How Do Distance Learners Connect?

Shared Identity, Focused Work and Future Possibilities

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ABSTRACT

Distance learners often experience social isolation and impoverished social interaction with their remote peers. To better understand the connections that distance learners are able to build with peers, we interviewed them about whether and how they perceive or cultivate connections with one another. Our analysis reveals how connections in an online learning environment are formed and experienced across different social contexts and technology affordances, and what strategies and practices enable and inhibit these connections. We discuss the implications of our findings for concepts of shared identity and evolving peer relationships among online learners and for design directions that might address their social needs.

CCS CONCEPTS

• **Human-centered computing → Empirical studies in collaborative and social computing**; *Empirical studies in HCI*; Ethnographic studies;

KEYWORDS

Online learning community, Shared identity, Connection strategies, Distance learning

ACM Reference Format:
Na Sun, Xiying Wang, Mary Beth Rosson. 2019. How Do Distance Learners Connect? : Shared Identity, Focused Work and Future Possibilities. In *CHI Conference on Human Factors in Computing Systems Proceedings (CHI 2019), May 4–9, 2019, Glasgow, Scotland UK*. ACM, New York, NY, USA, 12 pages. https://doi.org/10.1145/3290605.3300662

CHI 2019, May 4–9, 2019, Glasgow, Scotland UK

ACM ISBN 978-1-4503-5970-2/19/05…$15.00
https://doi.org/10.1145/3290605.3300662

1 INTRODUCTION

Although enrollments in online university degree programs are increasing [29], distance education continues to suffer from the mere fact of distance: the separation of students in time and space leads to feelings of being socially removed from the situation [25]. This social isolation is a major contributor to the retention problems in online education [12, 55]. As suggested by Ashar and Skenes [2], specific learning objectives may attract adults to an online program, but it is the presence of a social environment that can keep them engaged in the learning activities.

During the college years, schools serve as nuanced social environments where students share beliefs, fears, values and norms [3, 27]. However, when university education "goes virtual", the social fabric of learning may be weakened. If online students do not feel they are part of a community, they may feel isolated, anxious, defensive and unwilling to take risks in their learning [57].

Our vision is that all learners - including students learning at a distance[1] - should feel like members of a community, trusting that they will be heard and treated sympathetically by their fellows, and can confidently reach out for collaboration and social support as needed. Because these learners are interacting and working together at a distance, the creation of community will likely depend on digital tools that evoke and support feelings of shared identity and connectedness.

In response to these concerns, researchers explored social affordances in computer-supported collaborative learning (CSCL) environments. When designing CSCL environments, it is important to not assume that students will engage in social behavior simply because it is technically possible [30]. Many important interactions are not planned; impromptu encounters and informal non-task-related conversations can often form the backbone of a positive learning environment [23].

However, even when purely "social" exchanges are seen as valuable, casual interactions may be difficult for distance learners, who often have little time to spend with peers

[1] Although the term "distance learning" encompasses much broader contexts, our study here focuses on the instance of online degree-earning program provided by universities.

[43]. As a result, some researchers question the cost-benefit equation for community-building activities [42]. Any efforts to promote sociality in distance education should address the trade-off between the costs of time and the benefits of stronger social ties.

Researchers studying collaborative learning have described how students' learning takes place as a tight integration of individual learning with cooperative learning that may occur across multiple settings, including dyads, small groups, classrooms and communities [45, 48, 56]. This view of shared knowledge construction points to the importance of understanding the social structures through which collaborative learning takes place, including how these peer relationships come to be. This need is especially strong for distance learning, where the ways that peers can interact are radically different from traditional brick and mortar schools. As a step toward building such an understanding, we conducted an exploratory interview study of distance education students. We were guided by the following research questions:

- *How do distance learners perceive and develop social connections with peer learners?*
- *How do feelings of connection, and strategies for building connections, differ for different types of peer groupings?*
- *In what ways does the social and technology structure for distance learning influence the building of connections?*

2 RELATED WORK

Our interview methods and analysis draw from studies of community in online learning environments and on computer-mediated communication (CMC) and related tools used to enhance the social experiences of online students.

Fostering Connections Among Online Learners

"Connections among peers" is a complex notion given the variety of online educational settings. Some online learning takes place in well-defined groups (e.g., class projects), some comprise an entire degree program, and some is associated with a broadly distributed online course (e.g., MOOCs) [34, 54, 59]. Motivations and financial investment to learn at a distance, the source and number of potential peer learners, as well the time course for possible interaction, will vary across these settings and affect the nature of connections that can be built.

Researchers interested in cooperative learning in a class setting often focus on connections felt by group members or classmates [19, 24], where small-group relationships are almost certainly an important source of social support when members collaborate to gain the course grades. Across multiple classes, students enrolled in formal programs at a distance exhibit more of a temporal pattern while balancing work and life constraints [26]. Researchers studying an online master degree program reported that students' social capital accumulates across the sequence of courses, with higher social capital predicting better grades [22]. A recent study of distance learners enrolled in multi-year degree programs [54] revealed that online students felt efficacious in regulating their identities, coordinating with one another and providing support support [4, 14]. Interestingly, this same study found that feelings of friendship – a peer relationship one might expect from face-to-face social settings – tended not to be experienced by distance learners.

