Preferences of Returners and Direct Pathway Students for Online vs. In-Person Master's Program

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Abstract

Online graduate degree program offerings, particularly at the master's level, have increased tremendously over recent years. In all disciplines, the online option provides an additional opportunity to students who wish to pursue graduate education. These programs are effective and viable for many students, but others strongly prefer or learn best from in-person education. In this paper, differences in preference and experiences with online and in-person master's programs will be examined for two groups of students, returners and direct-pathway students. We define returners as those who work in industry for at least five years between their undergraduate degree conferral and matriculation into a graduate program, while direct pathway students have less than five years' gap between their undergraduate and graduate degree programs. Previous work has shown that the two groups exhibit a variety of differences, although they are also similar in many ways. This paper will discuss returners' observed preference for online programs, and what rationales led students to choose the type of course delivery they did. Experiences in these programs will be explored and discussed, with analyses covering both qualitative and quantitative data that has been collected.

Introduction

Since the COVID-19 pandemic and the emergency switch to education via distance, online education has become ubiquitous both at the k-12 and higher education levels [1]. Previous to lessons learned by the forced online environment, education via distance had been an area of expertise for instructional technologists and others interested in providing opportunities that were not related to geography and utilizing the relatively new internet technologies [2]. After the pandemic, many more educators were better equipped to conduct courses online, and students who had success in the online environment could see the efficacy of online learning. The ability to offer learning via distance has allowed students to remain in their locales while obtaining a degree from an institution that may be many miles distant, or in another state or country.

Graduate education and the desire to earn a master's degree has driven universities to offer not only online courses, but also entire degrees via distance. For some students, the attainment of a degree may rely on the online learning option. This is the solution for many students. Instructional technologists and learning engineers are constantly updating methods for learning and teaching online. Individual student opinions vary, but the opportunity to attend via distance is a way to help those students who may not be able to travel to attend courses at the university level.

Graduate engineering students bring many different needs, desires, and worldviews to the classroom [3]. The study that follows was part of a larger NSF-funded project that primarily focused on two specific groups of students within graduate engineering education. One group is denoted as Returners, who are defined within this study as those students who have completed their undergraduate degrees five or more years before returning to obtain a master's in engineering. They may have completed other training or another master's but have waited this length of time before enrolling in a graduate engineering program. Direct Pathway students are those who have elected to enroll in graduate school for a master's in engineering or who have

completed a joint bachelor/master program concurrent to or less than five years from when they completed their undergraduate degree.

Research Questions

The focus of the overarching study was on adult learning and adult learners. Since graduate engineering students may have spent time in industry, it was also helpful to keep this in mind during the data collection phase. The research questions for this study included the following:

- How do returners' work experiences influence their learning skills?
- What background material do returners forget, and how do they handle that forgotten material?
- When learning new material, how do returners and direct-pathway students construct and organize knowledge, particularly in relation to previous knowledge?

While these questions do not necessarily ask about experiences regarding online learning, respondents were online learners and had opinions regarding this type of learning experience.

Background

Online learning has its roots in correspondence courses that date to the 18th century in the US [4]. With the advent of radio, classes were broadcast to interested learners, and later television programs were used to transmit learning via distance [5].

Not only in the US, but also in Europe, and particularly Australia embraced learning via distance. The School of the Air, broadcast over shortwave radio, was the main education offering for those school-aged children who were growing up on remote sheep stations in what is known in Australia as "The Bush" and who do not have access to organized education due to their distance from cities and other students. The School of the Air converted from shortwave radio to the internet in 2009, and now conducts classes online [6]. As well, Massive Open Online Courses (MOOCs) are available for learning a variety of topics on one's own, with options for certification and recognition [7]. Preparation for K-12 teachers to teach online was realized after courses were in place [8]. Picking up on the need, universities offer online learning certification because teaching and learning online is not the same as the in-person experience. This has been recognized by the Online Learning Consortium, an industry group, in order to support exemplary online course construction and delivery [9].

Attitudes towards online degrees

There are mixed opinions toward learning via distance. It seems that online learning has had to overcome some negative attitudes, which seem to adhere to the notion that it is of lesser rigor than in-person coursework. However, notably, in July 2020, as the experience of forced online engulfed the learning community, researchers found that these ideas are changing. Attitudes to online learning have improved for those previously engaged in online learning as well as those in full-time employment [10]. There is also some evidence to suggest that online learning offers opportunities that in-person courses do not [11].

