Formation of friendships and their effects on adult students in online degree programs

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Abstract—Research indicates the importance of having meaningful peer relationships because of the effects they have on student's mental health and academic performance. Understanding this phenomenon for adult students in online degree programs is important. This phenomenon is explored in this research study through surveys and personal interviews. The results reveal around 49% made no friends, for 60% the friendships made were of average quality. Cohorts for spending multiple courses together, virtual meetings, collaborative activities were found to facilitate friendships. The challenging factors were, not having consecutive courses together, lack of tools for informal socialization, anonymity of peers, and lack of time.

1 INTRODUCTION

1.1 Sense of belonging – a human need

The phenomenon can be explored by investigating the origins from basic human psychology. There is an innate human need to have a "sense of belonging" to a social group, which arises from early childhood (Over H., 2016), which contributes to how children develop their self-esteem and eventually how they reflect upon themselves. This creates a need for deep friendships and peer relationships which is said to create purpose to life and makes humans more satisfied and happier (Lambert et al., 2013).

1.2 Transitioning to Student life

This innate need for a sense of belonging can be applied to college students as well. Students, when they started a degree program, were found to go through a tough transition/adjustment period which was considerably eased by the quality of friendships they formed in their peer groups (Marder, S.L., 2009). When

students started college, it was important for them to affiliate/relate themselves to the learning community they are part of. (Karaman et al., 2018). Similarly, adults went through significant transitions as they started life as a student. Student identity formation for an adult with prior social roles/identities was tedious and confusing which led to psychological distress. Interviews conducted in a study revealed that deep personal interactions and bonding with peers helped ease this transition (Moss, et al., 2013).

1.3 Student's mental health

Student life involves various forms of stressors – academic and interpersonal. Friends were found to provide more emotional support to students than their families during times of stress (Rodriguez, et al., 2003). Students involved in faster and healthier manner of coping in the availability of such social support, the absence of which led to involving in dysfunctional/detrimental coping strategies (Chao, R. C., 2012).

1.4 Adult learners

Students of an online learning community comprises mostly of adults rather than the traditional young learners. The psychology of an adult learner, their learning process must be accounted for while researching these communities (Charles, D. C., 1980). This leads us to understanding that adult learners require more positive reinforcement/motivation to establish their learning goals, as they already have existing responsibilities with work and family (Huang, H., 2002). Adult learning theory explains that adults learn by connecting/relating new concepts they learn with their existing notions/ideas. Cognitive learning facilitates this and makes the educational experience long-lasting and fulfilling. The absence of deep peer-to-peer interactions tend not to facilitate cognitive learning in students (Garrison, et al., 2005). To add more, the phenomenon of social isolation and loneliness also shows evidence of cognitive decline (Cacioppo et al., 2009).

1.5 Adult learners and Virtual friendships

To understand adult students' friendships, we need to explore the nature of adult friendships. Adults tended to favor multiplex friendships, that is friendship with people who already had overlapping roles (Verbrugge, L. M., 1979). This makes it hard for adult students to form friends relating to their role as a student outside of the community. Adults also showed bias towards people with similar social

identities such as beliefs, interests, marital status, gender, etc. (Verbrugge, L. M., 1977). Online learning communities bring together people from various cultures, which can make it even harder to make friends among their peer groups, since there are cultural variations to what it means to be a "friend" (Baumgarte, R., 2016). Virtual friendships by their very nature differed from traditional real-life friendships. In online communities, there is no possibility to experience complicated circumstances, which might prevent individuals from connecting to each other based on their virtues. Without experiences to relate to each other's inner core values, virtual friendships do not develop into genuine and deep ones. (Fröding, B., & Peterson, M., 2012).

From the background literature, if students need friends, and it is challenging for adult learners in online communities to make meaningful friends, this research project aims at understanding the phenomenon. The important questions to raise in this project are,

- Do the students in these communities develop meaningful friendships like their campus counterparts?
- What effect does the absence of such relationships have on them? Mentally? Academically?
- What facilitates/challenges the adult students in these communities to make friends?

2 RELATED WORK

There has been research work done on students' friendships, college life, effects on their mental health, academic performance in on-campus settings. But there isn't a lot of research on virtual environments in online programs.

Sense of belonging/relating to the university and how it affects the students' happiness and success is explored across literature for on-campus programs (Karaman, Ö., et al., 2018) This is impacted by the quality of peer relationships students form. the If it is vital for a student to relate themselves and friendships play a role, the same is not researched or factored in while designing online degree programs. The transition period to student life was found to have an impact on how they go on to define/believe themselves capable of in the program (Marder, S.L., 2009). But there is not much research done on these effects on the adult students in online degree programs.

A paper on the educational psychology of the adult learner, points out that such "adult learners" vary in their capabilities, retainment, cognitive performance, psychological needs and this area is largely unexplored in the current literature (Charles, D. C., 1980). There has been research done on adult learners' peer interactions, instructor-student interactions (Thompson, et al., 2007), but not specifically on whether people in these communities form genuine friendships and their impact.

A paper on virtual friendships, using Aristotle's theory of friendships, states that friendships in online settings are less meaningful and in depth than the traditional ones. The main shortcomings, the paper argues, is that, there is no possibility to experience complicated circumstances, which might prevent individuals from connecting to each other based on their morality (Fröding, B., et al., 2012). If virtual friendships are harder to become deep or meaningful, there is not much research done in understanding how this affects the students in online learning communities.

Topics like these might often be shrugged off as one of the shortcomings of E-learning, while it provides various other advantages. But there was an interesting paper which consisted of an exploratory case study of how an adult learner in an online degree program with existing social identities faces challenges in adapting their new identity as a "student" and having deep interactions with peers eased this identity formation (Moss, et al., 2013). It raises the question whether sufficient research and importance has been done about such student needs while designing online degree programs.

3 METHODOLOGY

3.1 Research Methodology for Hypothesis I

Hypothesis I—In an online degree program, adult students do not develop meaningful friendships like their campus counterparts.

Research method— Participants/Sample for the study were students from the OMSCS program of 94 respondents. Data was gathered through "Surveys" posted online. The survey questions ("Appendix 9.1 Survey Questionnaire 1.") were designed to find out how many friendships the students developed and how deep their friendships were. The questions to measure friendship quality

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were on a Likert scale on their agreeability of the statements - Strongly agree, Agree, Neutral, Disagree, Strongly disagree. Friendship quality can be conceptualized using four dimensions – Closeness, Help, Acceptance and Safety (trust and reliability) (Thien, et al., 2012). Survey questions were taken from this paper.

Analysis — The data was analyzed quantitatively. Mean of the rating scale was calculated for each section. Likert scale is quantified as, Strongly agree as highest to strongly disagree being lowest (5..1). The depth/closeness of the friendship will be represented as the resulting number, larger number meaning deep friendships and smaller numbers indicate casual acquaintances. This is interpreted by adding the quantified values to bins which represent quality/closeness – Low (0 to 3), Average (3 to 4), High (4 to 5).

3.2 Research Methodology for Hypothesis II

Hypothesis II—In online degree programs, the absence of meaningful friends and social support affect the adult students mentally and academically.

Research method — Participants/Sample for the study were students from the OMSCS program of 75 people. Data was gathered through "Surveys" posted online. The survey questions ("Appendix 9.2 Survey Questionnaire 2.") were framed to assess the effects of the absence of friends and a close social circle on the adult students psychologically and academically. The effects were measured Likert scale on their agreeability of the statements.

Analysis — The data was analyzed quantitatively. The agreeability on the Likert scale (Strongly agree, agree) of the respondents were taken to calculate the percentage of participants for the mental and academic effects. The data collected from Figure 6 about what would help is used to further inform the interviews.

3.3 Research Methodology for Hypothesis III

Hypothesis III—In online degree programs, it is challenging for adult students to make friends. There are not enough tools/programs that facilitate such social life.

Research method— Participants/Sample for the study were students from the OMSCS program, 10 people were interviewed. Data was gathered through "semi-structured interviews". Interview questions ("Appendix 9.3 Interview

Questionnaire.") were designed to understand the individual perspective on what facilitates and challenges these students to make friends. Interviews were conducted over zoom meetings in audio or video calls and recorded.

The data was analyzed qualitatively using "Thematic analysis" which is a method used to understand the implicit meaning from data about people's views and opinions on the phenomenon. The following steps are followed in the process,

Transcribing data — The interview calls were recorded as audio files and then transcribed to text using software and manually.

Coding — Coding involves emphasizing the parts of interview excerpts using colors and adding "codes", a short description of what the interview data is about. It involves reading through interview transcripts in detail so we can capture and highlight the relevant and useful parts for our analysis.

Generating/Reviewing themes — The codes are then grouped to find recurring patterns/themes from the excerpts in regards with our hypothesis. The generated themes are verified by looking into the interview excerpts and linked with quotes to support their importance.

4 RESULTS

4.1 Surveys Results

The demographics of the surveys from Table 1 shows about 95% were employed, which reaffirms our notion of the added responsibilities the students have in these online degree programs. Around 97% have completed more than a Bachelor's degree, which indicates the students in these programs are adults beyond their traditional learning years. 97% of the participants belong to the OMSCS program, so the results can be interpreted with respect to that program.

The first survey was to understand if the adult students in online degree programs developed meaningful friendships like their campus counterparts. This was measured using the friendship quality scale (Thien, et al., 2012). From Figure 1, around 49% of the students did not make any friends in the program, which seems quite high. Of the people who answered no friends, around 76% of them had taken more than 5 courses which is halfway through the degree program. From Figure 2, the overall friendship quality of people who did make friends for

around 59% it is average and only 20% enjoy high quality friendships. Most of these friendships indicate mere acquaintances which may not develop into something close.
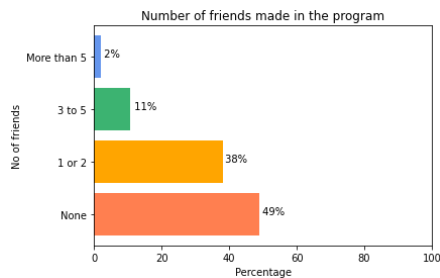

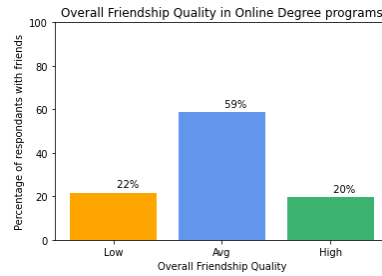*Figure 1*—No of friends made in the program.