At the other extreme, even some MOOC learners are socially motivated to study together and to make friends [59]. Further, learning-at-scale researchers (e.g., MOOCs) found the connections that not only grow out of a specific class, but also those felt by alumni who lingered around after the end of a single class session. For example, MOOC researchers found that a persistent chat room encouraged course alumni to reach out and help new learners [40]. This suggests that the alumni might feel a shared identity or connection "back to" an educational setting they had previously experienced.

Given the many forms of social connection that may play a role in online learning, we chose to investigate an online degree earning program that enables multiple types of peer groups as one instance of distance learning contexts. Specifically, we asked distance learners to reflect on connections they may have experienced in small groups, within an entire class, and beyond individual classes at the level of a university.

Technology-Mediated Social Engagement in Online Learning Environments

Prior work has studied both synchronous and asynchronous technologies as supports for online learning behaviors in different settings, ranging from formal education (e.g. classes taken in pursuit of undergraduate or graduate degrees [52]), to MOOCs (open access to large individual classes, e.g. Coursera [59]) to social media platforms that appropriated for informal learning (e.g. Google+ [9]). Much of this work has investigated what types of remote interaction channels can enhance students' learning experience, as well as whether and how social behavior is embedded in learning activities.

For instance, researchers have observed that synchronous videoconferencing may raise levels of engagement in online learning [31, 53]. One study investigated the use of online class presentations that combined presenter audio with video streaming of the presenter and audience [37]. The video was found to help the presenter assess audience engagement using facial and postural cues to enhance remote interaction. Unfortunately, the resulting composite presentation was so rich in content that it may have introduced issues with distraction.

Building on the oft-observed pedagogical benefits of peer learning [46, 47], researchers have started to explore how online technologies can be used to encourage collaborations with other learners. One example is a crowdsourcing platform that emulates learning in a MOOC [17]. The researchers found that when learners participated in semi-synchronous discussion as members of small groups, they had better learning outcomes than those who worked alone. Another study assessed student performance and engagement in MOOCs, and found benefits for groups that use Talkabout, a synchronous, small-group video discussion platform [31].

Asynchronous interaction with other learners – for example, in discussion forums – has also been seen to promote higher achievement in online learning environments [16]. In comparison to synchronous technologies, asynchronous communication is easier to support across widely varying student populations and access situations. However, studies have shown that these more drawn out interactions are susceptible to the influence of learners who are willing to post or reply on a regular basis; if such individuals do not "step up", the forum may never develop a healthy level of activity and fade away [28].

Summing up, any technology that allows peer learners to communicate and work together on projects seems to enhance their learning outcomes. Synchronous interaction technologies seem to be preferred over asynchronous options, but can be difficult to implement and may be overwhelming in some situations. With this in mind, we took a broad approach in our study, asking open-ended questions about many technologies used to support distance learning.

3 METHOD

Research Context

Our research project was conducted in a distance education program called World Campus (WC) at Pennsylvania State University (PSU). As a high-quality, paid degree program, it is typical of modern distance education programs, in that all communication and coursework activities are computer-mediated, students are separated by time and space, and students may take just one or a few classes each term as they work toward degree requirements. The tuition cost is often covered by students' corporate affiliation, personal savings or a mix of both. There are no mandatory in-person meetings or face-to-face events. At the time of this study, WC had an enrollment of 17912 students; a large majority (87.9%) are part-time. Most of these students (85.0%) are "adult learners" ($\geqslant$ 25 years of age), who are often working full-time and/or are responsible for a range of family concerns in addition to their online coursework. In addition, 21% have military ties. With respect to other demographic characteristics of WC students: 48.4% are female; 70.1% White, 7.0% Black, 4.5% Asian; 36.0% reside in the state where university is located; 57.5% are undergraduate students.

WC courses typically enroll 30-60 students per class section with one lead instructor. Students log into educational platforms (e.g., Canvas[2]) for access to the class materials (e.g., syllabus, assignments, exams). Most WC courses use Big Blue Button or Adobe Connect for videoconferencing. External collaboration tools (e.g., Google Drive and Slack) are common, and are selected according to the preferences of individual students or groups.

Using a combination of purposive and convenience sampling [39], we recruited our target participants from seven summer online classes offered by the iSchool, an interdisciplinary college that attracts students with varied backgrounds to enroll in technology-related courses. Upon our request, six online instructors sent out invitation emails to seven classes (one was teaching two courses). We invited only students who were enrolled in an online degree program (undergraduate or graduate) and thus committed to a long-term educational goal. The seven class subjects included legal issues, a capstone course, human-centered design, project management and programming. Some participants received extra credit for their time; others volunteered with no promise of compensation.

