

## **Overcoming Difficulties in Research Statement Preparation for the Academic Job Search: Expansion of a Peer-Focused Professional Development Program**

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Kaitlin received her BS in Materials Science and Engineering with a concentration in biomaterials from Michigan State University in 2012. She is currently working on her PhD at the University of Illinois Urbana Champaign under Professor Paul Braun. Her research focuses on manipulating eutectic material microstructures for optical applications. She is also one of the co-coordinators for Girls Learning About Materials (GLAM), a summer camp for high school girls interested in engineering.

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Nicole D. Jackson is a third-year PhD student in the Civil and Environmental Engineering department at the University of Illinois at Urbana-Champaign (UIUC), and is a member of Megan Konar's group. Her research focuses on applying big data to understand the food-water nexus to promote food security. Also, she is currently a co-coordinator for the Illinois Female Engineers in Academia Training program as well as the Girls' Adventures in Mathematics, Engineering, and Science camp for environmental engineering and sustainability.

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Wan-Ting Chen is a Ph.D. candidate in the Department of Agricultural and Biological Engineering at the University of Illinois at Urbana-Champaign, working under the guidance of Professor Yuanhui Zhang. Wan-Ting received her B.Sc in Chemical Engineering from the National Taiwan University and M.S. in Agricultural and Biological Engineering from the University of Illinois. Wan-Ting's research work has been in the context of developing a synergistically integrated waste-to-energy system, Environment-Enhancing Energy (E2-Energy), that simultaneously produces biofuel, treats wet biowaste and captures carbon dioxide via algae growing and hydrothermal liquefaction (HTL). Wan-Ting's ongoing work focuses on upgrading of the HTL biocrude oil converted from wet biowaste into transportation fuels by distillation, esterification, thermal cracking, and hydroprocessing with catalysts. Wan-Ting has been a SWE member since 2012 and is aiming for a future career in academia.

### **Chaoyang Liu, University of Illinois at Urbana-Champaign**

### **Prof. Rohit Bhargava, University of Illinois at Urbana-Champaign**

Rohit Bhargava is Founder Professor of Engineering at the University of Illinois at Urbana-Champaign with affiliations in several departments (Primary – Bioengineering; Affiliated - Electrical and Computer Engineering, Mechanical Science and Engineering, Chemical and Biomolecular Engineering and Chemistry) as well as the Beckman Institute for Advanced Science and Technology. Rohit received dual B.Tech. degrees (in Chemical Engineering and Polymer Science and Engineering) from the Indian Institute of Technology, New Delhi in 1996 and his doctoral thesis work at Case Western Reserve University (Department of Macromolecular Science and Engineering) was in the area of polymer spectroscopy. He then worked as a Research Fellow at the National Institutes of Health (2000-2005) in the area of biomedical vibrational spectroscopy. Rohit has been at Illinois since as Assistant Professor (2005-2011), Associate Professor (2011-2012) and Professor (2012-). He was the first assistant professor hired into the new Bioengineering department and played a key role in the development of its curriculum and activities. He later founded and serves as the coordinator of the Cancer Community@Illinois, which is to become a unique technology-focused cancer center. Research in the Bhargava laboratories focuses on fundamental

theory and simulation for vibrational spectroscopic imaging, developing new instrumentation and developing chemical imaging for molecular pathology. Using 3D printing and engineered tumor models, recent research seeks to elucidate hetero-cellular interactions in cancer progression. Rohit's work has been recognized with several research awards nationally. Among recent honors are the Agilent Thought Leader Award (2016), election as fellow of AIMBE and SAS (2015), Meggers Award (Society for applied spectroscopy, 2014), Craver Award (Coblentz Society, 2013) and the FACSS Innovation Award (2012). Rohit has also been recognized for his dedication to teaching in the College of Engineering (Rose and Everitt awards) and he is routinely nominated to the list of teachers ranked excellent at Illinois.

# **Overcoming Difficulties in Research Statement Preparation for the Academic Job Search: Expansion of a Peer-Focused Professional Development Program**

## **Abstract:**

According to data from ASEE, women were awarded 23.1% of engineering doctoral degrees and held 15.7% of tenured/tenure-track faculty positions in 2015 versus 21.3% and 12.7% in 2009, respectively<sup>1,2</sup>. This slight increase over six years is encouraging but also serves to highlight the continuing paucity of female engineering faculty. The causes are multifaceted, including a perceived lack of academic work-life balance, a diminished self-confidence after a PhD, and a lack of existing role models. To combat this problem, graduate students and faculty at a large public university started a multi-month professional development program designed to strengthen the preparation of prospective female faculty candidates. The main goal of the program is to address the gender gap in engineering academia by knowledge dissemination in a collaborative community. We strive to provide information to our participants through seminars and panel discussions, followed by peer review groups to share and review application materials. This is the third iteration of the program and significant changes have been made to further increase its efficacy. One major development is expanding the research statement segment of our programming. In this paper, we examine the effectiveness of this new structure and explore in further detail how to successfully break down the research statement writing process into tangible segments. Lastly, we explore the differences between the two structures and make preliminary comments on the success of our program's expansion.

