

The contribution of office-hours-type interactions to female student satisfaction with the educational experience in engineering.

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Abstract

Recent literature includes discussion about many female students' need for a *personal* type of a professional, professor-student relationship to feel connected to the course and to a major.^{1,2} Our research builds on these findings to emphasize the importance of positive experiences during office hours to female students. We interviewed 41 students from the School of Industrial Engineering at the University of Oklahoma to analyze the unexpected success that this School has had in attracting and retaining female students. In our sample, female participants commented spontaneously on office-hours-type-interactions considerably more often than the males did (90 vs. 55 comments). Students of both genders reported many more positive experiences (56) than negative experiences (3) with IE faculty in particular. This suggests that the high quality of faculty-student interactions outside of class is likely to be one factor affecting the attainment of gender parity in this program.

Introduction

P: If I could tell somebody one thing, that's it [go to office hours]. Because all the other stuff is a give-me. I mean, yeah, study, yeah, go to class, duh. I mean (laughing) but the office hours and the professors, I don't think people think of that. Because I, I didn't do that when was it - probably those semesters I was struggling I didn't go to office hours, you know. And I don't know if there's a direct relationship between when my grades started getting better and whenever I started camping out in the TAs office. I don't know. [senior, female, industrial engineering major]

Interactions between students and faculty are the foundation of higher education. Students and faculty interactions within the classroom have been, and will continue to be, widely studied.³ Although out of class interactions have also been studied for several decades and likely play a significant role in students' educational experience, they have been less studied than in-class interactions.

By office-hours-type interactions we mean interactions between students and faculty that occur outside of the confines of the classroom. While posted office hours are one example of this type of interaction, we also include informal interactions such as those that occur when faculty and students meet in the hall, or meetings in the office that occur at times apart from posted office hours. However, for brevity, we refer to all of these office-hours-type interactions as office

hours. Interactions that occur when faculty mentor student groups, such as technical societies, or that occur away from campus, such as when students and faculty interact at a restaurant, are not included in this category.

Background

There are many reasons that a school within any university should emphasize and scrutinize office hours. Office hours have long been recognized as an important part of the educational process with articles and books offering suggestions to faculty for better office hours efficacy.^{4,5} There are also references to office hours as an integral part of successful department practices that do not discuss methodology.⁶ There is research evidence that students value the office hours experience. For example, one study found that for students who attend office hours on a regular basis, the office hour visit can be as important as class sessions.⁷

Studies show that student interaction with faculty (and peers as well) outside the classroom are positively related to gains in general cognitive abilities^{8,9,10} and motivation. Critical thinking skills have been shown to improve with increased interaction between faculty and students outside the classroom.¹¹ Student motivation has also been correlated positively with the frequency of both informal out-of-class contacts with faculty and office hours visits.¹² The same study also showed that student motivation correlated positively with the length of office visits with faculty.

Office hours provide students with the opportunity to get to know the professor more personally. The act of advising a student, for example, represents an opportunity for a significant personal relationship between faculty and students to develop.¹³ Since the most positive factor in student retention in certain college settings is the caring attitude of faculty and staff,¹⁴ office hours can contribute to student retention. A good way to communicate caring and concern is to give students the opportunity to be heard, and to know that their ideas are important to their professors. It makes the students feel worthwhile.¹⁵ Thus caring contact with students during academic advising and office hours may contribute to student retention.

It has been shown that in male dominated fields, women's confidence diminishes with time and drops in confidence precede drops in interest.² It has also been shown that the learning experiences of girls are more passive, less demanding and less experiential—even in all-girl's schools^{16,17,18,19} This suggests that situations such as office hours, where a student can receive one-on-one attention without the potential for public embarrassment, would be particularly attractive to female students (although some male students could also benefit). In fact, females have been found to consider office hours to be more important than males.²⁰

Lower levels of self-confidence exist for females in science-related majors, and are not necessarily warranted based on knowledge of material.²¹ Many academic problems for female students are not due to innate lack of ability but to inadequately developed skills and low self-concept resulting from negative attitudes on the part of teachers.²² Studies have shown that females tend to get higher college GPAs in mathematics than males with comparable SAT scores. Yet females still tend to feel less secure regarding their math skills than males do.²³

Women tend to need reinforcement to overcome this self-confidence issue and may see office hours contacts as a way to measure how they are doing in the professor's opinion. According to Tinto, "The occurrence of largely informal contacts with faculty outside the classroom appears as a consistent factor distinguishing those who stay (in school) from those who voluntarily withdraw".²⁴ Positive office hours experiences can help improve self-confidence as well as satisfying the need for these important "informal contacts with faculty".¹² Students tend to remain in environments where they feel comfortable and satisfied.²⁵ A lack of self-confidence can lead to a lack of satisfaction with coursework and then lead the student to seek a more comfortable environment.