Participants

We used a screening survey to gather interview availability, education status, prior online courses, and demographic information. From this we selected students using two criteria expected to enhance the richness of the sample: 1) varying levels of experience with online education; and 2) variations in demographic background and employment status.

All participants resided in the U.S. at the time of the study, though travel internationally while taking online courses. Most were 3rd year undergraduates or above, and had taken online courses within and outside of the iSchool; some were completing degrees in other departments but pursuing a secondary degree in the iSchool. This breadth in sample allowed us to ask more generally about different types of distance courses (including Math, Economics, Political Science, Philosophy, Spanish, English, Education, Music, Art, Nursing, Health, Meteorology, Statistics, Anthropology, Communication, Human Development, Astronomy, Architecture). In this sense, although students were drawn from a set of (seven) course rosters, their online learning experiences were much broader than the courses from which they were recruited.

As intended [39] , the 15 participants represented a broad mix of age, ethnicity, life stages, and industry experience

[2]Canvas is a popular learning management system (LMS) used by 3,000 universities, school districts and institutions around the world. https://www.canvaslms.com; institutions can choose to integrate other tools as listed in https://www.eduappcenter.com.

Table 1: Interviewees' demographics and background

Pseudonym	Age/Ethnicity/# of Online Classes (Transferred History)	Work Experience
Becky	31/White/15[3] (T)	10 years in a major-related field
Judi	24/White/22 (T)	1 part-time job (major-related), job hunting
Gabriela	23/African/Over 7 (T)	2 part-time jobs (non-major-related)
Anne	45/White/Over 7 (T)	26 years in Navy; 13 years in a major-related field
Dan	33/Hispanic or Latino/ 6 (T)	14 years in military
Jeff	31/White/26 (T)	Full-time (non-major-related)
Rafael	59/White/Over 30 (T)	Self employed in a major-related field
Marshal	35/White/ 18 (T)	3 years in a major-related field; several years in a non-major related field
Elson	44/Hispanic or Latino/ 9 (NT)	21 years in a major-related field
Howard	39/White/[N/A]	14 years in a major-related field
Jeremy	40/White/5 for this semester (NT)	10 years in a non-major-related field; full-time position in major-related for 1 year
Charles	38/White/[N/A] (NT)	10 years in military; 10 years in a major-related field
Yolanda	22/White/5 for this semester (T)	Internship
Ross	26/White/4 for this semester (T)	7 years in airforce; 9 years in a major-related field
Kevin	24/Asian/13 (NT)	1 part-time job (non-major-related), job hunting

(Table 1). Eleven were White, two Hispanic or Latino, one Asian and one African American; the median age was 34 and five were female. A majority (11) had transferred credits from other institutions (e.g., community college), with ten already having obtained (2-year) associate degrees. On average, participants had taken 15.25 courses. Their current employment status also covered a wide range, from an undergraduate internship to more than 20 years in IT: 10 had full-time jobs at the time of the interview; one was self-employed, 2 part-time, one in an internship, and two job-hunting.

Study Procedure

Our (audio-recorded) semi-structured interviews were conducted remotely using the respondent's choice of communication medium. In one case the interview took place by telephone; in other cases we used video communication tools (Skype or Google Hangout). At the beginning of the interview, we asked participants to introduce themselves and reflect on their online education experiences with respect to their academic, career and social goals. We then probed in depth the students' experiences and felt connections with peers in three contrasting *scopes*: project groups, classmates, and PSU as a whole.

After each interview, we reflected on points of interest and emerging themes, gradually refining our questions to focus on social interaction in contexts that seemed to be yielding the richest reflections. Specifically, we added questions to probe the use of introductory forum posts to learn about their classmates at the start of a course. We stopped recruiting participants once we reached theory saturation and were no longer able to uncover new themes [49]. This happened after the 15th interviewee, yielding a sample size typical of remote interview studies [10]. Through the screening activity, we were able to construct a sample that contained rich variations of attributes such as age, gender, ethnicity, career stage, location, and family status.

Data Analysis

On average, the interviews lasted 61 minutes. The recordings were transcribed and examined through inductive thematic analysis [8, 49]. Specifically, we first used open coding to obtain categories emerging from the first few interview sessions. The first author organized these codes into a table of codes, memos defining the codes, and sample quotes. The first author and two other researchers then discussed and refined the codes. After that, the researchers searched for semantic themes and examined similarities and differences, followed by a pruning of codes seen as irrelevant to our research questions. We applied axial coding to the remaining high-level themes to identify categories and relations among them. Finally, each theme was mapped into the sub-themes that form our primary findings.

4 FINDINGS

We first summarize how students responded to our questions about the three different scopes - project groups, an entire

class, and Penn State in general. Following that, we discuss strategies or mechanisms that seem to promote feelings of connection at these various levels.

