Comparison of Advising Needs for Returners and Direct-Pathway Students in Master's Programs in Engineering

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Abstract
Advising of students at all levels is important in supporting student success. In this work, we examine the differing needs of returners, those who have been out of school for at least five years between their undergraduate and graduate degrees, and direct pathway students, those who have had less than a five-year gap between completing their undergraduate degree and beginning their graduate work, in engineering master's programs. A large-scale national survey was conducted, which included questions on many topics including advising. While there were many areas in which the two populations were the same, several key differences emerged, with returners placing a higher value on course planning topics than direct pathway students did, and less value on advising focused on plans beyond the completion of the master's program.

Introduction
Advising is a major component of an academic program in many disciplines, including engineering, and many levels of study. The master's degree level has some unique features, as the master's degree could be a primarily course-based program, a research-based program, or some mix of the two; they may also range from being a very prescribed course of study to a very open-ended program with a great deal of room for student choice of courses. Another variation comes from the students themselves; they may come from any of a wide variety of backgrounds, with some students proceeding directly from their undergraduate degree to graduate school with little or no time in between and others spending significant time in industry before returning to school for their graduate degree. We term these students direct pathway and returners, respectively, with a five year gap between receiving the bachelor's degree and starting the master's degree marking the boundary between the two groups. Their differing backgrounds contribute to differences in their needs and expectations from an academic advisor, and understanding these needs and expectations could help universities to provide more effective advising and mentoring to these students.

Background
Graduate-level returners in engineering programs have been the subject of rigorous research for approximately the past ten years. Prior to that time, there was little literature on the subject, and what existed was primarily anecdotal (e.g., [1]). The research on returners has included some studies on exclusively doctoral students (e.g., [2], [3], [4], [5]), work that included both doctoral and master's students [6], [7], [8], and work focused exclusively on master's students (e.g., [9], [10], [11]).

Returners have many different possible reasons for returning to academia for graduate degrees. These may include many of the same reasons that direct pathway students pursue graduate degrees, such as the desire for jobs that require graduate education, but it may also include reasons that do not necessarily apply to direct pathway students, such as the desire to change careers [8]. These differences and others, such as the difference in outlook characteristic of adult students [12], [13], contribute to their particular needs in the advising process.

Graduate student advising and mentoring is acknowledged as being a key contributor to success [14], particularly for Ph.D. students [15], [16] and for students who are under-represented in engineering [17]. With a close and healthy advising relationship, students tend to see a lower time to degree, higher completion rates, and numerous other positive outcomes [18]. Demb [19] reported that a good advising relationship included five critical areas, specifically:

- Demonstrating respect for the student and valuing their ideas;
- Trust;
- Providing challenge, feedback, direction, and conceptual support;
- Appreciating the difference between an advisor and a mentor; and
- Investing in the relationship by sharing personal experience while maintaining appropriate boundaries.

The area of master's degree advising, however, is far less studied, although it has been included as an element of a larger study (e.g., [20]). Some of the characteristics of good advising at the doctoral level may apply, particularly when a master's program is focused on research. However, many students pursue a course-based master's degree, for which research mentorship simply does not apply. There are other variations in master's programs, including the recent growth of online programs in many fields including engineering [21], [22], and the fact that they may be completed either full-time or on a part-time basis.

Methods
In this study, a survey was designed and deployed in a web-based format to allow participants at any location to complete it. Recruitment was performed via e-mail, with a variety of universities within the United States asked to distribute information to their students. A rolling recruitment process was used, in order to ensure that a sufficient number of returners would be included in the responses. The survey population was limited to citizens and permanent residents of the United States, in order to eliminate variables due to cultural differences and variations in international undergraduate education. Ultimately, 300 valid survey responses were collected.