Figure 2—Overall Friendship quality.

Table 1—Demographic information of the participants in Surveys 1 & 2

Demographics		Survey 1	Survey 2
Age	18 - 29	53%	55%
	30 - 39	35%	37%
	40 - 49	10%	8%
	50 - 64	2%	0%
Gender	Female	22%	31%
	Male	78%	69%
Relationship status	Single	30%	36%
	In a relationship	24%	20%
	Married	46%	44%
Employed	Yes	95%	96%
	No	5%	4%
Level of Education	Bachelor's degree	80%	79%
	Master's degree	14%	16%
	Doctorate	5%	3%
	Others	1%	2%
Online degree program	OMSCS	97%	97%
	Others	3%	3%
Progress in OMSCS	1 – 3 courses	25%	24%
	4 – 6 courses	39%	35%
	7 – 10 courses	36%	41%

The second survey was to understand the effects the absence of friends have on the students. From Figure 3, an astounding 92% said they were not able to make friends like their on-campus experience. This question removes the bias if their personalities affected their inability to make friends. It indicates that it is the nature of the program which does not facilitate such friendships. Of the people who said they were not able to make friends, 76% were more than halfway through

the program, this number removes the bias if time in the program had an effect to make friends. Around 63% said they felt isolated in the program.

From Figure 4, 65% felt not having friends affected their student identity, how they related themselves to the university and 69% agreed they did not have a sense of belonging to the class because of this. Though when asked about relating depression, anxiety, and stress to this phenomenon less than 50% agreed, we know from background literature how important is student's identity and affiliation to their university causes psychological distress (Karaman et al., 2018) Sense of belonging was an innate need which affected human life satisfaction itself (Lambert et al., 2013).

From Figure 5, the effects academically are little lesser compared with mentally, this might be due to the asynchronous nature of the program and due to their age where students are better equipped to plan and cope with assignments and deadlines. But around 49% felt absence of friends makes it difficult to have deep discussions and understand concepts better. We can recall the paper on Adult learning theory, which says how adults involve in cognitive learning reflecting on their understanding through peer discussions (Garrison, et al., 2005).
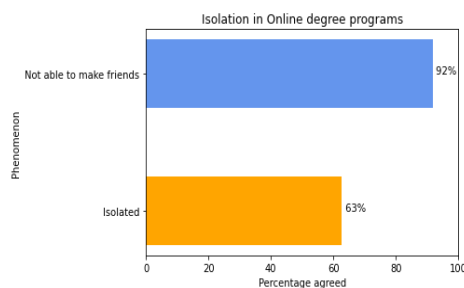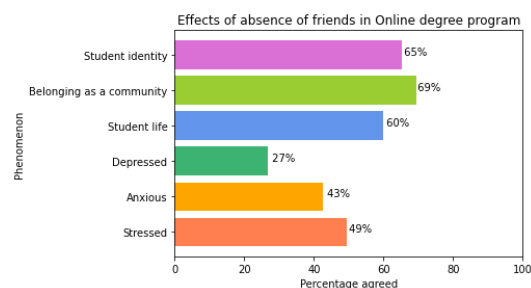

Figure 3—Isolation in OMSCS.
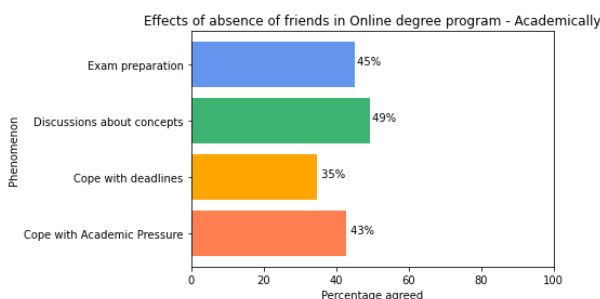

Figure 4—Effects of absence of friends mentally

Figure 5—Effects of absence of friends academically.
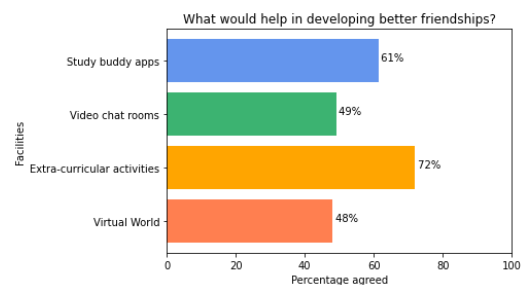

Figure 6—To facilitate friendships.

4.2 Interview Results

The following themes were generated after coding the interview excerpts. The themes are organized in the order of frequency of their occurrence across all the interviews. The detailed thematic analysis can be found in the appendix's sections, "Appendix 9.5 Interview Analysis – Coding.", "Appendix 9.6 Interview Analysis – Themes."

Friendship quality — Almost all the participants said they were not able to make good quality friends in the program. The ones who had friends were people they previously knew and came into the program with.

4.2.1 *What facilitates/would help the students to develop friendships?*

- *Cohorts* — Many participants felt that forming cohorts or small groups at the start of the OMSCS program and travelling the program together, sharing similar courses would help them form good quality friendships. Interactions were comfortable and easier in smaller group settings.
- *Long time/courses together* — Having multiple courses together would mean spending longer time together with the same of students, which would lead to long-lasting friendships.
  "your relationship would last longer than just a single course and you would be able to help one another and kind of form longer term friendships,"
- *Coming into the program with already known friends* — Many participants who had friends came into the program previously knowing each other, and it developed into a good support system.
- *Virtual meetings* — When asked about the kind of facilities that would help meet people, all the participants liked the idea of having virtual meetings periodically would help them get to know their peers personally.
  "it first starts out really kind of formal. But as you get more and more comfortable with those people, you know, you start to get to know them"
- *Collaboration*— Collaborating in group projects provided a setting for a small group that met periodically, which helped people connect with the others in the group and form friendships. Across the interviews, the students who came close to friendships were through group projects. Collaboration would promote going through challenges together.

- *Regional in-person meetups* — Participants liked the idea of university organized local meetups periodically with an agenda/ workshops, which would later help them to connect with these people.
- *Applications* — Applications to find/connect people who might be working in their offices, similar interests, a space to have informal interactions.
- *Geographical locations* — People who lived in same regions, had no timezone conflicts which helped them connect to form study groups, set and work towards similar goals, etc.

4.2.2 *What factors motivate these students to pursue/develop friendships?*

- The students in these learning communities mainly wanted to have friends for emotional and academic help/support.
- To come out of the program with a professional network.
- To share ideas and have deep discussions, understand others learning strategies, mutually benefit from each other's skillsets, form study groups, receive feedback and reviews about courses.
- They felt that they wanted to feel a sense of community and have shared experiences in the program. Some of them felt it would also help in student retention and completion.

4.2.3 *What Challenges do students face to form friendships?*

- *No consecutive courses together* — Almost all the participants felt that one of the most challenging things was not having multiple courses together, and each semester was with a different set of students. There was just not enough time to know someone to develop a friendship.
  "Every course and the set of students will be different. Each of them pick a different course and move their separate ways."
- *No existing tools/mechanism to promote socializing*—The students felt, since there were not existing facilities in the program itself that promoted meeting people, they couldn't go out of their way to make friends with their responsibilities and limited time.
- *Existing communication channels (Piazza, slack)*— These channels were for formal discussions and professional interactions, so it does not connect them closely to their peers to make friends.
- *Anonymity* — Since there was no direct interactions with their peers, seeing them face-to-face or talking, they were not able to relate to them.

"somebody unseen you don't want to make a friends with."

- *Differences* — Time zone and Geographical differences
- *Other responsibilities* — Most of the students had full-time jobs and other responsibilities which meant they did not have the time to go out of their way to develop friendships.
- *No collaborative work* — Collaborative activities were limited, even the group projects involved professional/formal conversations, thereby making it difficult to get to know their peers.
- *Other factors* — Some felt though they tried meeting students from their regions, self-organized meetups were exceedingly difficult to organize and initiate. The online medium and also even the nature of the course determined how much students interacted with each other.

4.2.4 *Effects/Downsides of not making friends*

- *No professional/career network* — Many participants felt bad that they were leaving the program without a good professional network as they would in an on-campus program, which they felt was a huge downside for online programs.
- *Not relating to the university* — Without friends, how they related themselves, or cherished their time in the university was affected.
- *No Emotional support* — The lack of emotional support, the participants felt made it more stressful, whereas having someone to go through the difficult phases would have helped them. One participant even mentioned withdrawing from the program once because of the lack of a social support network.

5 LIMITATIONS

The participants in the research were from the Georgia Tech's Online Master's degree program (OMSCS), so the data collected are with respect to the online learning environment in this program. Though this can generalize online degree programs, there might be few factors which might be different. For example, one of the important factors identified to facilitate friendships, "cohorts" are available in some online programs. The most challenging factor also was not having multiple consecutive courses together, which cohorts would provide. So, there might be different challenges or areas of improvement across different programs.

The 10 interviews conducted, some of them generated less data due to the time limit of the interviews. Though many of the themes were recurring, getting more interviews might strengthen or weaken some of the opinions.

The sample size for the surveys were 94 and 75 which can be increased to get more general results. The first survey to measure friendship quality was adapted from literature, though it can be applied here, there are certain limitations to how far it is applicable for adult students especially in virtual settings. If future research finds methods to measure friendships differently it might lead to different results.