Small Groups, Classes, the University

Not surprisingly, small groups (study groups or team projects) were the most tangible context for feeling connected to peers. All participants reported stronger feelings of connection when a course includes a group project as part of the assigned work. However, they also described feelings of connection at the level of a class and beyond.

Group Members Can Be Almost Friends. Working in a group was commonly described as *"how you get to know people"* (Ross). Four students (Ross, Elson, Gabriella, Judi) elaborated that group activities led to social interaction with their peers, enough so that these groups became the essence of the class: *"that (a group) is your class size right there, those three to five people whatever, tends to be your class size."* (Elson)

Some students reported that they had become "friends" with a few team project members, *"As we're doing group projects we don't only talk about schoolwork, we also talk about our personal lives, and our challenges"* (Dan). These friendships became evident when students felt free to reach out for help, relying on their shared interests and interpersonal knowledge, such as their peers' expertise domains and work ethics as part of a collaborative team. Over time, these "kind of friends" may offer other sorts of social support, such as help with course content, insights into professional practices and suggestions for future classes.

Even when group projects are not assigned in a class, some students seek a more intimate group structure to address the relative anonymity of an online class. They consider a small group as a source of help and information.

> *If I haven't had a group project in that class […] I've reached out to them and ask them, "hey I'm confused in this class, do you want to work together and try to learn together? I think it's easier if we can explain things to each other."* (Judi)

Class Members Start to Seem Familiar. An online class can be a setting for interpersonal knowledge growth and nurturing of social ties. Typically, class-wide interaction consists of either synchronous sessions scheduled by the instructor (to answer questions about course content, grading, or other issues) or asynchronous discussion posts (for self-introductions and knowledge exchange). Through these interactions, students may at times notice names that are familiar from prior shared classes (this is particularly true for students pursuing the same degree). In addition, students who sign in personally for a class meeting or who make thoughtful posts make more of a personal impression.

> *We have been in the same cohort, and you see a lot of the same names over and over again because we're all on this major-related track […] We run into each other in the same classes.* (Becky)

When learners see a familiar name attached to a discussion post or other contribution, they may reply with something akin to *"Ohh hey, good to see you again"* (Becky). Dan said he is more willing to help a peer if he recognizes the name. It may be that the simple process of repeated exposure to student names in an online program is a way to create and reinforce social ties, wherein each viewing reinforces a feeling of connection [51].

University Identity is a Shared Identity. Feelings of connection to PSU were reported as diffuse and hard to describe, even though some students participate in online meet-ups of the online student club, or subscribe to notifications of the physical campus' activities. Similar trends have been reported for feelings of community in residential education, where students report a higher felt sense of community for classrooms than for the entire school [45].

We found some evidence that connections with PSU may arise as feelings of *organizational commitment*, which relates to people's affinity to a group as a whole [1]. Though they have no physical presence in campus-wide activities, the online students nonetheless said that they take pride in being part of PSU and feel connections to one another from their shared identity as PSU students.

We now turn to findings relating to mechanisms or strategies for building connections within groups defined by the three different scopes. We start with reflections about class-based connections, because these in a sense "set the scene" for more intimate small-group connections. We next discuss what seems to help or inhibit feelings of connections in these small groups, closing with the participants' reflections about connections that go beyond an individual online course.

Feeling Connected to Classmates

When students join an online class, they have little advance knowledge of classmates. They may be able to see a roster of other students' names, and may recognize students they have encountered before, but most of their connections emerge through activities that the class goes through together.

Discovering Affinities in Introductory Posts. Most online classes begin with an activity in which students introduce themselves to peers. Students share basic information about themselves, such as hometown, family situation, profession, and perhaps a fun fact. These introductions are shared via different media platforms, for example VoiceThread, a cloud-based application that allows students to upload a short video or narrated PowerPoint presentation; other students can then

comment. Howard said he uses these self-presentations to see where people have been *"because a lot of people put up vacation pictures or family pictures and I enjoy that."*

The information that helps students feel an affinity to a peer often relate to their own personal characteristics. For example, distance learners with a military background (e.g. Dan, Charles, Ross, Anne) said they are more likely to feel a connection with peers who also have military background. Judi saw herself as part of a minority group (females in Technology) and cited gender as a selection criterion for connecting with others. Note that most of distance learners share implicitly an interest in career advancement, which is what draws them to the online learning program. As a result, the learners are often seeking established professionals as sources of advice now or in the future.

Live Sessions. Some participants reported that they build connections to their peers through live video or audio sessions, where students can pose or answer questions in real time, and connect with others at a more personal level. During a live session, the students felt that their peers were "present" with them. Howard liked these sessions because of real-time conversational nature of questions and responses. For him, getting an immediate response is better than having to *"send an email hoping I'll hear back today or tomorrow"*.