The survey included a wide variety of questions on many topics, including past experiences, motivation, learning in the classroom, decision process, and future plans. In this particular study, the focus is on a subset of questions dealing with student advising. Survey respondents were asked a number of questions on advising. These questions included the following:

Is it required in your program for you to have an academic adviser? (Yes/No/I don't know)

Do you have an academic adviser? (Yes/No)

What do you need from your academic adviser?
Frequent meetings
Course scheduling
Personal supportiveness
Ease of arranging a meeting
Assistance with academic difficulties
Career advice

> *Advice on future academic plans*
> *Advice on suitable academic courses*
> *Other needs*

How well does your adviser meet your needs? (five-point Likert scale, from Extremely Helpful and Supportive to Not at All)

Is there anything else you would like to add about your academic adviser?

In addition, a question was asked about the degree of structure in the participant's program. Specifically, participants were asked the following question:

Some masters programs have a set course of study with very little variation in coursework allowed, while others are not. How would you characterize your program?
> *Very structured. Courses build on a set, specific sequence for any concentration*
> *Introductory courses and subject-specific courses need to be taken in a sequence*
> *Courses need to be chosen from a group of options, taken in any order*
> *There are only a few required courses*
> *Not at all structured (courses can be freely chosen and taken in any order)*

This question was also analyzed as part of this study, as it was hypthesized that the degree of structure in a program could influence students' advising needs.

Survey data analysis was carried out using standard statistical methods, with Chi-squared tests used on categorical data and T-tests used for Likert scale data to determine whether differences in the populations were significant.

Findings
Participants' responses on whether or not they are required to have an advisor are shown in Table 1, with percentages based on those who provided an answer to the question. Approximately three quarters of the participants were required to have an advisor, and there are no significant differences between returners and direct pathway students. Those who answered "yes" or "no" did not answer the follow up question of whether or not they had an advisor; of those who said they did not know whether an advisor was required, the responses on whether or not they did have one are shown in Table 2; the percentages given are based on those who answered that specific question, rather than the total sample size of the returner and direct pathway populations. Again, there are no significant differences between returners and direct pathway students.

Table 1: Requirement to have an advisor

	Yes	**No**	**I don't know**
Returners	62 (78%)	10 (13%)	8 (10%)
Direct Pathway	162 (74%)	29 (13%)	27 (12%)

Table 2: Advisors for those who did not know if it was required

	Yes	No
Returners	5 (63%)	3 (38%)
Direct Pathway	17 (63%)	10 (37%)

When asked about their advising needs, some needs were more highly rated by both groups. Advice on suitable academic courses, for example, was very highly rated by both groups. The ranking of the items was slightly different for the two groups, as seen in Table 3.

Table 3: Relative importance of various advising needs

Advising Need	Ranked by Returners	Ranked by Direct Pathway
Advice on suitable academic courses	1	2
Course scheduling	2	4
Future academic plans	3	1
Assistance with academic difficulties	4	7
Ease of arranging a meeting	5	3
Career advice	6	5
Personal supportiveness	7	6
Frequent meetings	8	8
Other needs	9	9

One of the most striking differences in the rankings is in assistance with academic difficulties. This was ranked fourth overall for returners, while for direct pathway students it was ranked seventh. Other differences in ranking were relatively small, with at most a difference of two places, and many items were quite close together.