## **Introduction:**

In the STEM fields, the existence of a gender gap is well known and part of an ongoing discussion<sup>3-6</sup>. In 2015, women were awarded 23.1% of engineering doctoral degrees and held 15.7% of tenured/tenure-track faculty positions versus 21.3% and 12.7%, respectively in 2009<sup>5</sup>. While this increase over the last six years is encouraging, it also serves to highlight the continuing paucity of female engineering faculty. The causes are multifaceted, including a perceived lack of academic work-life balance, a diminished self-confidence after a PhD, and a lack of existing role models. Many schools, including the University of Illinois at Urbana Champaign (UIUC), offers many seminars and workshops aimed at disseminating information regarding an academic career path and the application process. However, while these programs are successful in disseminating information, they are lacking in terms of encouraging students toward an academic career path and maintaining such enthusiasm. In addition, these programs do not address certain causal issues of the gender gap including poor self-confidence, lack of role models, and poor support network.

To combat this problem, graduate students with faculty supervisors at UIUC, a large public university, started a multi-month professional development program, Illinois Female Engineers in Academic Training (iFEAT), designed to strengthen the preparation of prospective female faculty candidates. The main goal of the program is to address the gender gap in engineering academia by knowledge dissemination in a collaborative community. The program consist of

seminars and panel discussions, followed by peer review groups to share and review application materials. Over twenty faculty from the College of Engineering and others volunteer to serve on panels, deliver seminars, and provide feedback on application materials. They also serve to provide mentorship, act as role models, and share their stories and experiences on life as an academic. The iFEAT program aims to increase the confidence of its participants in their application packages by providing structured feedback both from individual meetings with faculty and from their peers during peer review. The program is limited to approximately 15 female engineering graduate students and postdocs who are one to two years away from applying for academic positions. These small groups allow each participant the opportunity to ask questions and speak with faculty speakers. It also serves as a safe place to ask questions without fear of judgment.

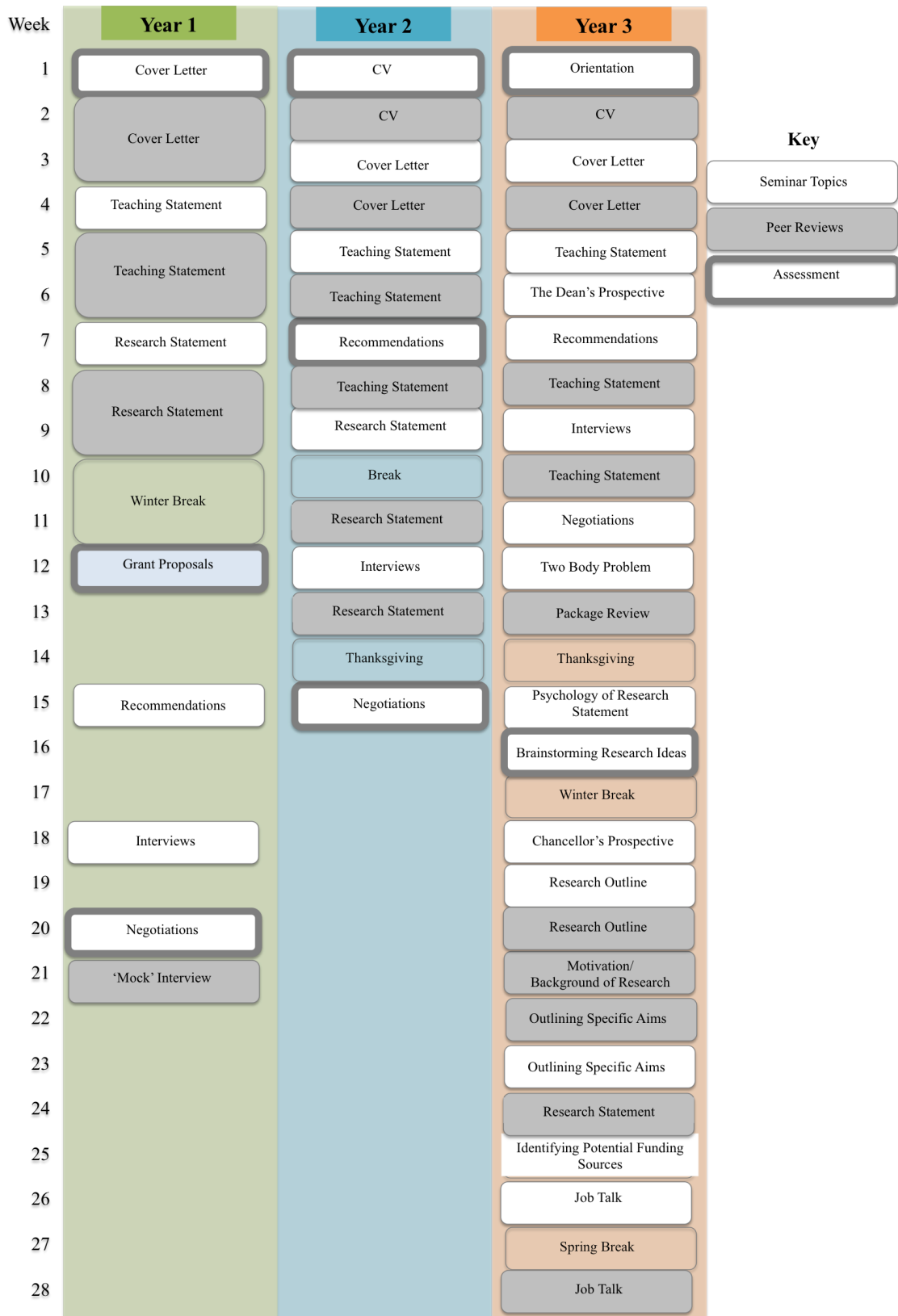
The 2016-2017 school year is the third iteration of the program and significant changes have continued to be made to improve the program. One major development is expanding the research statement segment of our programming from one seminar into multiple seminars in a semester. *The goal of this work is to examine the effectiveness of this new structure and explore in further detail how to successfully break down the research statement writing process into tangible segments. Lastly, we explore the differences between the two structures and make preliminary comments on the success of our program's expansion.*