Reflecting more specifically on video conferencing, Yolanda said she felt more strongly connected to others when she can match a face with the person, rather than relying entirely on text conversations. Even when a student is not able to attend a live session, the recorded videos from class-gatherings evoked feelings of "being there": *"it's at least nice to sit there and hear it"* (Marshal). Jeremy said that live sessions made him feel like someone really cares:

> *[A live session] gives a more personable level. It's not like you're just reading a book, doing the content, or getting the grade. It's like a real person there hoping that you're well.* (Jeremy)

Closeness after Facing Challenges Together. At times a shared struggle or challenge can create a feeling of connection. For example, several participants told us of rapport built during disruptions caused by teaching mishaps (e.g. an absent instructor), difficult content, or ambiguous instructions. Gabriella's Public Policy class created a Facebook discussion group to air confusions and exchange perspectives in a hard class. Likewise, Howard felt company when a teacher suddenly became severely sick increased the class' feeling of connection: *"We're all stunned, but there's a closeness in that at least we are all in this together. I am not suffering alone. I feel like that, we're veterans together: these people are suffering in the same way I suffer"*. While babysitting his sick daughter during the interview, Dan also cited a story to illustrate how supported he felt when he realized another peer student's similar situation: *"Sometimes she can't go to work because one of the kids is sick and she's trying to knock out the college before Sunday midnight. It really helps to know when things gets really stressful that there are other students out there that are having the same challenges as you are."*

Even when their life situations are not exactly the same, all distance learners share the challenge of balancing their course work with their many real-life roles. Seeing their peers succeed in handling these challenges helps them believe that they too can succeed: *"What stood out is that a lot of people have jobs, have kids, have to clean and cook and everything […] It's like they have to worry about so much more, and then they're in this class with me […] If they can do it, I can do it"* (Gabriela).

Building Connections in a Group

Group projects are common in PSU distance learning programs, and these are often the primary source of felt connections with peers. Because of the groupwork focus, students tended to view these sorts of peer relationships in an instrumental fashion; that is, they sought to anticipate and build connections that would help the group be successful.

Vetting Candidates as Group Members. Some interviewees told us that they deliberately read their peers' introductory posts, so that they can assess a) how well they write (important for projects with substantial written work); b) how professional and responsible they appear to be (a predictor of team effort); and c) most importantly, evidence of some initial shared affinity: *"[if] you don't have something that connects you with each other, it makes it hard to bond as a team eventually; you're basically working with strangers."* (Dan) Kevin said he reads these posts to decide on whom to reach out to based on how similar he thinks that person is to himself in the introduction. As veterans, Charles, Ross and Anne looked for evidence of peers' military background, whereas Jeff, a retail store manager who hoped to move into IT said: *"Being able to find people in my area who have done the Mydegree and network with them is going to be the biggest benefit that I get out of Penn State."*

These vetting activities suggest at least two strategies. On one hand, students want to find group member with whom they can quickly and reliably connect, preferably someone with a similar background or similar professed interests. On the other, they are sensitive to characteristics predicting solid team contributions, hoping to connect with people who have these characteristics.

Temporal Proximity. As a parallel to the well-known phenomenon of distance matters [41], seven participants mentioned time zones as a factor that influences their ability to connect with group members. For example, Elson explicitly called

out the value of temporal proximity over physical proximity: *" [Teammates] don't necessarily have to be in CampusState but they have to be on the East coast so that there's no weird scheduling conflicts."* (Elson) Becky elaborated further that everyone can then (with the same time zone) be *"working at the same time"* when crunch time approaches.

Mismatches in preferred study time can work against efforts to connect with online peers. Gabriella was disappointed with one team collaboration, attributing the problems to being out of sync with her teammates: *"I've opted out of being in a group because I do my homework on the weekends and my group did this Monday morning. In the mornings I'm busy so I couldn't keep up with there."* This comment suggests that distance learners' feelings of connection with their peers might be mediated not only by geographic proximity (and corresponding time zones), but also to the days and times that these largely adult learners have set aside for study. Such scheduling constraints may affect how quickly a peer is able to respond, including times at which they are simply not available (e.g., work shifts in real life).

Managing the Group's Common Ground. A group's early interactions establish a common ground that members use in managing expectations about each other. If successful in this grounding phase, the group can enjoy shared understanding, empathy and pleasurable interactions, leading to. As *"better product and grade"* and *"better feelings about working together"* (Becky). In contrast, resentfulness can build if a team member fails to contribute to the social fabric or does not carry their own weight in a project.