6 CONCLUSION

Meaningful peer friendships are an important aspect of student life. To understand the quality of these friendships among adult students in online degree programs, surveys and interviews were conducted. The friendship quality survey found that 49% of them did not make any friends, though 76% of them were past halfway through the program. Even the ones who made friends, only 20% enjoyed deep friendships, whereas 59% the friendship quality was average indicating they were mere casual acquaintances. Around 92% said they were not able to make friends like their on-campus experience. More than 60% felt it had a psychological effect on their student identity, belonging and student life. About 40% felt it affected them academically, especially to facilitate cognitive learning.

The interview results revealed that cohorts, long time/courses together, virtual meetings, collaborative activities facilitated friendships. Not having consecutive courses, no tools to promote socialization or informal conversations, anonymity of peers, not having the time with other responsibilities were the challenging factors.

7 FUTURE WORK

Conducting in-depth interviews of longer duration with more students would reveal more factors at play. Doing a case study of students who made good friends, would help reveal underlying factors and understand how a friendship developed in these environments. Studying focus groups implementing some of the facilitating conditions like cohorts, virtual meetings would help understand how much these solutions are practically helpful and scalable.

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9 APPENDICES

9.1 Survey Questionnaire 1

Demographics

1. What is your age?
a) 18 to 24 b) 25 to 34 c) 35 to 44 d) 45 to 54 e) Above 55
2. What is your gender?
a) Female b) Male c) Other
3. How would you describe your relationship status?
a) Single b) In a relationship c) Married
4. Do you have children living with you/you take care of?
a) Yes b) No

5. What is your highest level of completed education?

a) High School b) Diploma c) Bachelor's degree d) Master's degree e) Doctorate
f) Others

6. What online degree program are/were you enrolled in?

a) OMSCS b) others (please specify) [ ]

7. How many courses have you taken so far? [ ]

8. Are/were you employed (full-time/part-time) during the online degree program?

a) Yes b) No

9. How many fellow students you studied with or got to know through the Online degree program would you say became your friends or your social circle?

a) 1 or 2 b) 3 to 5 c) more than 5 d) None

Friendship Quality

Please answer the following questions about the friends you consider most close among your social circle in the Online degree program.

Options: a) Strongly agree b) Agree c) Neither agree nor disagree/Neutral d) Disagree e) Strongly disagree

Closeness

10. I always joke with my friend(s).

11. I understand my friends' mood. I get/understand him/her.

12. I always chat/talk with my friend(s) even if we are enrolled in different classes.

13. My friend(s) and I always share our life experiences.

14. I understand the personal background of my friend(s).

15. I would not feel shy when performing something humorous in front of my friends.

Help

16. My friends correct my mistakes in my homework/assignments or my understanding of concepts.

17. My friends always help me when I have problems in completing my homework/assignments.

18. My friends readily offer emotional support in solving my problems.

Acceptance

19. My friend(s) forgive me easily.

20. My friend(s) and I can overcome differences in our opinion quickly.

21. My friend(s) treat me well.

22. I can be myself around my friend(s).

23. My relationships with my friend(s) are like siblings (brothers and sisters).

Safety

24. I believe the information given by my friend(s).

25. I can get vulnerable/share my feelings with my friend(s).

26. I am confident that my friend(s) will not spill my secrets.

27. I always listen to my friends' advice.

28. I go to my friend(s) to talk when I face difficulties/problems.

29. I feel safe while spending time with my friend(s).

9.2 Survey Questionnaire 2

Demographics

1. What is your age?

a) 18 to 24 b) 25 to 34 c) 35 to 44 d) 45 to 54 e) Above 55

2. What is your gender?

a) Female b) Male c) Other

3. How would you describe your relationship status?

a) Single b) In a relationship c) Married

4. Do you have children living with you/you take care of?

a) Yes b) No

5. What is your highest level of completed education?

a) High School b) Diploma c) Bachelor's degree d) Master's degree   e) Doctorate f) Others

6. What online degree program are/were you enrolled in?

a) OMSCS b) others [   ]

7. How many courses have you taken so far? [   ]

8. Are/were you employed (full-time/part-time) during the online degree program?

a) Yes b) No

Student's mental health

Options: a) Strongly agree b) Agree c) Neither agree nor disagree/Neutral d) Disagree e) Strongly disagree

9. I find/found myself socially isolated in the online degree program.

10. I was not able to make friends/social circle in the online degree program like my on-campus college experience.

11. I feel the lack of emotional support through not having friends in the online degree program, makes it more stressful.

12. I feel the lack of a coping mechanism through not having friends in the online degree program, makes me more anxious.

13. I feel the lack of emotional support through not having friends in the online degree program, makes me depressed.

14. I feel the absence of a close peer group, makes it difficult to enjoy the student life in the online degree program.

15. I feel the absence of having close friends in the program, makes it difficult to feel like I belong to the class as a community.

16. I feel the absence of having friends in the program, makes it difficult to relate to my identity as a student of the institution compared to an on-campus program.

Student's academic performance

17. I feel the lack of support through not having friends in the program, makes it difficult to cope with the academic pressure.

18. I feel the lack of support through not having friends in the program, makes it difficult to cope with Assignment/project deadlines.

19. I feel the absence of having friends in the program, makes it difficult to have deep discussions and understand concepts better.

20. I feel not having friends in the program, makes it difficult to talk about my academic challenges to someone I can relate to.

21. I feel not having a close peer group in the program, makes it difficult to prepare for exams through study groups.

22. I feel facilities and environment provided in the Online Degree programs is not enough to develop close friendships/peer relationships.

Facilities to develop better friendships

23. If there was a Virtual world environment for the students in the online degree program to hang out, interact with, I would be able to develop better friendships.

24. If there were fun extra-curricular activities conducted, I would be able to connect more with my peers and develop friendships.

25. If there were online video chat rooms to talk, I would be able to connect more with my peers and develop friendships.

26. If there were applications in the program to match/connect me with study buddies, I would be able to connect more personally with my peers and develop better friendships.

9.3 Interview Questionnaire

1. Age

2. Gender

3. How many courses have you taken in the OMSCS program?

4. How many friends would you say you made in the program?

5. Can you describe how close you felt with these friends and the kind of support you received?

6. Was it easy to make friends? Why or why not?

7. a) What helped you make friends?

   b) What was challenging if you were not able to make friends?

8. How would you compare this with your on-campus experience with friendships?

9. What do you think about the social life in online degree programs like OMSCS?

10. There are various communication channels in the program like slack, piazza. What do you think about those? Do you think they help you connect close with your peers?

11. What other facilities, applications, or activities like meetups, etc. do you think will help?

12. What do you feel about this phenomenon overall? Do you have any opinions about this to share?

9.4 Survey 1 Analysis
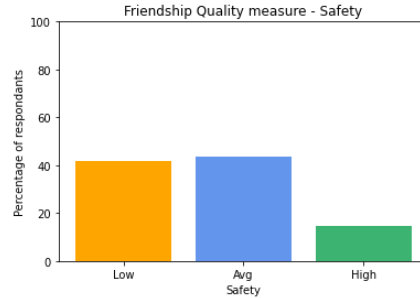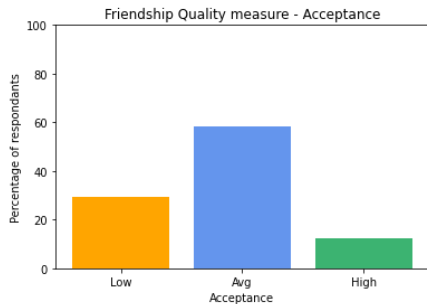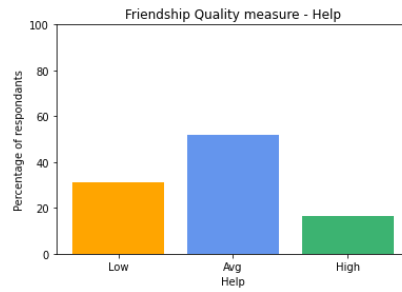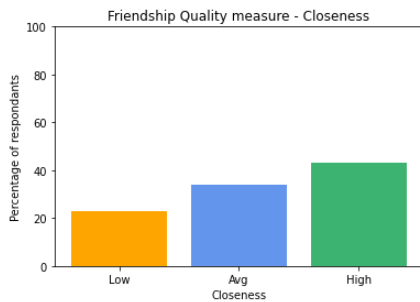
9.5 Interview Analysis - Coding

9.5.1 *Interview 1 Analysis*

Age: 35
Gender: Male
Courses taken in the OMSCS program: 10 (Completed)

Table 2—Interview 1 Coding

Interview Excerpts	Coding
I don't know whether they can qualify them as friends, but I probably interacted with about five people. I don't know whether I can qualify friends which kind of implies like an outside relationship. I mean, in the sense that, you know, you have something outside of curriculum and stuff.	Number of friends Friendship quality – not close
Pretty much nine out of my 10 courses I had; I didn't need to interact with anyone. I was not a very interactive person also especially on online forums. I have some chats going on in Piazza. But I believe that other people who had like much more interactions in those medium, even slack, or Anywhere, I was there. I was listening on the conversations I would contribute here and there. But I was not like a consistent person. I was not making jokes or anything out there.	Not very interactive in online medium