The online master's degree

Online programs have proliferated. Even before the pandemic, offerings of online master's degrees in all disciplines had been ticking up [12,13]. The online learning and teaching experience is not the same as an in-person course; best practices in online education have become a more important subject of study particularly because of the Covid 19 pandemic, which

shut down all in-person gatherings in 2020. A study by Asgarpoor and Wang gauged effective strategies for various aspects of the online learning experience for students and instructors [14]. At the beginning of the Pandemic, many instructors whose classes could only meet via distance were left to scramble for effective strategies. Online instructors, however, were already better equipped to implement learning via distance [15]. Online degrees are designated as "online" when at least 50% of courses are taken [16]. Employers do tend to support the online option for employees. While some graduate engineering students are able to work as graduate assistants to pay for their degree, other students are able to keep their jobs while pursuing a master's [17].

Graduate engineering students

People go to graduate school for a number of reasons, and these motivations differ. Returner students, those who go back to formal education more than five years after having obtained their undergraduate degree, differ from direct pathway, who return to formal schooling less than five years after their undergraduate studies are completed [3,18, 19, 20] The disciplines for study cover the wide range of engineering, and also include engineering management [3]. There are more than 53,000 graduate engineering students in the United States [21]. They pursue a degree for many reasons [3], but the goals and skillsets, needs, and desires of returners and direct pathway students differ slightly.

Degrees offered online vs online learning

While this study is concerned with graduate engineering education, it is instructive to understand that many degrees are offered online. While some courses in a mainly in-person program of study might be offered online, this research is concerned only with graduate degrees that are offered online. The graduate engineering student is joined by learners in all disciplines. For some areas of study, both virtual and augmented reality are employed to support student learning [22]. Techniques and learning objects continue to proliferate. Online learning and teaching will only become more efficacious and useful as the years go on.

Results

Method. This study was part of a larger, mixed methods project designed to learn more about returner graduate engineering students. After obtaining institutional review board permission, schools of engineering were contacted to distribute emails to graduate engineering students who might be interested in responding. These data were collected in 2016. There were two major activities involved in this study. The first activity involved distribution and analysis of surveys, which were sent to a convenience sample of students whose undergraduate work was done in United States institutions. Respondents were all US citizens or permanent residents. 330 surveys were returned and analyzed. From those surveys, 20 direct pathway and 21 returners were selected for in person interviews. These interviews involved a set of structured questions, a calculus concept inventory, and a concept map that represented their view of engineering. The first part of the study, the survey, is where the data for this paper came from. One of the areas of interest to the project were the experiences of returner and direct pathway online graduate engineering students.

Findings. There were 88 returners (R) and 242 direct pathway (DP) students who returned the survey. Of these, 73 R responded to the question regarding online or traditional coursework. 32,

or 44% of these respondents were online learners. 47 DP of 184 respondents, 26%, were online learners. Table 1 is the difference in age and time in industry for all respondents.

Table 1: Age and time in industry before returning, all respondents.

	R	DP
Median age	36	24
Mean time in industry	9.5	1.3
Median time in industry	6.75	1.25

Table 2: Age and time in industry before returning, online students.

	R	DP
Median age	34	25
Mean time in industry	8.3	1.75
Median time in industry	6	1.75

All students were asked to evaluate the importance to them of courses offered online. The results are in Table 3. slightly more R than DP believed that online course offerings were important or very important.

Table 3: Importance of online coursework

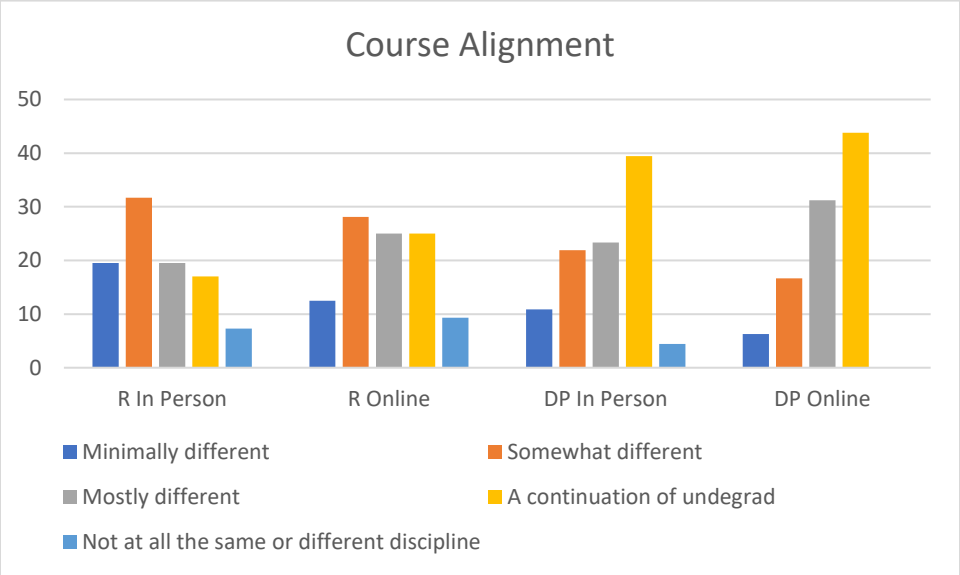
	R	DP	Percentage R	Percentage DP
Not at all	27	85	33.75	39.50
A little	3	15	4	6.90
Somewhat	5	16	6.25	7.40
Important	5	19	6.20	8.83
Very	37	80	46.25	37.20
Total	77	215	~97	~100

Not all students answered all of the questions, so the totals for each question are unique. The percentages reflect the answers to the specific survey question. As well, not all students who responded to this question were online learners. The table above is included to show opinions of the importance of online course offerings. Of these respondents, 42.5% of returners elected to enroll in coursework, while only 25.6% of direct pathway did.