Beyond setting up appropriate expectations, some interviewees echoed Clark's theory that these shared understandings must be maintained with continuous effort [15]. They were willing to accept an absence or missed deliverable from a peer if it had been announced ahead of time and if he/she had previously demonstrated a cooperative work ethic. Staying aware of team members' situations implies that important constraints or issues are shared and respected:

> *We try to keep abreast of what's going on in everybody's life, just so we know what to expect of them. We try to be understanding if something is going on that week that's going to prevent them from doing something, and try to be helpful in picking up the slack where we need to.* (Becky)

Enjoying Purely Social Interaction. Judi noted that when a group schedules an audio or video call with a detailed agenda, the formality of the *"meeting"* can inhibit the casual and spontaneous interaction that often occurs in residential education (e.g. grabbing lunch). However, other interviewess told us that casual conversations do take place as a side discussion to online meetings, helping to *"lighten up the mood of the meeting"* (Jeremy). These low-stakes interactions may occur before everyone arrives, or at the end of a meeting:

> *When we'd have our group meetings usually we'll spend the first few minutes just sort of chitchat and see how everybody's doing, a little bit about the weather, sports, get to know each other.* (Rafael)

Another type of incidental social connection can occur when video meeting reveals an attendee's surrounding; this personal information may prompt feelings of closeness in surprising ways. For example, group members might see a child's birthday party in the background, or a baby held in the arms. As a single dad of a young kid, Dan felt empathy for a teammate who was holding baby during a live session:

> *The mother held the kid in the camera so we all got to see the baby too. We got to hear, like you're hearing right now my daughter just talking, that develops a little bit of closeness too.* (Dan)

Having a Persistent Online Space for Group Work. To support project work, distance learners often create *persistent online spaces* outside of the online platform (i.e. Canvas) provided by the University (of course, this is also true for residential project groups, but distance learners have fewer options). For communication, they used instant CMC tools such as GroupMe, Google Hangout or Skype; for collaborative work, they used Google Docs and GitHub to share and work on the same artifact.

One consequence of setting up a persistent space is a feeling of regular and consistent availability for collaboration and mutual support by group members. The interviewees told us that these spaces led to closer feelings of connections within their study groups. Judi, Gabriella, and Elson felt comfortable with dropping ad hoc questions about course content or assignments in their Google Hangout; they believed that these spaces produced a rapid response time:

> *It's a study group, so if you have questions they're always there, we've always used instant messaging like Google hangouts. Since that's always on if you have a question just drop it in there somebody is going to get back to you.* (Gabriella)

Connecting to Peers Beyond a Class

As we reported earlier, feelings of connectedness to peers beyond a project group or class were vague. But in some cases, there were rather specific and instrumental approaches to these diffuse feelings of connection. In other cases, the feelings seemed tied to the simpler notion of shared identity.

Familiar Names in New Settings. Just as in residential education, distance learners may overlap with each other across

classes, potentially bootstrapping peer connections, and easing the overhead of coordination during the course. For example, *"I have four group projects, and three of my groups have two of the same teammates. We're doing all of these projects together, and we know what each other's responsibilities are. We know the work load we're all carrying"* (Becky).

However, when asked whether they explicitly plan for overlapping groups across semesters, none of the students reported this as a deliberate strategy. Instead they said that they simply spot previous teammates when new classes start. As a comparison, Elson noted that it was difficult to reinforce connections when he knew that previous teammates were enrolled in the same class but a different section.

Planning for Future Interactions. Another way in which peer connections were sustained beyond a course was to gather contact information at the end of a group project. As part of their group experience, students often rely on tools such as Google Hangout or Skype; they may also exchange personal contact information. These project-focused interactions may evolve into relationships that are maintained afterwards using general social media tools (e.g., LinkedIn).

> *Instead of just working on a project together and then just saying bye-bye at the end of it, I actually want to maintain communication and get their contact information, maybe add them on Linkedin and keep connected.* (Kevin)

Participants may be especially likely to invest effort in maintaining teamwork ties when they are entering a new field together. For example, Dan tried to stay in touch with teammates who evinced a strong work ethic in a particular shared project:

> *We've all agreed there's an importance in networking with each other. I'm staying in touch with them and we're keeping tabs to see how well we're doing with our online endeavors.* (Dan)

The shift from project-based communication to more general social media ties echoes observations about residential education, where the maintenance of course-based connections seems to depend on subsequent social media contacts [5, 32]. However, these contacts may fade into inactivity even when friendships with other teammates grow and are maintained in real life. With regret, Becky, Judi, Ross, and Elson noted that they did not interact with their former team members, *"probably 95% of them I'll never speak to them again after the project."* (Judi)

Celebrating a Shared Identity. As mentioned earlier, many students mentioned things that they do to reinforce their connection to PSU. Such connections are difficult to describe, because they are not ties to individuals or even to a group, but rather to the concept (campus) of the university in general. As an example more specific to distance education, Kevin said he feels connected with peers in PSU's online programs because they share the goal of distance education:

> *They've chosen Penn State for a reason. It's probably the same reason that I chose it. I know most of them are busy. Most are working adults.* (Kevin)

Individually, many of our interviewees also report that they collect PSU-related souvenirs and memorabilia, such as sweatshirts, car stickers, or previous student IDs. They also report that they they watch PSU sports events, even though they are not able to do in person together. Charles reported that he was once teased about how devoted he is to collecting everything about PSU:

