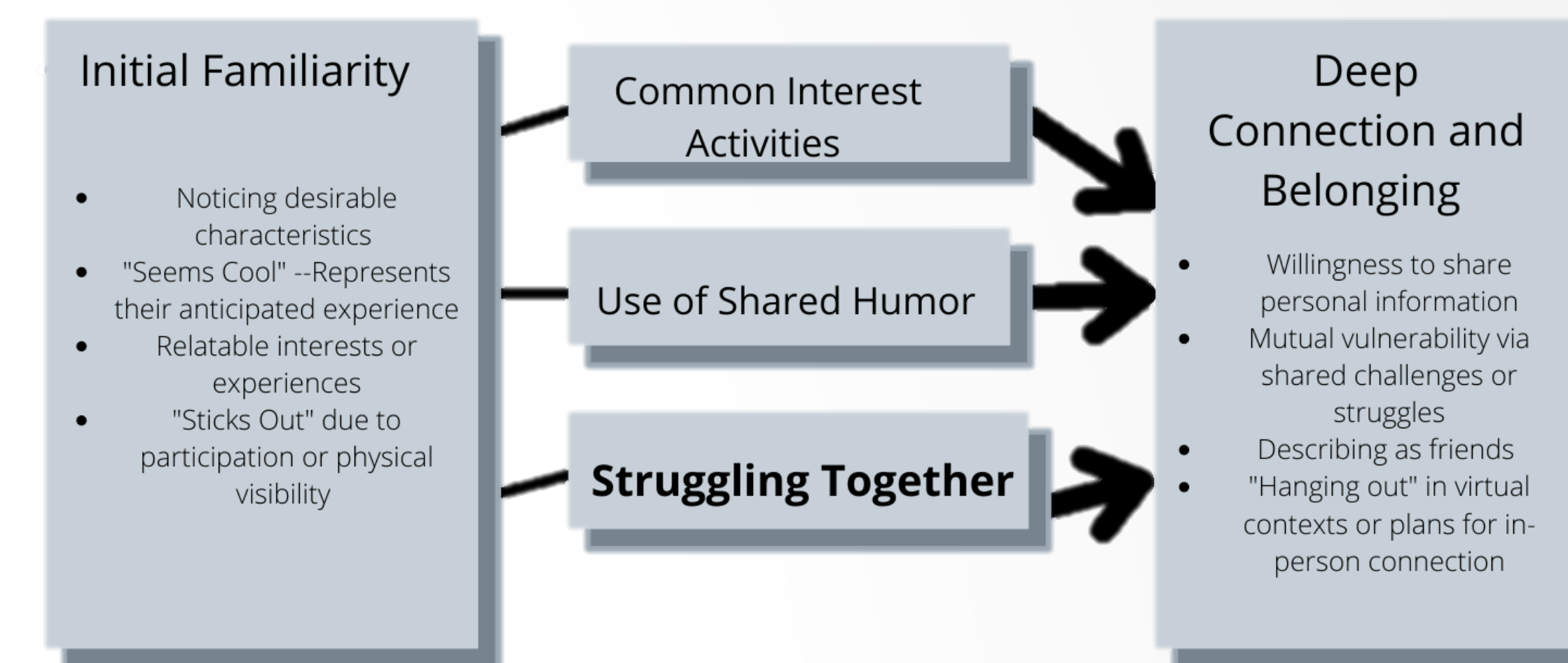
Overall, our findings indicate that the way we think about creating spaces for socializing in online contexts may not be effective in supporting the gradual processes of belonging. More generally, there appears to be a lack of understanding of the fact that this process is, indeed, gradual, involving several steps that are difficult to plan and orchestrate in the way we are used to doing in organizational and managerial contexts. Our findings accentuate the importance of Initial Familiarity as an initiator for the process, and the need to create repeated interactions and find ways to enable opportune encounters in the virtual space. This needs to happen in a defined process with stages, otherwise students faced feelings of intense othering and disconnection from their peers and a disconnect with the campus as a whole.

Conclusion

Implications for Virtual Teaching and Learning: Our study indicates that it is beneficial to emphasize practices that promote building Initial Familiarity and allows students to passively get to know one another in a virtual space, such as check-in questions, using forums and discussions, allowing for flexibility and free time where students can find similarities and connections. Additionally, promoting student autonomy and space where they can connect in an unstructured way is likely critical to a greater sense of belonging. We also recommend practices that encourage students to work through small academic challenges together.
Implications for Inclusion in STEM: Many of the implications for teaching and learning are even more important for historically underrepresented groups in STEM. Encouraging students to find common interests, especially those based around cultural boundary objects (e.g. Korean dramas, common spiritual practices, cultural traditions) leads to greater connection. Additionally, we suspect that those from historically excluded backgrounds in STEM are much more likely to seek academic support from trusted and familiar peers rather than professors or school-based resources, so encouraging collaboration and peer support with challenging academic problems may help.

Future Direction

Our Findings contribute to several areas of literature and provide insights for practitioners in educational and virtual work domains. The processual nature of creating belonging in online learning spaces provides insights for virtual or hybrid courses, that may be even more common after covid-19, as well as demonstrates methods of engaging students in informal learning communities, such as MOOCs or educational forums. By creating opportunities for participants to build familiarity and then engage in routinized sharing or "struggling together" on a project, instructors can boost engagement and increase belonging. Increasing belonging is especially important for underrepresented groups in STEM, such as the majority of students who participated in this study. Equity-focused STEM educators and student affairs practitioners can glean insights from this study involving creating opportune structures for belonging for these groups, as well as support informal solutions and platforms where students can safely give and receive academic support. Finally, as the Great Resignation has revealed, many people may elect for more hybrid and virtual work arrangements and additional care needs to be taken to increase belonging for these geographically dispersed workers in order to create and retain happy, connected, and functional virtual teams.

Future papers are planned comparing this virtual context with a social enterprise coding school's practices of belonging as well as linguistic studies on the language used by participants.

Acknowledgments