There are also differences, for various items, on the importance that returners and direct pathway students placed on them. Chi-squared tests were performed on these differences in order to determine significance, and the differences are shown in Figure 1. As participants could choose multiple options, percentages do not add up to 100%, and are based on the total number of participants in each category. The significant differences are in frequent meetings, ease of arranging a meeting, course scheduling, future academic plans, and career advice.
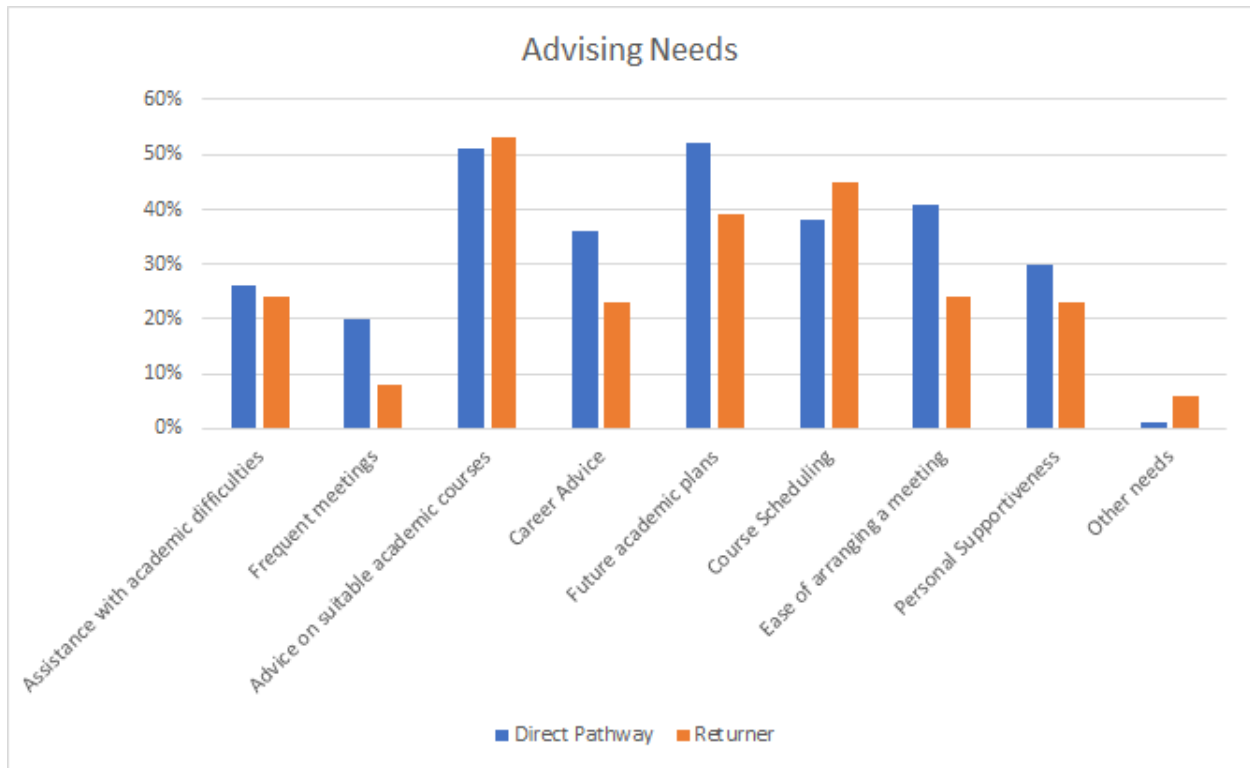
Figure 1: Advising Needs of Returners and Direct Pathway Students

Returners were more likely to feel that they needed help with course scheduling from their advisor. They had a much lower need for help with future academic plans or career advice, as well as with frequent meetings and ease of arranging a meeting.

In answer to the question about how well the advisor met a participant's needs, advisors generally were highly rated, with an average rating of 3.7 on a five-point scale for returners, and an average of 3.8 for direct pathway students. A standard T-test indicated that there is no statistically significant difference between these two means, indicating that returners and direct pathway students do not see differences in how well their advisors meet their needs. This matches with the distribution of ratings for both groups, with similar percentages in each of the five levels on the Likert scale. Percentages are based on the number of participants answering this particular question.
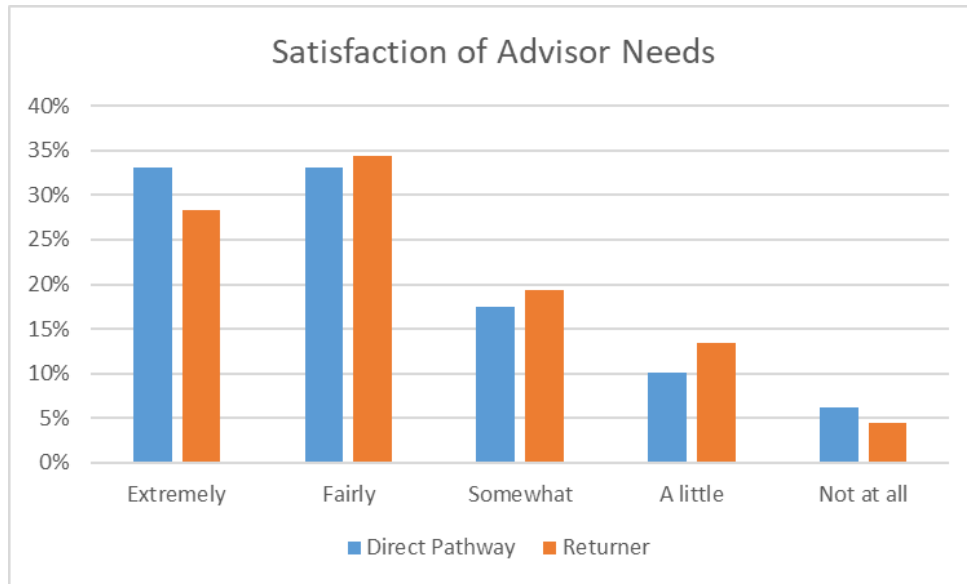
Figure 2: Satisfaction of Advisor Needs for Returners and Direct Pathway Students