> *It's just like, "If Penn State makes it, Charles probably has it." I'm like, "No, I don't. I don't have all of it." I like to show it a lot.* (Charles)

Summary

Looking across the three scopes for reflections about peer connections (small group, classes, virtual campus), we can see two general bases for felt connections. On one hand, some early, relatively lightweight connections are formed through shared social identity. Distance learners seem to begin with an implicit bond that emanates from the challenging situation of being an adult learner who is juggling an active real world life with current education goals. In other cases, it is personal characteristics (e.g., former military, female in IT) that suggest affinities. On the other hand, some peer connections are formed and nurtured through steps that learners take to vet and invite collaborators of various sorts, including team members whose schedule and work ethic is a good match to theirs. These connections are strengthened through the processes of group collaboration, wherein members learn more about each others' expectations and work habits. This more instrumental connecting process can even extend beyond the class, as prior teammates may be recognized and recruited to new projects, or individuals with special characteristics may be cultivated as potential lifelong professional contacts. This type of connection can be seen as a natural side effect of organizing or carrying out collaborative activities.

5 LIMITATIONS

Although PSU is typical of North American universities that provide online degree programs, we acknowledge the variety of online education forms, and caution the readers not to overgeneralize our qualitative findings from a relatively small sample in one instance of online learning context. We anticipated this problem and addressed it with our screening survey, which allowed us to select participants who varied on a number of characteristics (e.g. gender, ethnicity, college

program, employment status). Nonetheless, these individuals were all taking summer courses offered by an iSchool, so they are likely to be more tech-savvy than the distance learning population at large. Therefore, we note that future work will be needed to validate and generalize the interesting patterns revealed in our semi-structured interviews.

6 DISCUSSION

Our analysis of the student interviews revealed that students come to feel connected as a result of goal-directed interactions with one another, especially when their social actions yield immediate responses (e.g. in a live session, videomeeting or chat). At the same time we found that feelings of connection can arise from coincidental encounters (e.g., recognizing the name of a former classmate, showing up early for a live session). With respect to variations in scope, we found that a shared choice of university creates a sort of general brand commitment, but that the feelings of connection at this level are diffuse.

Some of the ties described to us seemed to be evoked by discovery of shared identity, such as introductory posts of being veterans. Other ties are deliberately established and maintained, especially if a peer is viewed as a useful contact for future learning or professional activities. Students certainly seek "good" partners for shared work, but also help one another at times of difficulty. In the following sections, we discuss these findings in more detail, and consider design directions that might promote a collaborative and connected distance learning environment.

Promoting Discovery of Shared Identity

Distributed teams who are given a basis for shared identity will prioritize interaction reciprocity and resource sharing relative to teams without a shared identity [7]. Our findings contribute to this body of work, documenting how distance learners seek out – or simply discover along the way – elements of shared identity that contribute to feelings of connection with one another. Construal level theory [21] suggests that prior to interpersonal interaction, gleaning any information that reveals similarities with an unknown individual can engender a more vivid and accurate perception of a remote person [36]. This suggests a direction for CSCL designers to promote a sense of community: despite the potential learning gains from heterogeneous group composition [35], designing ways to convey shared identity, especially in the early stage when learners have little ior interaction with one another is critical to foster connections in distance education.

Even before encountering peers in online classes, distance learners share the identity of being a student at their university, and an additional identity of choosing an online program. Organization commitment theory posits that members' affinity to the "brand" of the organization predicts their contribution to that organization [1], especially with regard to people's willingness to provide information [33]. Perhaps distance learning programs could offer students ways to reinforce this rather diffuse connection, for example sponsoring online meet-ups to "attend" a university-sponsored event together, or creating clothing or other collectibles to celebrate the distance learning mission of the university. The online student organizations described by some of the students is an example of how this is already happening, but designers could enhance those opportunities.

Interviewees also found affinities with peers by reviewing self-introductions. But it can be tedious to sift through one introductory post after another. Some students also object to being asked to introduce themselves time and time again. We see this as a clear design opportunity for a program-wide profile module, perhaps one that can be searched or filtered to highlight particular aspects of shared identity (e.g., single parent, job switching). Meanwhile, using a universal profile may introduce privacy concerns and maintenance efforts for different course subject, which may call for designers' further consideration when promoting the sense of community.

Feelings of shared identity can also emerge from tacit knowledge of a shared situation (e.g. a tight schedule, comparable personal challenges). Although this is not unique to distance learning, we were struck by the *"we are in this together"* bond from observing what their peers are able to do and accomplish even when stressed. They hold the "team spirit" in their efforts to succeed in a similar challenging situation even when working individually on a coursework. As the theory of *expectation interaction* [35] suggests, people set up similar expectations when they observe others' outcomes. Finding ways to celebrate these feelings of accomplishment in a virtual context could also enhance distance learners' shared identity (e.g. annotating chat messages with emojis to show their pride or joy [58]).