Interview Excerpts	Coding
One program, I don't know which course it was. We had a group project. I think that was the only interaction. So, I was put in a group of five people and it was just professional. All the people were professional. We met once or twice a week. It was not a bad experience. It was a good experience.	Group projects – professional friendships
Like, no. Yes, we were cordial. We will have, like, you know, chitchats here and then make jokes here and there. But after that, after the course ended. No.	Friendship didn't have time to develop
It was not easy, of course. I mean, I would have been made more friends. Met more people. I mean, I. Yeah, but no, I mean, I don't think so. This this platform or this mode does that. I mean, that is facilitate that.	Online mode doesn't facilitate friendships
It is I mean, sorry, I went to grad school in person and also online. I don't think so, It's bad in a way. But there are certainly advantages, huge advantages doing an in-person program. The network. Not so. I mean, you know, even if I take out the personal and support and stuff like that for career and professional support, the network that you've built in the on program on in-person program, on-campus program is a lot big. I still like to have like a ton of friends from my online program or sorry from my on campus program. I have I have I think a lot more I associate to that brand of that alma mater more than Georgia tech, the online program. And you know, so that is a big deal. I mean, I have I made like some long, I mean, lifelong friends on my other program and not this one.	On-campus helps build a network
	Friends helped with relating to the university
But to be fair, I knew that going into this program, this is going to be different. My expectations were different. I was a different person altogether. I think if I had taken online when I was like twenty-five or twenty, I mean, when I was younger, I would have definitely struggled. But doing I think I started this when I was like 33, pretty established professionally, and I knew how to manage my team, how to manage my work. I knew pretty much what I can capable of. And so, I was I was in a much more, you know, sure Footing in this program. I don't think so it was a downside.	Adult student – different expectations
	Younger student – huge challenge
But yes, given a choice and given I mean, in the sense that, you know, if I didn't have to quit my job and dig through the program, I would have definitely selected in an on campus program because that would have helped me like No.	Opted on-campus program for the network

Interview Excerpts	Coding
One thing is, you know, the time that I would have been able to spend. But apart from that, also, like, you know, build those network relationships. So, for example, if I have, you know, even today, if I have like some sort of some finance question or like a marketing question, I know. I mean, you know, I know who I can reach out to I have a bunch of people that I usually reach out to. But here, I don't have that. When I get stuck with how to implement RNN for some a specific problem. I don't have the network to reach out to someone and say, like, hey, how would you approach the problem? Right. So that is a big downside this is more like I've learned a lot. But the one we don't say I would say is that, you know, I don't have a support, a professional network around me out of this program.	No networks for technical help/support
I mean, now when we had like, tough, you know, when you were going through some tough phases in the course, having someone also go through the same thing with you just just chatting to someone. I mean, having the same problems as you have, that definitely helps. That was definitely missing. We did go out a little bit in Piazza and Slack, but yeah, I mean, somebody who is more closer and, you know, you could be more open, that could have helped.	Emotional support missing Piazza, slack not enough for close friendships
What could make this program better maybe is some kind of like physical groups in different locations especially. I mean, it should be easier to do that in the cities like, say, Chicago, New York. I mean, we could be region wise and Midwest. You know, the city chaps could meet say, once a month. The region factors. So, in fact, I mean, you know, chaps meeting some kind of like interaction. You know, maybe the university can coordinate something of that sort. I'm not thinking about something like let's meet for a two-hour meeting. I mean, looks like have like, you know, you know, just have I mean, just have dinner or something of that sort.	Regional meetups occasionally would help
But like a probably workshop kind of thing, maybe a weekend or out of day just, just, you know, set up an agenda. We, we can be as good as, as this one, but that is something of that sort would have definitely helped, you know, and maybe a monthly meeting because that's what was missing. Right. We were not being physically present with other people. So that could have helped.	Meetups - Workshop with an agenda No physically interactions - challenge

Interview Excerpts	Coding

Slack. I mean, Piazza was a very, very professional. I don't want I don't know whether a professional is the right word, but more more formal discussion forum. Slack was, to an extent, a formal discussion forum too maybe something more informal, something similar to, say, like Facebook, where there were networks and people were interacting. I mean, I know that this is this may be asking too much, asking people to be develop a new Facebook for OMSCS students, but then something more casual could have helped. But I think I would have preferred to meet other students in this in any way. Yes. I mean, we did have the option of, like, setting it up on our own and and, you know, meeting we actually. I think a couple of times during the course, there were plans to actually meet them that but that never mattered. I mean, that never materialized. You know, somebody will say you guys can meet on this Saturday or something, but know, I never went to anything. I don't know whether they behaved like any good sized meeting like that.

Piazza, slack – more formal

Need informal communication space

Self-organized meetups – didn't work

If the university had done something, I think I might have gone. With a set agenda like, you know, say, you know something that I could get something out of it. Not just be only like, you know, meeting people but maybe meeting professors. I mean, you know, that could have been a big incentive for me to go get out of my house and go to that meeting. Or like, you know, just people show showcasing some kind of research or something that they've been doing and stuff like that. Yeah.

Yeah. I would have even traveled to Georgia for that. You know, I would have travelled to Atlanta. Like you know, even if I say, like, you know, once in six months, let's meet together. I would have preferred that I would have done that probably.

University organised meetups like workshops – definitely attended

And especially when we want to get younger people into this kind of like mode, I mean, into an online program, I think they might struggle. I think for a mature adult, this might make more sense. But if somebody was still, like, not sure about themselves and like, you know, I need some support from the peer group. So, it's not I mean, this mode, there are still some challenges in this. So maybe the organizers or the university can look into it and make it make some things better.

Younger students in online programs – challenging without peer connections

I think if we if we if the university wants to take it to undergrads and target slightly younger population, I think they definitely need to add some add some parts to it so that, you know, that the peer support part of it is satisfying.

9.5.2 *Interview 2 Analysis*

Age: 28
Gender: Male
Courses taken in the OMSCS program: 2

Table 3—Interview 2 Coding

Interview Excerpts	Coding
So when I was previously enrolled in the program a couple of years ago, I did, I did find it hard to make friends because of the geographical differences and the time zone differences. So, for example, if I was working eight to five Eastern, people thought I would try to talk to and get help from and help them online, they could be in different time zones such as, I don't know, West Coast time or in Europe. And that definitely made it difficult, especially if we were all working standard work week jobs. So, that definitely was a challenging factor.	Challenges- time, geography, jobs
I was able to make a friend with a girl named Suma who actually lived not too far from me. So we would go to like the Georgia Tech campus or went to the library a few times. We studied together there and that was a huge help. Just being able to interact with someone and just kind of having this working towards the same goal. It definitely helped me focus and stay on track because with the full-time job being the focus of my attention without a social support network, also reminding me about the schoolwork and being involved with that. It definitely became a backburner and the work kept pushing and creeping into my time. And it kind of made the online program difficult to keep up with, which is a big reason why I eventually withdrew because at work they kept demanding more stuff and I just didn't feel engaged because I didn't really have a social network or a lot of friends there. So I do I do think that was the big factor, why I withdrew.	Facilitates – living nearby Benefits – study, same goal, focus Downsides – study buddy, withdrew from program
And now that I've come back, I've tried to make friends online, but it seems to be kind of hard. I haven't really made any yet, but taking two classes right now, which is essentially a full time workload over summer. So I don't have that competing influence of work going out	Challenges – time, jobs

Interview Excerpts	Coding
my schedule, which has made this a lot easier. So I'm fully involved in it. But it would definitely be really nice to have another group of people that I could talk to about, like my challenges or what they're doing and how they're learning and so on and so forth. I do think that's the biggest part that's missing from a traditional campus environment	Reasons for Needing friends
It is necessarily the facilities or really that sense of community and being able to meet with a lot of other people that have the same goal as you, which is if you're an undergrad to get a bachelor's degree or here, which would be to get a masters. And I do think that's a big intangible that's really kind of missing from this program.	Downsides – same goal, community
And it's something that I noticed when I was doing my MBA at Emory a few months ago when Covid hit and there were no, Where there is no way to directly engage with students, it definitely became more difficult. But because I kept, that was a small class and we were all in the same time zone, we were able to meet with each other online and hang out and support each other. So I'm kind of worried going forward in the fall if I don't establish a big, like, social support network. How that would affect my grades and my ability to complete. And stuff like that. Kind of a long, long tangent there.	Facilitates – small groups Downsides - academically
Yeah, for sure. if you're working eight to five days and I work eight to five then we have, we have the seven-hour time zone difference. It's virtually impossible to really meet with people.	Challenges – time zone, work
So piazza is really good for stuff inside the class or that class specific. But what I post there, I feel like it's like communicating in the classroom setting. Slack, I don't understand how to use it. I haven't been able to figure it out yet and reddit is really publicly visible. So I'm not always comfortable with what I post there or it's very limited. I mean, its just general information. But I don't think it's really a good tool for meeting with people. When I made friends with Suma in the past and a couple other people online, Google Hangout and Google Plus, were still a thing. So we made friends on Google Plus, which was being used heavily by students back in 2016, 2017. And that tool worked really well because we were able to segregate, like, into different pools. Who you're interacting with, like it was your friends, who was your classmates, who were your acquaintances and stuff like that. But I don't think a tool equivalent to that exists at this time. I guess Facebook kind of does. But I haven't really used my Facebook in years. I have had to log back in there and see how that works.	Challenges - Piazza, slack, reddit formal, publicly visible Facilitates – Google plus, hangout – private chats

Interview Excerpts	Coding
So my idea for my research was we needed more of an open community where people can interact kind of like a student center. But online. And that's why I'm hosting these quote unquote parties for my research is to see how well those tools work for student engagement, for informally meeting each other outside of the classroom environment, because I'm able to meet people and kind of message them in my classes who have classes with me on Piazza. But I don't really have a way to engage with students who are in different courses from me. And I was hoping that I would be able to drive that because it would be great for me to be able to meet people who have taken classes I haven't taken or because maybe I can learn from them that they really liked, Like maybe an algorithms class, which I wasn't considering taking, then I could learn for them, hey, maybe I should take that class. So there's definitely a lot of intangible benefits that come from meeting people outside of the classroom, which is really what I see piazza as, its just a virtual classroom.	Facilitates – virtual communities Challenges – meeting students from different courses Benefits – course reviews
I think that's a great idea. I would definitely show up if they held a meetup. I think I would be really cool. Would also be really cool if they could, like, have a teleconference room where you can meet people from the other meet ups. Be pretty sick. I really like that idea.	Facilitates – meetups, virtual meetings
I mean, I think it's really a good idea to research and probably some doing something similar. I do think that's if you look at MOOC programs, there's a very low completion rate. And even the OMSCS program compared to the on-campus program has a lower completion rate. And I do think having a more involved community could definitely help improve it. So I think it's good idea.	Benefits – Retention, completion

9.5.3 Interview 3 Analysis

Age: 23
Gender: Male
Courses taken in the OMSCS program: 2

Table 4—Interview 3 Coding

Interview Excerpts	Coding
Honestly, none. I only had one going into the program and I didn't really meet anyone from my last semester at all. I knew them through undergrad and our employer in terms.	Facilitates – knowing before

Interview Excerpts	Coding

I mean, I think it's a bit multifaceted. I think part of it is just, I think it is a little bit difficult to carve out the time. When I, I've been so used to, you know, having direct contact with people like during my classes or walking in between classes or on collaboration and stuff like that. But the one semester that I've taken so far, we didn't have group projects at all. And people weren't very talkative. Piazza really. And then the Slack channel was always essentially just people bugging the TAs, asking if they could help them with their homework for the most part. So I think I think part of it is just the lack of direct communication that I would be used to. And therefore, it makes it a little bit more challenging with the limited amount of time between, you know, full time jobs for everyone and then homework and stuff like that to try to dedicate time to like, you know, talk to people individually through Piazza or through slack, especially when there's not as much engagement on there. As far as what I guess I would like personally, but that's just for me.