In addition to the analysis of the advising questions alone, the relationship between advisor satisfaction and program structure was analyzed. No clear picture emerges, nor are there any statistically significant differences between returners and direct pathway students; thus, the hypothesis that satisfaction with advising would be influenced by program structure is not supported.

When asked for any other information participants wanted to provide about their advisor, there were several general areas in which participants commented.

Distance Program students
Several of the participants were in distance programs, both among the returners and the direct pathway students. These students felt far less connection to their academic advisors, and far less need of their advice. Comments from returners were as follows:

> My program is distance education so my advisor's main purpose is to make sure I am taking classes that meet the program requirements.

> As a distance student I just get an advisor assigned to me and basically never meet with them in person. That said, I've never extensively sought their input.

> Only one advisor for all distance ed students, so there is no opportunity to build a real relationship with the advisor

Direct pathway students in distance programs made similar comments:

> 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.

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.

Among those not in distance programs, returners exhibited a lower rate of dissatisfied comments about their advisor. In Table 4, comments by returners are given, along with the type of program structure and degree of supportiveness they reported. While one participant reported that their advisor "does the minimum", the majority reported that they were getting what they needed.

In Table 5, comments by direct pathway students are given, also with the type of program and supportiveness indicated. Unlike the case for returners, some of the direct pathway students did not feel that they were being well advised, with some of them describing their advisor as "Very slow, very unaccommodating", or as being unresponsive to emails. This was not universal, however, as some of them found that their advisor was very supportive.

Table 4: Returners' Views on Advisors

Structure of Program	Supportiveness	Comments about Advisor
Courses need to be chosen from a group of options, taken in any order	Somewhat supportive	does the minimum.
Introductory courses and subject-specific courses need to be taken in a sequence	Extremely helpful and supportive	Very available through email and helped devise a path to being accepted into the program
Courses need to be chosen from a group of options, taken in any order	Extremely helpful and supportive	He is very honest, and wants nothing more than for me to get the most out of my Master's education even if that means modifying my program from a Non-Thesis one to a Thesis one.
Courses need to be chosen from a group of options, taken in any order	Extremely helpful and supportive	She's very approachable, professional, and helpful. She is also transparent. It was great to get to talk to her before I ever started the program.
There are only a few required courses	Fairly supportive	Accessibility to the academic advisor is critical. (S)He should make time to tend to advisee needs, academically, professionally, and personally.
Very structured. Courses build on a set, specific sequence for any concentration	Somewhat supportive	He's ok, by big research university standards. He feels cold when I talk to him, he doesn't give me the inside scoop on anything, and ultimately, he has better things to do. However, we're all adults, he's not my mental wet nurse, and at the end of the day, he does his job and I do mine.