Respondents were asked how confident they were to complete the graduate program of study. The differences between online and traditional direct pathway were closely aligned at 73% fairly or totally confident for online students and 70% for in person students. For returners, though, online students were 90% fairly or totally confident, while only 79% of in person students said they were fairly or totally confident to complete their graduate program.

Course Alignment
Participants compared the alignment of graduate program coursework to their undergraduate programs and how closely the two could be said to align. Figure 1 shows the breakout of these answers by group and whether the student was attending online or in person.

Figure 1: DP and R Course Alignment



Results show that DP students identified that online and in-person coursework seemed to be a continuation of their undergraduate studies, which were within five years in their bachelor's experience. For R, though, in-person coursework seemed different in their graduate programs than their bachelor's degree coursework, but less so in the online environment.

Grade Point Average (GPA) and Confidence to Complete
The majority of respondents who attended online reported that their GPA was between 3.3-4.0 on a 4.0 scale and were "confident" or "very confident" that they would complete their studies in the timeframe that they predicted. This held true for in person students as well. 96.4% of returners, and 97.6% of direct pathway students reported their extreme confidence to finish by the date they specified.

Students were asked to leave any comments they thought might be of interest to the researchers about their experiences in graduate school and that were not asked. Two DP specifically stated they sought out online only programs. "I am an Engineering Online student, so I want to specify how important it is that there is an Online Option." A few other graduate students had opinions both positive and negative about the online experience and the efficacy of it.

In the further comments section of the survey that was distributed to respondents, they had many comments about their graduate experience. The following comments were specifically related to online coursework:

> Student 1: My wife is in the military so having a flexible 100% online curriculum was the most important to me.
>
> Student 2: Engineering online is a great program for engineers looking to complete a masters degree while working full time. I have really enjoyed it and can say nothing bad about the program.
>
> Student 3: This is my first online degree that I'm taking, so it is an interesting learning curve compared to physically being in class.
>
> Student 4: Colleagues are usually respectful and accommodating, but the main things I've heard are "Why the heck would you do that" and complete puzzlement that I can get a degree from a University that I've never been to (My program is completely online). This is as much from young engineers (3+ years of age) [sic] as it is older engineers.

Some students had opinions regarding relationships with advisors online:

> Student 5: It is difficult to establish a relationship as an online student.
>
> Student 6: As a student in a 100% distance education (online) program, advising is mostly nonexistent. All students are required to have an advisor assigned to them, so I know I have one, but I'm not entirely sure who that person is, nor have they ever introduced themselves.
>
> Student 7: Since I am an online student, most of my communication is via email or phone. It is easy to schedule phone calls through email exchanges.
>
> Student 8: We have minimal communications as I am an online student.

Comments on the overall perceptions of the online experience follow.

> Student 9: USC has been a great experience. I have two classes left, and although I have taken all my courses online, I do not feel as if my degree is watered-down or less valuable than a degree obtained while attending class in person.
>
> Student 10: Able to participate in classes from a distance (watching lectures online, being in teams, etc), very similar to the on-campus experience.

The combination of the ability to complete the degree while attending classes part time, and added to that the employer's willingness to pay for it made a choice easy for some. The flexibility was alluring to many.

> Student 11: I chose my program because it only had 8 actual courses to take, which would take 2 years to complete doing part time, the institution was regarded very highly, the courses offered were of great interest to me, the

> Residencies required gave me the impression that I would be well-integrated into the program as a distance student, and my employer agreed to pay for my tuition costs. If there wasn't an online option and my employer did not pay, I would probably not be doing the program. I feel that I have been able to work in teams very well, and my curriculum is very applicable to my current job and where I want to go. The case-study model used by the program has been very interesting, relevant, and helpful.

> Student 12: The Global Campus with KSU allows me flexibility to watch classes and complete homework when I have time available instead of adhering to a rigid class schedule. Life is full of activities and finding time can be difficult but online course work has enabled me to pursue my masters.

> Student 13: This is a pure online program, a professional (as opposed to an academic) master's degree in computer science--data science. It was very important to join a growing, high salary field. My university has an excellent reputation, which was very important to me. Also, it is very affordable ($20,000 for a 32 credit program) which was also important.