Challenges – time, jobs, no direct interaction, no collaboration

Challenges – piazza, slack – only formal

Yeah. I mean, I don't have any through grad school, like on campus experience with grad school. But I think it's definitely a lot different. There are definitely things that I really enjoy about the program and make the program easier for me to be able to digest. But in terms of just strictly friendships, I do think not being able to see people face to face or even know, I guess, where people are in relationship to me, because I don't know anyone that's even from Wisconsin or even Milwaukee in particular. So it's hard to, you know, establish the like beginning grounds of like gathering a friendship for me in that regards. I think it definitely makes it a lot more challenging.

Challenges – no face-to-face, no relatability

I definitely do think at times it would it would help just to have somebody to talk to about what's going on in the class to almost like brainstorm or get my ideas out there. So it's not just, you know, come my own little echo chamber. So I do think that the more friends that you do have in the program, probably the more beneficial, because I know it helped me in my undergrad studies a lot to have people around. But it also does, in a sense, like the fewer friends also, I feel has promoted a lot more and better, I guess, more independent and better study habits. And I felt like I feel like I have learned a lot in just a couple of classes that I have taken. And so I think there are pros and cons to it. But overall, the process of school would be a lot easier with people around. I think.

Benefits – chat, share ideas, study groups

Yeah, I think I think a little bit more just like openness or maybe more promotion for people to have meet ups or try to connect with one another at the beginning of the semester. Because

Interview Excerpts	Coding
I know as you're going along and it's you know, it's hard to kind of get out of the groove and do something different. So I think if classes were to promote that a little bit more at the beginning of the semester. Like the first week or week and a half to say, hey here is like a thread maybe or here is like a slack channel that you guys can connect with and it doesn't have to be formal and you can kind of just get an idea of who is around or who has similar interests to you. Maybe just something like that to maybe promote a bit more interactive idea. Or like, you know, interactivity between students in the class.	Facilitates – meetups, connect at the start of classes, promote interaction, connect through interests

9.5.4 *Interview 4 Analysis*

Age: 23
Gender: Female
Courses taken in the OMSCS program: 2

Table 5—Interview 4 Coding

Interview Excerpts	Coding
None. Zero. Oh there was a person I already knew. Like we're in the same office working full-time. So he is also enrolled in the same course. But like there are no new friends that I have made as a part of this online course.	Facilitates – knowing before, same workspace
First of all there is no need to interact as such with others. If you are stuck on a doubt you post a question on piazza to which either the instructor or the students reply, but I think that's the end of the conversation that you have with anyone. And so far I have never been in a course which involves group projects and as part of this course which involved group project well it turned that the colleague I mentioned earlier. We just decided to collaborate on the same project. So yeah like apart from this I have had no interaction with any other student in the course. Yes. Definitely, group project or something of that sort would help you connect closely with your peers.	Challenges – no need for interaction, piazza only formal Facilitates – collaboration, group project
So one of the easier things is that we are in the same time zone so it is easier to manage collaboration on the project and also the like oh because it's the collaboration is easier I believe like that's the only thing that has been helpful. Nothing much to say there.	Facilitates – same time zone,

Interview Excerpts	Coding
OK. Yeah so that is another helpful point. Especially when you get like when I get blocked in something and I have to ask a doubt specific to my system or specific to my piece of code, then I can reach out to this colleague and get some clarifications. Like Oh I cannot paste my exact system details and my sample piece of code and ask some stranger or someone on piazza to debug it for me. So yeah in this sense it has been helpful.	Benefits – academic help,
Yes definitely. I think it would have helped enormously in multiple ways, first of all the quality of my assignments would have improved. Like in this particular course because we do peer feedback, I can see how the other students have given their assignments but for the previous course there was no way of judging that. And like I had no idea why like there was nothing I could learn from or no way to improve. Had it been an on-campus class I could have seen how the topper was doing his or her assignments and learn from them and improve.	Benefits – learning from others, peer feedback, improvisation
And other aspects also I believe it is very helpful to have friends so that you get that emotional support. Like if you're stuck on a piece of code for many days and you have an approaching deadline you need someone to talk to you need to you need someone for one morale boosting, you need someone for debugging as well and you need someone to talk to so that you can get up perhaps a third point of view for your piece of code. So it helps in multiple ways.	Benefits - emotional support, deadlines, morally boost, peer feedback
Given an opportunity I think I would just grab it but because there is already a lot to juggle like a full-time job and this Masters course, it will be very difficult to engage let's say actively on slack or another platform. So like you mentioned earlier having a project, having a group project would be helpful or some other way could be, I don't know perhaps, Quizzes or something where people are supposed to actually collaborate and answer as a team or something of that sort.	Challenges – jobs, time to interact Facilitates – collaboration, teams
I think virtual meetups would be a great way. Where people can come together to like talk about a particular issue I think like we have instead, weekly debates. That is one topic on piazza where everyone gets together shares their opinion but like for forming friends and for forming relations I think it would be better if we have something similar but with a video call and it is mandatory in my opinion I believe to have the camera on that forms a tighter bonding.	Facilitates – virtual meetings, seeing face-to-face, discussing a topic

9.5.5 *Interview 5 Analysis*

Age: 33
Gender: Male
Courses taken in the OMSCS program: 10

Table 6—Interview 5 Coding

Interview Excerpts	Coding
I would probably say zero. I had some partners in a group project and of course, about four years ago that I worked with. But, you know, I think we became acquaintances, but then, you know, years went by. We'd never really saw each other in any other class. And so we never really ever worked again, ever work together again. So, you know, I would say that those friendships that we've kind of developed at the very beginning have kind of gone away at this point.	Facilitates – collaboration, group projects Challenges – short time/classes together
We were working together on a group project. And so we were meeting probably two or three times a week for about a month. And so we had to kind of learn about each other to understand what our relative skills were so that we could work together to build an Android app. This was back for the software development processes course. And so we needed to make an app for a grocery list Android app. And so we got to know each other. And because we were constantly coordinating to get to work together to figure out how to build up the parts of the app, you know, as we got to know each other better.	Facilitates – meeting, interaction, collaboration
In terms of support, you know, we helped we learnt from each other in terms of we had to coordinate our UML diagrams, like our class diagrams and activity diagrams and stuff like that as part of the course. And we all had different approaches. And so I got to know we had discussions on how to actually combine our UML diagrams and to learn from one another, which was really useful. But I haven't really had that experience in any other course. I don't think I've had any other group projects in any other course, which is a shame. I recognize it is challenging, given that, you know, OMSCS students are, you know, distributed all around the world and in different time zones.	Benefits/Facilitates – coding help, learning new approaches Challenges – time zone, geography
But I, I took a nano degree course through Udacity in 2016 and 2017, and I did make a good friend through that program that we ended up working together frequently. And I would help him on several of his projects. And he helped me on some of my stuff as well. So that was actually a friendship. And we still text to this day. And so it's about the same. It's about	Close friendship

Interview Excerpts	Coding
the same time when I was working with my initial OMSCS group project stuff. But because we continued to work together basically for the rest of the year, we still keep in touch. You know, he's I've helped him on his job search a little bit, and because we both interviewed at a few of the similar companies. And so. Yeah.	Facilitates – working long time together
So I would say the key difference with the OMSCS Program is that when you don't actually have a group project, it's very unlikely that you're actually going to, I think, make a friend in a course if you only interact via piazza posts or on slack, maybe you can make better friends through slack or something.	Challenges – no collaboration, piazza, slack only formal
But because you're basically going to separate and go to a different place, to a different course most likely the following semester, it's unlikely that you're actually going to keep on working with that person or as part of a cohort, whereas in the nano degree program, we were in a cohort of around 250 students in the program. And so we stayed with mostly the same people for an entire year. So you got to know people's backgrounds and kind of know where they were coming from and who would be people that were good to go to for different types of questions.	Challenges – different courses every semester Facilitates – travel program together, cohort
It started off that we kind of we started just chatting about more personal stuff and kind of the challenges that we were going through at the time. We were going through the self-driving car nano degree course. And it was the first time it had been offered. So we were in the first group of people going through that program. So Udacity was still trying to get a lot of the bugs worked out of their program at the time. It was very new. And so when we were going through the program, you know, the content that they had just produced for us or the projects had lots of bugs in them or stuff was very, very difficult. And since we were the first people going through, you know, we had to kind of suffer a lot. And we went through a lot of the same struggles together of stuff not working.	Facilitates – going through similar challenges, for long period.
Kind of a key element, I think, of forming friendships that last is going through shared hardship together. So shared struggles and things like that. So I remember I was not very good at C++, but my friend, a peak was good at C++. But I knew a lot about the technical material for the program, but he did not know as much. So I was able to help him a lot in the technical engineering content and he was able to help me in resolving some of my C++ issues. So it was kind of a mutually beneficial relationship.	Facilitates – mutual beneficial skillset

Interview Excerpts	Coding

And yeah, I think it was you know, he was going through challenges as well of trying to figure out if he wanted to stay at his job and how hard he was working on this Nano degree program. And then I was in a slightly different situation of having, I had a family and so we both worked full time in addition to doing the nano degree program. So it just kind of we had some different life experiences and because we were kind of struggling and kind of sticking together through a very challenging program, I think that's kind of what helped us stick together because we were going through a shared struggle at the same time.