Research Design

In 2002, we began interviewing students from the School of Industrial Engineering at the University of Oklahoma (IE at OU) to investigate the unexpected success that this School has had in attracting and retaining female undergraduate majors (National Science Foundation under Grant No. 0225228).^{1,2} In 2001, for example, IE at OU had 58% female enrollment versus the national average 25% degrees granted. As of Fall 2004, female enrollment in IE at OU was 45% (54/119).²⁶ This paper examines one aspect of the larger ongoing study, which continues to recruit participants.

Students were recruited to participate in 1-1.5 hour long interviews. Of the 41 participants in this data set, 23 were female (56%). Female students were slightly over-sampled by design because the focus of the study was gender equity. The semi-structured interview protocol probed students about their experiences as IE majors and as college students, including explicitly asking for their best and worst experiences with faculty members. The protocol did not include a specific question about office hours, although one interviewer did probe a single student on the subject. That instance was removed so we could focus on comments that students made spontaneously. Student responses were recorded, transcribed, and analyzed to identify patterns. The importance of office hours to students emerged during an analysis of comments related to student-faculty interactions.

Quantitative Results

Transcripts from the interviews were coded using the qualitative software, NVivo. From these coded transcripts excerpts were found that had occurrences of "office", "office hours", "help", "assist", "discuss", "willing", or "personal". Table 1 shows the distribution of comments by gender. As patterns emerged, comments were clustered by similarity and then tallied. Table 2 gives the details of the tallies. For all of the quotes, *I* refers to the interviewer, *P* refers to the student participant, and all identifying information has been removed or replaced; furthermore, the quotes have been cleaned for readability (e.g., instances of "you know" and other verbal pauses have been removed).

For example, one student said,

I: Like what do you think are the positive things here at OU, in the OU I.E. department?

...

P: ... And all of my professors are very friendly open people. It's not intimidating to go talk with them in office hours. They are generally very accessible which are some of the best things about it. [senior, female]

We classified this quote as *positive IE* (denoted POS IE in Table 1). Other quotes in this category also showed praise or appreciation for an IE instructor or general praise for the department with specific reference to office hours. Conversely,

I: If you could give advice to the faculty, what would that be?

...

P: And to have, have office hours that don't conflict with the other IE classes that we'll be taking to make sure that's the case. [senior, male]

typifies *negative IE* (NEG IE).

Similarly, POS NOT IE and NEG NOT IE refer to comments specifically made about office hours within a specific department other than IE;

I: So the, the [other engineering department's] classes were bad, not because of the content, but because the professors weren't

P: ..., but I just felt like the professors didn't want you in their office hours. [sophomore, male]

Comments in the POS IE, NEG IE, POS NOT IE, and NEG NOT IE categories will be referred to collectively as opinionated comments.

Some comments explicitly stressed the importance of office hours without identifying a specific experience or department (POS GENERAL and NEG GENERAL).

I: What advice would you give new students?

...

P: Well, I would say definitely um, take initiative. Yeah, I think it's really hard to be in engineering and just to sit back. You really need to make decisions, especially with the office hours, I definitely encourage them to take initiative with that. [sophomore, female]

NEUTRAL refers to comments made in reference to office hours but held no bias toward good or bad opinions;

I: Yeah. Tell me about your experience with graduate assistants.

P: Graduate assistants. (c) They're kinda mixed. They can be good or bad. ...you get to go to their office hours. And when you go to their office hours, you know, they sit you down. And before they even look at your paper you introduce yourself to them you talk ...