Not a particularly targeted comment, but one student felt strongly that online courses are not as rigorous as in-person coursework.

> Student 14: I think online courses are not good; talk about lack of academic rigor and proliferation of non-sense [sic] degrees. Hey, half the troops these days have a bachelor's degree...ain't you heard, it's in organizational management, from American University...online. Online is only good for low level gen eds, and only because people don't take those very seriously...you're still getting a better gen ed experience with bricks and mortar.

Finally, a student really wanted more research in the area of online learning and to be able to speak to it:

> Student 15: Due to the increasing number of online base programs, it would have been nice to have the questions directed in that direction. This questionnaire seemed to focus more in general and my answers to the questions could provide misleading statistics if lumped together with on campus students.

Discussion

For the purposes of this discussion, online coursework refers to those students who attend their courses via distance, either synchronously or asynchronously. Because online learning can mean that students take some courses in person and others online, this paper is only looking at data from those students who complete their graduate coursework online only. As outlined in the literature review, online degrees denote that at least 50% of coursework is delivered online [12].

Choice of Course Delivery

Returners more than direct pathway elected to enroll in online programs. For older learners, locale-based programs may not be available because of family or work responsibilities. Younger learners may be able to move to the location where the program is being offered, so there is less pressure to attend online. Returner learners who elected to take an online degree tend to skew slightly younger and with less years in industry than the returner group overall. It is not clear why this is so, but other research has shown that returners tend to change disciplines at a fairly high rate [1, 15]. Online learning may be quicker and more facile than attempting to find a traditional master's program in their geographic locale.

Performance

In terms of performance, it is difficult to compare the work of online students to those in classrooms that meet regularly. However, the GPA of the online graduate engineering students holds up to those of traditional classroom students. It is of interest to note that the age and time in industry of the returners who do opt to attend classes online tend to skew slightly lower than those in a traditional classroom, while for the direct pathway age and time in industry are higher than those students in traditional classrooms. Since this research was conducted, everyone who was working or in school during the Covid 19 pandemic has had a chance to experience the online environment for themselves. Enrollment in online classes seems to be ticking up [19]. It would be of interest to determine whether more engineering graduate students attend or would opt to attend online courses after this experience. When looking at the confidence to complete coursework, online returners specifically said even more than direct pathway at 90% that they would complete their program. It could be that attendance in these courses was much more flexible than in person attendance.

Perceptions of online graduate engineering education are varied. The option to complete a master's degree via distance has been a game-changer for some students. Others feel the pain of isolation regarding communication with others in the program as well as officers of the school environment, such as advisors. This may need to be examined further in order to understand the breakdown in communication in a world where instant messaging is ubiquitous.

Because there may be more of a learning curve for instructors to teach in the online environment, an understanding of the system of teaching and learning online, as well as best practices, needs to be more intentional. Universities are meeting the challenge of online teaching by providing training and advice to create learning environments that support the adult learner. In addition, instructors who are not trained instructional technologists and may not have the tools to create an online learning experience that rises to their standards have trainings in which they can participate in order to create the courses they envision. Support is available and instructors can take advantage of the expertise of instructional technologists and learning engineers to create the types of learnings that support students and the content.

The overall study focused on the differences between R and DP as learners and as adult learners. One of the differences seems to be that R tend to find the online option for a graduate degree is desirable, because many R opted for this course of study. It can be seen that online coursework is more flexible in that one does not have to appear on campus to take the course, one can log on when there is time to work on the course.

Online coursework has gone from *nice to have* to a *need to have.* Since the early 2000s, online learning has grown, and master's degrees are part of this growth. Both of us (researchers) teach online courses. We find that the locale-specific programs do work for some, but for others who for whatever reason—be it employment, family, or other choices—the online degree may be the only option to pursue higher education. For instance, when a learner cannot leave their employment but would like to attend formal education coursework, the online degree option is the only choice for this learner. The online option gives more flexibility for learners.

Conclusion and Recommendations

The respondents to this survey were a convenience sample of graduate engineering students who are already enrolled in programs across the United States. For those engineers who did not go to or were not accepted into a program, online offerings might be an enticing way for them to continue their education. Since all students at the present time have had an opportunity (or were forced) to interact online with instructors, it will not be totally foreign to anyone and is an option. Online learning seems to be gaining traction at all levels, but especially at the graduate level [23]. It would be of interest to know whether more master's in engineering students would opt to attend graduate school if online options were more commonly known and available. As well, this study did not look to answer whether students with disabilities might have unique needs. This is an area that is of interest to instructors and instructional technologists alike, and merits study. Neurodivergent learners may find the online environment more conducive to success than in the traditional classroom. In addition, as a field, engineering skews white and male. An online learning option may promote inclusion and diversity for underrepresented minorities and women. Studies outlining how online learning may support all students are needed and encouraged.

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