Table 5: Direct Pathway Students' Views on Advisors

Structure of Program	Supportiveness	Comments about Advisor
Courses need to be chosen from a group of options, taken in any order	Not at all	Very slow, very unaccommodating (unlike undergrad, where the advisor helped a little). No flexibility in choosing classes
Courses need to be chosen from a group of options, taken in any order	Somewhat supportive	We reach out to them, not really the other way around.
Introductory courses and subject-specific courses need to be taken in a sequence	Fairly supportive	He is the head of the Mechanical Engineering department. It's a large department at {redacted}, so, considering that, he's doing pretty well.
Courses need to be chosen from a group of options, taken in any order	Not at all	Has never responded to my advising related emails
Not at all structured (courses can be freely chosen and taken in any order)	Extremely helpful and supportive	Very supportive and would like me to pursue PhD. She believes I would do well in research and should stay for PhD program.
Very structured. Courses build on a set, specific sequence for any concentration	Extremely helpful and supportive	I'm coadvised for my Master's and PhD programs
Courses need to be chosen from a group of options, taken in any order	Fairly supportive	I chose my advisor because after talking with his current graduate students, I knew that he would be demanding but also allow me to grow very much as an engineer.

It is also noted that, proportionally, more returners commented on their advisor; there were significantly more direct pathway students in the survey population, but approximately equal numbers of returners and direct pathway students commented.

Discussion
As stated, there are no differences between returners and direct pathway students in whether an advisor is required or whether a student has an advisor, most likely because this is influenced by the program, not the student; it does indicate, however, that returners and direct pathway students are not self-segregating into different programs based on advising.

The differences in what students need from an advisor indicate that returners feel much less of a need to consult with their advisor on future plans and their career. This may be due to the fact that they have already started on their career path, and have a clearer idea of where it is headed. Their previous experience may make them more independent, which aligns with the lower need for frequent meetings and the corresponding need for ease of arranging meetings. However, they do need more assistance with course scheduling. This could come from several sources; if they have family or other responsibilities, they may have more constraints on their availability to take courses. They may also need advice on courses because they have taken pre-requisites farther in the past than direct pathway students, and are unsure whether they are properly prepared. This merits further investigation, but it does point to the need for advisors to be prepared to provide these students with more help in planning out their courses.

The comments from participants indicate that returners feel their advising needs are, generally, being met. Even with the most negative tone ("does the minimum"), the participant felt that their advisor was somewhat supportive. This could indicate that returners have fewer needs for their advisor, or that they are more proactive about seeking out advice when needed. In contrast, several direct pathway students had negative comments about their advisor, such as the participant who indicated that they had never received a response to advising-related emails.

The results of this work have several implications for graduate advising. One such implication has to do with timing; given returners' stronger need for advising related to course planning, the timing of advising meetings could be specifically and intentionally chosen based on registration deadlines for courses. While advisors can and should be available for other advising functions, knowing what returners typically need can help them to align their timing and agenda for advising meetings to best serve their needs. They may also wish to pay particular attention to issues of pre-requisites and when they may have been taken, as that is more likely to be an issue for returners than for direct pathway students.

As direct pathway students expressed more of a need for advice on career planning than returners did, advisors can ensure that they do include that in the agenda for advising meetings for these students. If there are a significant number of returners at a given school, they may also reach out to advisees of theirs who are returners to participate in career-related discussions with direct pathway students, in order to leverage their experience and perspectives.

Limitations
One major limitation of this work is the lack of any information on how representative the sample of returners might be. Returner status is currently not a tracked demographic, and there is no data on how many returners there are in the overall graduate student population. This limits the ability to draw strong conclusions that can be generalized.

Furthermore, there is limited research on advising at the master's level. Given the diversity of master's programs, including online and in-person, research-based and purely course-based, advising could take many forms. Further research on the advising needs for students in all master's programs is needed, and the limited research on this topic poses difficulty in setting returners' specific needs into a larger context.

Conclusion

In this paper, the advising needs of returners and direct pathway students in master's programs have been examined, based on survey data collected in a nationwide survey. In many areas, there were no differences between the two populations. However, it was found that several key differences existed. Returners have less of a need than direct pathway students do for discussions and advising on their future academic and career path, and place more importance than direct pathway students do on course planning advice. Overall, returners' comments indicated that they were generally satisfied with the type of advising they received. This information could be used by academic advisors to better serve the needs of both populations in their efforts to advise students in engineering master's programs.

Acknowledgements

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