So you get to know them a little better. And then you talk about your

homework. Or your project. [senior, male]

Table 1: Distribution of Comments by Gender

| | female | male | female | male |
|--|--------|------|--------|------|
| number of participants | 23 | 18 | 56% | 44% |
| number of participants who commented on office hours | 22 | 18 | 55% | 45% |
| number of comments | 90 | 55 | 62% | 38% |
| average number of comments | 3.9 | 3.1 | | |

Table 2: Tallies of Student Comments Related to Office Hours

| total comments | | female | male | female | male |
|----------------|-------------|--------|------|--------|------|
| 56 | POS IE | 31 | 25 | 55% | 45% |
| 3 | NEG IE | 1 | 2 | 33% | 67% |
| 7 | POS NOT IE | 4 | 3 | 57% | 43% |
| 15 | NEG NOT IE | 9 | 6 | 60% | 40% |
| 43 | POS GENERAL | 31 | 12 | 72% | 28% |
| 8 | NEG GENERAL | 7 | 1 | 87% | 13% |
| 13 | NEUTRAL | 7 | 6 | 54% | 46% |

The total number of spontaneous comments (145, 3.5 per participant) indicates the importance of office hours to students. Females were much more likely than males to make an opinionated comment about office hours in general (38 to 13). That is, the females in our sample made nearly 3 times as many opinionated comments as men. In particular, the women were more likely to praise (31 to 12) but also much more likely to express distress (7 to 1).

Comparing the opinionated comments about office hours in general (13) to those about IE office hours, men were more than twice as likely to make a comment specifically about IE (27). On the other hand, women expressed somewhat more opinions nonspecific to department (38) than regarding IE (32).

Interestingly, the proportion of comments made regarding POS IE, POS NOT IE, NEG NOT IE, and NEUTRAL parallel the respective percentage of each gender in the data set. The number of NEG IE comments was too small to make comparisons, but this lack of negative experiences is noteworthy.

Qualitative Results

The volume of comments emphasizes the importance of office hours to students. This section offers examples of comments in three categories: general comments about office hours, comments about negative experiences, and comments about office hours in IE at OU. The positive remarks made regarding IE at OU indicate a sense of the student-centered atmosphere that exists within the department.

Again, in the quotes below, *I* indicates probes from the interviewer, and *P* indicates responses from the participant. Each quote is succeeded by an indication of the classification and gender of the student in square brackets. Furthermore, each quote has been edited for readability (e.g., instances of "you know" have been removed) and names have been replaced with relevant descriptions.

As indicated in Table 2, women made nearly three times as many general comments about office hours as the men did. For example, many participants said that they would give advice to new students similar to:

P: Just get to know your professors well and get them to know you well. I think that has helped me so much. Being able to talk to my professors and stuff.
[senior, female]

Several of these comments specifically suggested going to office hours to accomplish this goal. The prevalence of these comments underscores that, to students, office hours are far more than an opportunity to get homework questions answered.

Most of the comments about negative experiences were outside of IE (3 about IE vs. 15 about other). In some cases, negative experiences with office hours shaped students' perception of courses.

I: And what about you're least favorite general engineering [course]?
P: [course name] I'm sure he's a nice person but he wasn't a very good teacher, and I had a really hard time with the subject anyway. I had been into his office hours and it wasn't very beneficial to me. [senior, female]

I: What's the worst experience that you've had with a faculty member?
P: [course name] Probably this might have been just a personality thing. I'm sure he's a nice person but I thought that he was kind of degrading and like all about if you're, not if you work hard but if you're a smart person and I worked really hard in that class to get to my C and I went in to talked to him in office hours and he made me cry (l) I ended up crying so I was so frustrated with the class and he felt really bad after making me cry. But I don't know, I was asking him something and then he was like this "why don't you get this?" or something like that.
[senior, female]

Other students described instances of faculty not attending office hours and faculty busy with non-student work during prescribed office hours. In one case, a negative interaction with a faculty member during office hours had shaped a female student's career path. She changed her major to IE because a faculty member in her former major offended her by suggesting that she "wouldn't want to work [and that she] would maybe want to stay home and have kids".

In contrast, several participants compared the student-centered attitude of the IE faculty to their experiences with faculty in other departments.

P: ...they [IE faculty] really do a great job. They really have a way of making themselves available all the time to you, I mean, even outside of their posted office hours and everything. (If) you can catch one in the hall, they will stop and help you. They really do just a great job. I've been really, really happy with the IE faculty, especially you know even in comparison with the rest of the classes that I've had, it's just really an incredible group of people we (IE) have. [junior, female]

P: [in response to question about what advice would participant give to a new student in IE]

... I think that has helped me so much. Being able to talk to my professors and stuff. In the IE department it's so easy. It's like, some departments, you know, you have to call, you know, make an appointment, email to make sure they're gonna be there, wait in the hall for thirty minutes until they have time for you or whatever. [In IE] it's so easy, you just walk in and you talk to them.... [senior, female]

P: ...I didn't really like the professors [in the other engineering department where student majored] either. I noticed a lot of them, like I notice in industrial engineering department the professors are more like a friend, I noticed, but in [other engineering department], they're more of an enemy. (chuckles) Someone that's out to get you... [senior, male]

Students appreciated the fact that IE faculty, who are obviously busy, make time to interact with students informally and treat students as important.