Facilitates – shared personal struggles together

I think partly I think part of it is that when you join a new course, you don't. There's like, you know, I guess they do most courses do the thing where they post like everyone posts some brief biographical information about themselves. I post that and very seldom actually read anyone else's profile. And I think it's just kind of a weird thing to try to connect with people when, you know, two hundred or three hundred other people in the course are posting. There's just way too much content.

Challenges – piazza intro posts are huge number to read

I think what would be better is if, you know, maybe if you got a sign kind of like a group, maybe like so, you know. OMSCS offers different specializations. I think it would be wonderful, for instance, if you could opt into a program to get assigned to a cohort of maybe 10 or 15 other people in your same specialization who are starting at the same time and that you kind of agree that you're going to go through and take like the same set of courses at the same time with one another. And that way you could go and your relationship would last longer than just a single course and you would be able to help one another and kind of form longer friendships, longer term friendships. And that's more similar, I think, to what an on campus graduate program is like. When students work together, they go in the same courses and they might be part of the same research team working together in a lab. So they develop those types of friendships through that mechanism.

Facilitates – cohorts, specialization groups, same courses, longer time together,

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But I basically feel just like in most of my courses, just one person and I seldom post to piazza. And I typically struggle. I am a very extroverted person. While, Yeah, I've never really put the effort, I suppose. But there wasn't like a clear mechanism for how to meet people. I think it would be cool if there was maybe more like, you know, zoom calls or something like that to go join in and have conversations or something. But even then, I don't know if I

Challenges – no existing tools

Interview Excerpts	Coding
would have joined up with those. I think having people or partners to work, I want to do group projects. I think that would be effective for me.	Facilitates – video calls, face-to-face conversations
No, not really. The. I remember when I first started there was the Google Plus community, and that seemed to be the most active. I think the thing that would have helped perhaps the most is as an early student, was to get a better understanding of all the logistics of how OMSCS works and expectations. I remember being very frustrated first years of trying to join courses. And I felt very isolated in that because there wasn't a clear mechanism to kind of understand that posting, that type of material. But Google Plus at the time was used that was like the primary community. I know there's like a Reddit page as well or a sub reddit for a lot of OMSCS students. I would very occasionally check that basically for course reviews. I would also I did heavily use the OMS Central Web site for doing course reviews and kind of checking that stuff out. But I never used it to try to connect with other people.	Facilitates – community application Challenges – no communication about such resources Challenges – Reddit, OMS central only for course reviews
I guess one thing I should say is there was a coworker at my, area where I work, and she was about maybe two or three semesters ahead of me in the program that she had been doing it. I think she started about one year or a year and a half before I did. So having her to talk to was very helpful. But aside from that, I don't really know anyone else going through the program.	Facilitates – same workplace
I think it would be really helpful if there was something of a local, if you could, it's like a city based meet up in person or something like that periodically. I Know, I guess the key thing is like, you know, why would a person place some sort of value of going to an event? I guess one thing I would look for when I would like sometimes during piazza, So I would check to see if anyone else worked at NASA. I work at NASA in Houston. And so I would do a search sometimes to see if anyone else listed that they worked at NASA. And kind of find people that have that common background with me.	Facilitates – local meetups Facilitates – connect via workplace
But, yeah, I don't know. I think that the key reason to meet with somebody is to make sure that you learn from that person or to have kind of a common experience. So, yeah, I don't know that having, like, in-person meetings would have been a huge draw for me. Houston is a really big city and it takes someone is to hold it together downtown. Well, that's probably	Motivating factors – to learn, have common experiences together

Interview Excerpts	Coding

an hour long drive to get there. And I don't know if that would be worth it necessarily. I think I'd probably rather just after working all day, being able to join like a zoom call or something like that and get to know people that.

Facilitates – video calls, virtual meetings

My work friends are the people I end up working with. And not from some other departments and stuff like that. I mean, I do have friends in other departments that we've met through other shared experiences. I've stayed in touch with. But I think the key would be if I'm OMSCS offered more group based projects. And I know that can be challenging for co-ordination and logistics and there are downsides of group based projects. But I thought those were really meaningful because I got to learn from other people and their experiences. Maybe someone else had, like when I had a group project, there was another person I was with who was taking the machine learning course and I hadn't taken it yet. And so it was really interesting kind of hearing from him and his perspectives about what courses and how he was taken and how they were going, and gave me kind of ideas about what courses I wanted to take. So I would say my recommendation would be that the OMSCS program offers more group based projects

Facilitates – group projects, learning, new perspectives

Maybe assigns people to cohorts at registration. And or you can opt into a cohort program to say, you know, we're going to go through this together. And so these are, you know, that 10 people, you know, that are going to be going through the same courses with you the entire time.

And that was a big part of the nano degree program with Udacity was that we were in a cohort of about 250 people. And you could if you, you know, fell behind, you could stay in the program, but you'd have to fall back into an earlier cohort. And to me, that was, I guess, a pretty strong disincentive. I didn't want to fall behind where everyone else was. So I think of having group dynamics and wanting to, you know, maintaining inclusion and feeling support from a group is really important

Facilitates – cohorts, small groups at registration, support

I would say that the OMSCS program has been very isolating for me personally that not having not going through it with anyone was definitely a downside of the program. And so I'm not coming out of this program with a good professional network or friends in particular, unlike most of my coworkers at NASA who have master's degrees or PHD through traditional on campus programs.

Downsides – isolation, no professional network, no shared experiences

They have friends and professional networks that extend all around the country because of all the people entering the conferences or in their research groups or writing papers together and having that shared experience and OMSCS doesn't really replicate that. And so that's kind of one area of improvement I would say would be helpful for the program.

9.5.6 *Interview 6 Analysis*

Age: 37

Gender: Male

Courses taken in the OMSCS program: 7

Table 7—Interview 6 Coding

Interview Excerpts	Coding
Friends, I would say nobody. But some of my friends are already taking these courses. So after joining this course I haven't made any new friends. Yeah a few of us started it together.	Facilitates – friends starting the program together
So yeah. Yeah mostly I mean if our interests are aligned you know we take the same subject so that we can form groups and study and all that. So that's something we've been trying to do. And then yeah I have known them professionally and also outside you know from the friends of friends, so I share a good relationship with them. So other than that no I haven't been I haven't made any friends as such from any of the courses that have been part of.	Benefits – Same courses, study groups Facilitates – same workplace, friends of friends
Yeah I mean there is no I mean a venue for making friendship as such. I mean you can go into slack and Not the core specific slack channel but you know some generic slack channel and you can go and make friends. But I mean Basically you don't have the time to do all that things and the friendship should grow naturally in a setting where you're not forced to do it but we don't have any.	Challenges – no place to make friends, no time, no need at this age to initiate
And essentially we are not seeking out for friends either you're just here to I mean we are not in the early ages of our career right. It's like mid-career. We are all too busy with our family and our profession and then this course. Then for people who wants to really make friends and who have the time you know that is that is there are opportunities. But what I would say is personally from my perspective I don't see a reason why I should go and make friends.	

Interview Excerpts	Coding

Yeah I think that are some slack channels I saw where there is good discussion, funny jokes are being shared and all that between a lot of participants which slack was that? OMSCS is one of those main channels. Usually when I joined I saw that and then I saw a lot of discussion. Probably its in the registration announcement and some like that I don't know. Other than that, Well if you want to make friends I don't know if piazza is a good option. Slack would be my primary choice no if you want to, if I want to make friends here.

Coding: Facilitates – slack channels

As I said because I came into it with few friends already in the course. If they were not there then probably I may have found one or two people who could have who I could discuss everything with. I mean when technical challenges and everything comes up people ask questions I mean we also have the code of conduct, but within that whatever we want to discuss. If there is somebody that can respond to you when you need them that'd be better. That's what I feel. Other than the private and other than the general conversation in piazza where you post and you expect somebody to respond. Maybe nobody will respond or that if you have somebody that you can discuss you can discuss all these thoughts and ideas and everything. That'll be good.

Coding: Facilitates – starting program with friends

Motivational factors – discuss ideas, technical support

I would say from my perspective there is nothing that I get out of it socially. But people who are thinking of Yeah they wouldn't have to if they want to have a social life also as part of OMSCS here, they are finding, expecting a social life in OMSCS, yeah, then I don't think there is much of a choice other than slack. There are no zoom, virtual meetups or any of that right. I don't think anything is organized like that where all the students can socialize together. There is nothing like that.

Coding: Challenges – no social life, no facilities to promote that

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That I had it back in India. I mean that's totally different. I mean I don't know how it is here but there you know you and everybody in your class is a friend. You know you spend most of your time with them. You sit in the classroom and then you're like spending hours with them. And that was a full time thing. This was like partially and it is like asynchronous, whenever you want to study you study just have the common goal of so many assignments and exams. So it's really difficult in the setup to make friends.

Coding: Challenges – asynchronous nature, not spending time together

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I think that that's what's so once the Covid started my company and you know many of the companies have started this zoom or virtual meetings where you know they share a drink or something and talk about what happened in that week and all that kind of a thing.