It is interesting to compare the facets of identity that were discussed by our interviewees with studies of other online platforms, where researchers have noted that some members prefer to keep different facets of their lives distinct from one another [20]. Our participants seem to be routinely exposed to the blended identities of their peers. These facets of identity may be deliberately disclosed (e.g., in an introductory post), may be shared incidentally as part of group activities (e.g., special expertise or important life circumstances), or may even be unintentionally shared as unrelated context (e.g., taking care of a sick baby).

We suggest that the blended identities shared by the distance learners may be an acceptable version of *context collapse* [18, 38]; this concept refers to the conflict that may be experienced by members of social network sites (e.g., Facebook, Twitter) who post content intended for a specific audience to a more general audience. In contrast, many of

our interviewees seem to interweave their multi-faceted real world roles (e.g. being an employee, a parent, a community committee member [13]), making context collapse both more appropriate and at times even intentional (e.g., when managing expectations a shared timeline). This difference may be explained at least partly by the distance learners' instrumental goals: they choose online education for convenience of time and space. At times their learning goals must have lower priority than other matters (job, family). To manage their relationships and commitments with their learning partners, it is often critical to share this "outside" information.

Leveraging the Connectivity of Small Groups

Not surprisingly, connections situated in small groups appear the focal point for feeling connected to peers in distance learning. These groups are the primary source of social relationships, at times leading to an "almost friends" degree of interpersonal bonds. With respect to these feelings, we found an important role of real-time or close-to-real-time interaction (e.g. live sessions, messaging), suggesting a need to emphasize and enhance tools for real-time communication among online learners (see also the study of video meetings [11] and video-based discussion activity in MOOCs [31]). The immediacy of interaction is important for online students to initiate conversations [33], and to tolerate the occasional overdue contribution [50]. When a group meeting is scheduled, members may also arrive early or stay late, adding the opportunity for more casual interaction about their lives. However, "being there" for interaction with peers competes distance learners' time resources against their external life commitment [6]. Distance learners in a busy life may need to manage their own time while being aware of their peer learners for the benefits of real-time small group interaction.

An interesting compromise was the regular use of persistent work spaces, where team members could assume that their queries or offerings would be seen and addressed soon, even if not in real-time. This creates an interesting extension of the familiar goal of "being there" to something that is better described as "being there when you need me". By setting up a space such as this and reliably using it for project-related work, the team members can trust that their concerns and contributions will be seen and integrated in a timely fashion. If the shared space also has a mechanism for real-time communication history (e.g., recorded video/audio sessions, or even chat), members who miss a live session can use the recorded information to catch up.

Evolution of Distance Learning Communities

Another question raised from our findings concerns the possible future of group-based peer connections that are nurtured by small group interactions. In some cases these ties are continued as general social media connections at the end of a class; however, there is no guarantee that this will happen. Indeed a downside of forming close bonds with project members is that class-based groups are by their nature transient groups that form and die off each semester [44]. Some interviewees shared feelings of regret at having to leave these peers behind. However, note that many online systems now offer new members the option to register with "regular" accounts (e.g., from Google or Facebook); if CSCL environments provided similar options, one side effect could be that group members are more likely to continue their association beyond the rhythm enforced by the semester structure of higher education.

More broadly, the varied types of connections described by our participants suggest an evolutionary view of connections between distance learners, where initial vague affinities grow into stronger team-based ties, and in some occasions are carried forward into longer-lasting connections. Initially, our participants expect more closeness with classmates or team members with whom they share common identity (e.g. being a parent or coming from military background). Building from these early affinities, the learners strengthen their ties through focused group work. After initial class-based interaction is over, the learners may continue to recognize and reinforce connections that are now grounded in their shared educational goals and experiences. Eventually, the bonds originally established during tightly coupled group work may fade away or become a low-stakes resource for ongoing professional development (e.g., job networking). Our work thus extends the temporal pattern discovered by Haythornthwaite [26], who found that the underlying connections in an online learning community emerge but fade away in a temporal dimension with a refined evolutionary view.

We propose that CSCL learning platforms could take into account this evolutionary view of building and maintaining peer connections of varying types and strengths. For example, the platform could enact an explicit lifelong learning paradigm, wherein learners begin by taking classes and connecting with each other through shared identity and small group activities; move on to an intermediate phase where they can find and enhance ties with former classmates while building their network through new courses and group activities; and finally graduate into an alumni role as a provider or recipient of more broad-based career advice [40]. We recognize that not all distance learners will want to participate in such an extended learning community, but our small sample did contain some who expressed this sort of interest; even a modest presence of "old-timers" could make the environment more welcoming to new and intermediate learners.

7 ACKNOWLEDGEMENT

This research was partially supported by a Research Initiation Grant from Penn State's Center for Online Innovation

and Learning, and by the College of Information Sciences and Technology. We thank our interviewees for sharing their stories, and instructors and colleagues in Pennsylvania State University for their feedback and support. We also thank our anonymous reviewers for providing insightful comments.

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