P: Recently I really appreciated one professor that she's pretty high up and involved in a lot of stuff and I came to ask her about homework ... She actually had a meeting scheduled then but she said that was under the stipulation that the students came first and she was just really nice about me being there, and really very helpful. ... She was very like, said several times "don't be afraid to come in, we're here, office hours are for you guys" and it was very nice. [senior, female]

P: When you see them outside of class, there's not the wall between faculty and students. I mean, they're right there and you know you'll see them in the hall and they'll say hey to you before you say hey to them. So, it's real friendly. I feel like I can walk into any of their offices, outside of office hours and have a good chance that they'll talk to me and it's not like 'this is my time, not yours', they're real giving. [senior, male]

In fact, some participants mentioned out-of-class access to IE faculty even when asked specifically about in-class interactions.

I: How about in the classroom? Are they encouraging that way?

P: Yeah, they, they want you to ask questions. They want you to learn. They have the office hours. Some you can just walk into their office any time. There's no need to set up appointments, and so yeah, very encouraging. [senior, male]

Even when asked to describe their worst experiences with faculty, many participants commented instead about the high quality of interactions with IE faculty.

I: And have you had a worst experience with a faculty member?

P: Not in our department. Everyone seems very open and friendly. They want to make sure you are doing okay in your personal life as well as in your scholastics. [sophomore, female]

These interactions lead to an environment that one student described as a family, and many described as friendly:

I: What do you think are the positive things in the OU I.E. department?

P: Family atmosphere definitely ... The way the professors cooperate with each other. And all of my professors are very friendly open people. It's not intimidating to go talk with them in office hours. They are generally very accessible which are some of the best things about it. [senior, female].

I: Okay. What do you think it is at OU that works, what makes that department work?

P: Probably the friendliness of the faculty and usually the willingness to sit there and listen and help [senior, male]

Conclusion

Office hours are an important part of the educational process in colleges. Yet, little research has been conducted in this area. In this study, we have examined the students' perception of the quality of office hours, not the quality of office hours experiences themselves.

The literature indicates that office hours are disproportionately important to female students.²⁰ Our results concur with this finding. However, as evidenced in our results, the value that females place on office hours still does not ensure that they always utilize office hours, nor does it mean that they feel their needs are always met when they do go to office hours.

Also in agreement with the literature, our analysis documents issues that students have regarding poor experiences with faculty during office hours.⁷ When a negative behavior occurs, the student is left with negative feelings regarding the incident and sometimes those feelings become attached to both the professor and course. If the student sees the incident as a manifestation of general practices within a department, the feelings regarding the incident can become attached to an entire department and therefore the major itself.

This investigation was part of a larger study to investigate the attainment of gender parity in IE at OU. While, we can not define strict cause and effect between office-hours-experiences and

gender parity, we make note of some patterns. For example, of the 59 comments about IE office hours, 56 were positive (95%). The perception that the IE faculty is particularly student-centered is shared by both male and female participants. The literature indicates that this characteristic is disproportionately important to females.^{1,24} When our results are combined with the literature it suggests that the positive experiences that students have with IE faculty during office hours affects their satisfaction with IE as a major, and therefore their desire to remain in this program.²⁷ While we know that this factor is not the only one that has led to gender parity in IE at OU, it is part of the web of complex and interrelated factors that have contributed to this desirable outcome.

Students' perceptions ultimately determine decisions they make about their major, and their future. If we wish to retain students in the sciences, particularly female students, we must consider the perceived willingness of faculty to invest time interacting personally with students during office hours.

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27. We would like to thank the reviewers. In particular, one reviewer observed that departments with a higher student-to-faculty ratio than IE at OU might be expected to have fewer good office hours experience stories to report. While we agree with that observation, our research indicates that the quality of the office hours experience is more significant to female students than to male students. If a high student-to-faculty ratio does diminish the quality of the office hours experiences of students, as the reviewer reasonably suggests, it may lead more female students to attrite from these majors than male students. For departments with gender parity as a priority, this suggested relationship between student-faculty ratio and the

disproportionate impact of student-faculty interactions on females could provide sound footing for seeking additional faculty lines.

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