Coding: Facilitates – virtual meetings, face-to-face

Interview Excerpts	Coding
Something out of the professional, knowing getting to know each other personally, that is missing here. So there should be some videoconferencing or something that people who want to use that avenue. There is an opening that you know they can join and then share personally and make friends there.	conversations, personal interactions
People who are interested in doing that can do that. I don't see anybody, but the problem is you know who would organize that? So unless some students takes that initiative, That's not going to happen. Or else the university or the course TAs or instructors will have to provide a common occurring meeting where people can join and do that. Something like that is what I think.	Challenges – no one to organize
Not really. I mean this is this is challenging because you're not meeting any people in person nor over the video. Mostly that is what is preventing. You know somebody is over there but you know somebody unseen you don't want to make a friends with. That is One of the main inhibitions. Or else you should have a Facebook group also created that way you can you can get to know them.	Challenges – no face-to-face, anonymity
But again the challenges. Every course and the set of students will be different. It's a really difficult unless you know you share multiple courses together to build a bond. Exactly. Like in engineering I mean my previous in a bachelor's full time that was you know the same classes would be repeated over the course of 4 years. You gradually become friends. But here every semester is too short and then you move on. Each of them pick a different course and move their separate ways. It's really difficult to build a friendship. I mean three months is enough to build some friendship but that also I mean with all the daily pressures of finishing the assignments and everything it's really difficult.	Challenges – short time together Facilitates – share multiple courses

9.5.7 *Interview 7 Analysis*

Age: 27
Gender: Male
Courses taken in the OMSCS program: 2

Table 8—Interview 7 Coding

Interview Excerpts	Coding

I would probably say none. None that I consider like a friend.

Yeah, I wouldn't say it was. There were there were no many mediating mechanisms that kind of facilitate that. And depending on the level of engagement, you know, the professor or whatever hasn't given course like this current course EdTech is much more involved. So it may be easier. But even in the course like this, I feel like the social aspect isn't really promoted in any way. So it's really like a I don't know if there are any mechanisms by means which people would go about making friends in the program. That makes sense, yeah.

Challenges – no mechanisms to socialize

When I kind of think back to, like, conventional like in person school and during my undergraduate degree. Like, I think that it was very helpful to have friends in courses with you that kind of like day to day class, like communication in a more informal context where you're not talking necessarily specifically like thinking about the work when you're working in summer or anything, but just that kind of general, kind of like informal conversations you can have with friends about, of course, can kind of help your learning process. And it's just another resource, you know, during a or like a general resource training course where you find things that maybe you didn't notice yourself or stuff like that. You have other friends in course. And that's really what you like. Lines of dialogue being open. So you're relying more on kind of like, you know, that is really the informal kind of like job as opposed like a formal extract, the thing that would be like designed by the course itself.

Facilitates – personal/informal conversations'

Benefits – learning process, mutual learning

Yeah, I certainly think that there are courses that lend themselves more that that kind of require more kind of like day to day or more frequent interaction. And that would kind of like serve to kind of like bridge start the gap you miss by not having some friends in the course. Whereas there's other courses that are kind of just like raw information, understanding kind of deals where there is there is basically no reason for you to have to communicate with anyone over the course of the entire semester, basically. And I think those are the places where, like, you really kind of lose out on a major aspect of like schooling. Whereas it is like in in-person education.

Challenges – nature of the courses to promote interaction

Like, you know, I don't see, like, general e-mails about kind of like social activities or that kind of stuff, like from a program basis like it. Anything like that would come from like an individual course. So I know there like things like on like in OMSCS Like slack and stuff

Challenges – no information, community not fostered

Interview Excerpts	Coding

like that. And I don't know how I active those are. But yeah, generally I don't see a ton in terms of kind of like that being fostered as, like a community in the program.

Yeah, I certainly think that those kind of helped to bridge the gap a little bit. It's obviously still not the same thing. And a lot of that is still very much course oriented, like there is some room for a kind of like personal one off side chats and stuff like that. But it's really, I think, the primary focus when people when they it's like, So it's kind of a place like office hours, more than like a social community for the most part, I think.

Challenges – slack, piazza formal

Yeah, I, Yeah. Maybe just more infrastructure that's focused Kind of more on like a community building. Instead of just being like ancillary or like learning component. Like something on piazza would be something like specifically designed to foster like social, Kind of like aspects of the community. I'm not sure. Yeah, that seems like something because at like even like everything. I don't think piazza or slack. It's going to kind of still be course oriented for the most part.

Facilitates – infra to promote community

What do you think about maybe a virtual meeting or meet ups where you can actually get to know people? Would that help?

Yeah, I think that's something. Yeah, that's exactly kind of what I was kind of alluding to. Is this more kind of scenarios like that, I think would kind of foster that a little bit more? It's getting engagement is tough in those, though. That's kind of, I think, the difficult part. Because I did the big thing about the program is that the timing, flexibility. So to actually get people kind of lined up at the same time, is it? It certainly seems like a difficult challenge, but I think that would help.

Facilitates – virtual meetings, meetups

Challenges – time, flexibility

9.5.8 Interview 8 Analysis

Age: 25
Gender: Male
Courses taken in the OMSCS program: 6

Interview Excerpts	Coding
So I've had a couple of my friends that I've known previously, previously before starting the program. So I've got like two or three friends from that. But honestly, I don't think I've made too many friends from the program that I didn't know beforehand.	Facilitates – previously known friends
Maybe. Maybe honestly, two, two or three friends. And that was mainly just from. Kind of like courses with group projects where we kind of had to meet a lot and had scheduled meetings. So that's kind of where those friendships develops. So I would say that's you know, I think we're, you know, relatively close. I mean, we're not like best friends or anything, but, you know, they're friends that I can, you know, before registration can talk to and say, hey, you know, what are you thinking about signing up for? This is what I'm thinking about. It would be cool if we took the same class.	Facilitates – group projects, meetings
And that's actually how one of those friendships really developed was. So I think it was my third class. I took its software development processes and that there was a group projects in that class. And so I kind of developed a friendship through that. And then at the end of that semester, we kind of we were talking and we were like asking each other what class they were or we were thinking about taking. And our conversations kind of stopped there. But then during the next semester, we realized we were in the same class again. And so that class was also required, a group project that was human computer interaction. So we also kind of paired up again. So I'd say like the friendship really developed through, like just kind of constant communication through group projects and then just keeping in touch from there. Yeah, I think that was what helped develop the friendships. And it also helped to maintain them, too.	Facilitates – taking many courses together
You know, every so often it wasn't like we were we don't talk every week. It's I think it's one of those types of things where it's up our culture relationships where, you know, I can reach out and, you know, just kind of like a close friend. You know, you're not you don't feel awkward or anything. You feel comfortable around them. And so I think most of our conversations happen after a semester ends and before the next semester starts, just because I think that's, you know, another thing, how that helps with friendships like you can relate to things. And so, you know, the friendships I've developed here in this program are mainly relating on the stresses from the OMSCS program, sharing advice on different classes that,	Facilitates – shared experiences, relating to each other, registration

Interview Excerpts	Coding

you know, my friends may have not may not have taken. But, you know, in terms of how often we talk, it's not I say it's mostly just after each semester.

From these friends, So there is a Facebook kind of messenger group that we have. So it's not super active. But, you know, occasionally someone will pop in with a question or. You know, we'll talk in that group about our class or something relevant to the program itself. So I guess that could be seen as a support kind of group, that Facebook group shot that we have. But it's not super active. So when, you know, I would say yes. But it's not, you know, a really strong foundation of support.

Facilitates – messenger group, conversations

I just think in general, for like online, it's hard to develop relationships. And, you know, with this being said I can online master's degree program, that's, you know, a lot of a lot of students are working full time like myself. So in addition to, you know, the classes and the program being online. You know, there's you know, we don't have a lot of time to develop, you know, friendships. It's not I don't think it's my priority per say. So it's not something that I go into a class looking for, some kind of just trying to. Sometimes it just feels like I'm trying to get by with how busy I am with work and class. So I would say that, you know, the fact that it's online and just how busy everyone's lives are and even more so with now like the pandemic. So there's a mixture of things.

Challenges – online nature, jobs, time, not able to initiate

Yeah, some. Yeah. Like you said, students would have to go out of their way and it's you know, it's tough to do that with as many responsibilities I got. I don't have. I'm not married. I don't have any children. So for me, I have I feel like a lot more time than other people in this program. But even then, it's still something that I'm not. You know, it's not my focus.

Yeah, I do. I think that's so for my on-campus classes, We did used forums like we've used Piazza and forums like that help. But I think, you know, having that in-person aspects, you know, seeing your classmates every day, seeing your professors every day, and even then it just helps, you know. Put a name to a face and like it makes the experience more personal, whereas it seems like, you know, for example, this interview is probably one of the more like personalized things in this program. Right.

Challenges – no face-to-face, personal interactions

Like, it's not every day that we get to talk to our peers or our professors. And like, I actually hear their voices, you know, even to that extent. It's mainly just through the Piazza interface. So being able to actually see and interact and Kind of communicate in real time with your

Interview Excerpts	Coding

peers and your professors is kind of something that you don't really get. And the OMSCS Yes, I can always speak to the OMSCS program, but I'd assume it be the same for other online programs.

Challenges – anonymity, not relating to peers

I think I think it depends on the class. I think for this class Like, I rarely look at the slack. For other classes, I like my last semester, I used slack quite a bit. That was knowledge based A.I. I think the reason why I don't use it much in this class is because this class is so personalized to its just It's pretty independent based on your project. So questions that you have aren't really things that other people won't necessarily be experiencing. But I do think they're really good tools to be able to talk to students that you wouldn't otherwise be able to speak to.

Challenges – nature of the class, if independent

Facilitates – slack to talk to students

That's a good question. You know, I don't. I don't know if I have, you know, that specific thing per say. I think one thing I do enjoy at the beginning of this semester is going through. And, you know, I think this is maybe just with Dr. Joyner's classes, but having those introductory posts that students and professors and TAs can post on and kind of just share a little bit more about themselves. So, you know, I don't know if there's a way to do that.

Facilitates – personal introductions in piazza

You know, whether it be Zoom or something else like that. But I don't know, like going through this class I found it really it's been really nice to actually been able to, like, physically talk to someone. So I like the idea of like having introductory posts on piazza, but maybe like having another form of introducing yourselves to your peers and your your classmates. I think that would be really cool and add more personal touch to the program.

I don't. I think maybe Virtually, I think maybe in-person meetings, if they if they were mandatory, might be like more of a like obligation and kind of like inconvenience at times, especially with how busy it could potentially be. But I do think that, you know, like whether it be study groups or meeting virtually with your peers helps because that's how I've made friends through this program, basically having group meetings virtually and meeting often. And, you know, with those groups in those meetings, it first starts out really kind of formal. But as you get more and more comfortable with those people, you know, you start to get to know them and, you know, joke around and have a little fun with the type of work you're doing.

Facilitates – periodic virtual meetings, study groups

Interview Excerpts	Coding
So I do think maybe like if, you know, there were a little students were broken up into groups of five or some. Like little student groups that you kind of just you had from the beginning of the program and then you met with that same group as, you know, your time in the program passed. So you know that I think that would be pretty cool, kind of. You get to know just like five or six people from the time that you start the program that are starting the program at the same time as you and you get to meet with them and kind of develop those relationships that way. I think that would be so. Yeah, I think ultimately, I think it could be really helpful.	Facilitates – cohorts, share many courses, longer time together

9.5.9 Interview 9 Analysis

Age: 37
Gender: Female
Courses taken in the OMSCS program: 7

Table 10—Interview 9 Coding

Interview Excerpts	Coding
I don't think I've made any new friends. I have a couple of friends that I already know who is also in the program. So only those friends. Other than that I haven't made like any new friends in the program.	Facilitates – already known friends in the program
Like, I think it is good to have, like, friends that I already know in the program because it helps with the assignments and understanding the things. If we are stuck on some of the reading, or If hard to understanding, I can first check with them before asking in piazza. So it is kind of helping me in the learning process.

And also, like in class selection, like, you know, like there are like different courses. So like, like the selection or enrollment for the courses is like a huge process. Like you have to be really like you have to be really fast in choosing the course and you have to choose like the ideal courses. So those kind of scenarios and having friends already has like reminding me, like you have this study choose and this is are the best courses. So. So we used to have like we have like discussions before the course selection on like which are the best courses for us. I like that. So that kind of helps. | Benefits – academic support, registration, course selection, mutual sharing of experience |

Interview Excerpts	Coding
And like I think it's so far only one like only for software development and process, SDP like I had like a group project and the teammates were assigned to me. So even then, like it was most of the discussions were official and we were like we used to discuss about the projects and not like outside of that. And then that like I mean, like I, I don't think like even though, like in piazza we post questions, we get to answer, I haven't felt like making friends with anyone or like that.	Challenges – group projects formal, piazza formal discussions
Yeah. And I did I did not feel connected or like, you know, like I'm like working full-time. So we are like taking this course during the extra time. So one reason can be like the lack of time in engaging in more conversations with other classmates. It can be one reason.	Challenges – lack of time, jobs
I on-campus like you definitely will make friends. Like you see them every day. So the chances of like meeting new people and making new friends. It was easy. Like it happens on its own. You don't have to put any effort to make friends in an on campus program. But whereas I feel like in an online program, it doesn't happen by itself. You have to put some effort. You have to be online all the time and you have maybe like little bit walk on our side to make friends.	Challenges – needs effort and initiation
Yeah, and like every like in like engineering and all like we have the same set of students right, for maybe the four year program you'll meet or you are in the same class or you see the same people. But in this like each semester you may be having like a different set of students, different set of classmates. So even the classmates are changing for every semester.	Challenges – different students in each course, short time together
Yeah, that that's one reason as well, because like for the next course It will be like a different set of people that I'll be seeing in slack and piazza. So if it's the same set maybe there'll be like maybe after like three four sems, I think there may be a chance that we'll make friends. But that doesn't happen because like down the lane like it will be a different set of classmates that you interact with.	Facilitates – same courses together, longer time
Yeah I believe like some kind of virtual meet ups may help, but it again depends on the people and their timings. So I'm not sure like whether if such an event happens, If it's possible to get all the people that everyone will not be available at that particular point of time.	Facilitates – virtual meetups

Interview Excerpts	Coding
I will have Yeah, it would have to be like student driven. I don't know think like if it will be like, It will. It will come from the faculty. It might have to be like student run, Like how we have the alumni and we have like meet ups for the alumni like that.	Challenges – time zone, organizing people
No, I don't know whether like a physical or an actual meetup at George tech may help. I don't know, like how the turnout will be. Maybe like people in like maybe Georgia may come. I don't know, like that. Maybe some people who maybe within the U.S they may travel and come, but that's an option.	
Yeah. Like forming like groups within their particular region and like maybe a maybe like slack or WhatsApp or some kind of channel for the regions. And having like a meetup like once a year or once in six months, that may help.	Facilitates – regional meetups periodically, online regional groups
Yeah. Yeah. As you suggested like some kind of regional. It might be like more possible. Like it can be achievable. Since it's globally like it's hard to get everyone at one place, but if it's region wise, there may be a chance that we can get some people.	
Or maybe like an alumni, for the OMSCS also would be helpful because who have completed the course, and who can give like valuable insights on the course and how to tackle it.	Benefits – insights on courses

9.5.10   *Interview 10 Analysis*

Age: 24
Gender: Male
Courses taken in the OMSCS program: 4

Table 11—Interview 10 Coding

Interview Excerpts	Coding
I don't think I have made any friends. There are some groups, on telegram and WhatsApp. So there is hardly any communication taking place. And piazza also its all formal communication. So I don't think there is even a single friend. And many tools that are used Those also don't help us in communicating informally or like friends talk. That's the main reason, I think.	Challenges – no informal communication

Interview Excerpts	Coding
The on-campus program, you can't actually compare because every weekend we can even talk with the people that are in the same classroom. In on-campus classes, you make so many friends here, you can't. And so I feel like on-campus there is much more efficient than online learning	Facilitates – frequent meeting people
Sometimes it happens that you're don't get the right resources to complete assignments. You have to do a lot of research and keep searching for resources. That's one problem, and another one is that while learning in on-campus programs, You can quickly talk with friends and solve some problems that have trivial solutions. But here you can't do that. You have to search for everything on your own. And it takes a lot of time many times. That's the I think the biggest challenge in online learning.	Benefits – academic help
Informally talking doesn't happen generally on piazza or slack. Everyone talks about the assignments, solutions. Apart from that, you can hardly find anyone using Smileys. All the communication is formal. So social life Is not there. Individual chatting and video calling your peers would be helpful making friends. Piazza mainly its not allowed. That's a problem.	Challenges – piazza, slack formal Facilitates – virtual meetings, face-to-face interactions

9.6 Interview Analysis – Themes

9.6.1 *Facilitates Friendships*

Table 12—Themes facilitating friendships

Theme	Interview Excerpts
Cohorts	*"your relationship would last longer than just a single course and you would be able to help one another and kind of form longer term friendships,"* *"Maybe assign people to cohorts at registration. And or you can opt into a cohort program"* *"little student groups that you kind of just you had from the beginning of the program and then you met with that same group as, you know, your time in the program passed"*

45

Theme	Interview Excerpts
Long time/courses together	*"because we continued to work together basically for the rest of the year, we still keep in touch. We started just chatting about more personal stuff and kind of the challenges that we were going through"* *" I think that was what helped develop the friendships"*
Virtual meetings	*"for informally meeting each other outside of the classroom environment"* *"they share a drink or something and talk about what happened in that week"* *"it first starts out really kind of formal. But as you get more and more comfortable with those people, you know, you start to get to know them"*
Collaboration / Applications	*"perhaps, Quizzes or something where people are supposed to actually collaborate"* *"so we were meeting probably two or three times a week for about a month. And so we had to kind of learn about each other"* *"you can kind of just get an idea of who is around or who has similar interests to you"*
Sharing same workplace	*"find people that have that common background with me, So I would check to see if anyone else worked at my office"*
Going through challenges together	*"I think that's kind of what helped us stick together because we were going through a shared struggle at the same time."* *"Kind of a key element, I think, of forming friendships that last is go-ing through shared hardship together."*
Regional in-person meetups	*"What could make this program better maybe is some kind of like physical groups in different locations especially"* *"If the university had done something, I think I might have gone, with a set agenda, I would have even traveled to Georgia for that"* *"I would definitely show up if they held a meetup."*
Similar geographical locations/time zones	*"I was able to make a friend with a girl who actually lived not too far from me."*

9.6.2 *Challenges*

Table 13 —Themes that challenges friendships

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Theme	Interview Excerpts
No consecutive courses together	*"Every course and the set of students will be different. Each of them pick a different course and move their separate ways."*
No existing tools/mechanism to promote socializing	*"But there wasn't like a clear mechanism for how to meet people"* *"I don't think anything is organised like that where all the students can socialize to-gether"* *"social aspect isn't really promoted in any way"* *"kind of like that being fostered as, like a community in the pro-gram."*
Anonymity	*"somebody unseen you don't want to make a friends with."*
No time to de-velop friend-ships	*"students would have to go out of their way and it's you know, it's tough to do that with as many responsibilities I got."*
Piazza, slack – formal discus-sions	*"I mean, Piazza was a very, very professional, more formal discussion forum."* *"But I don't think it's really a good tool for meeting with people."* *"So I was put in a group of five people and it was just professional."*

9.6.3 *Effects/Downsides*

Table 14—Effects/Downsides

Theme	Interview Excerpts
No profes-sional/career network	*"for career and professional support, the network that you've built in the on program on in-person program, on-campus program is is a lot big"* *"I don't have the network to reach out to someone"* *"I'm not coming out of this program with a good professional net-work or friends in particular"*
Not relating to the university	*"I think a lot more I associate to that brand of that alma mater more than Georgia tech, the online program."*

Theme	Interview Excerpts
No Emotional support	*"when you were going through some tough phases in the course, hav-ing someone also go through the same thing with you"*
Withdrawal from program	"Without a social support network, the online program difficult to keep up with, which is a big reason why I eventually withdrew."