### **Background:**

Illinois Female Engineers in Academia Training was started in October of 2014. The program's goal was to provide a unique opportunity for women to develop materials for the faculty application process in a supportive environment. The program combines seminars with peer review groups to give the participants the chance to ask experts in the field questions about the various aspects of the application package and then implement said information in drafts of their own<sup>7</sup>. While other programs exist for faculty preparation at this university, iFEAT alone gives the participants a copy of faculty job package at the end.

In order to understand the efficacy of the program, surveys have been conducted at the beginning, middle, and end of each year<sup>7,8</sup>.

This is the third year iFEAT has been run. Figure 1 shows a schematic of the breakdown of the three different program years. For Year 3, dramatic changes have been made. The majority of these changes revolve around the research statement.

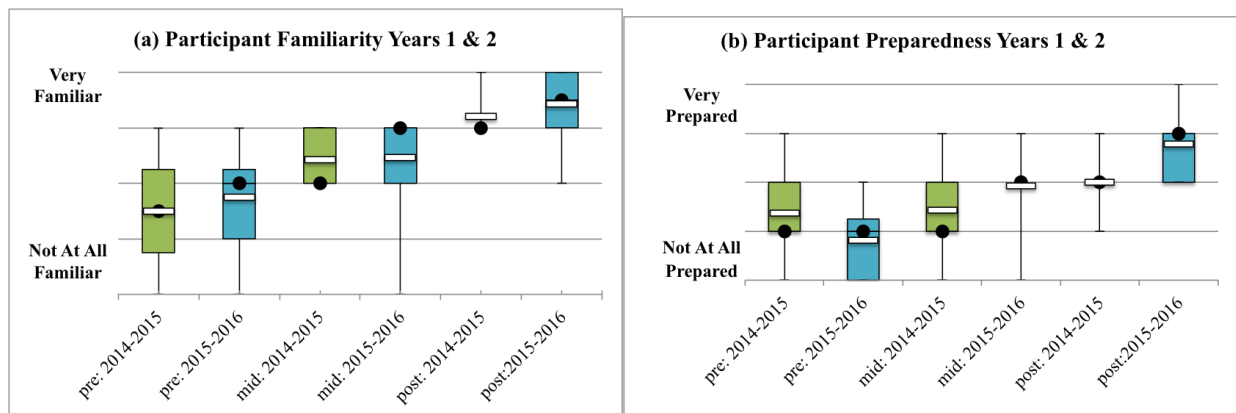


**Figure 1: Year by Year Breakdown of iFEAT Program Structure**

### *Year 1 and Year 2 Data:*

The motivation for the Year 3 changes come from the survey results from Years 1 and 2. Year 1 showed that out of all the topics covered; the research statement was the least well understood<sup>7</sup>. Furthermore, during Year 1 the peer review groups were meeting on their own schedules, leading most of the groups to fall apart by the end of the program. To combat this, the peer reviews were built into the structure of the program in Year 2. The hope was that building peer reviews into the program, plus moving all of the seminars closer together, would increase understanding of the research statement (as well as other topics).

Figure 2 shows the participants familiarity and preparedness with respect to the faculty job search process at the beginning, middle, and end of the program. The general trend suggests that familiarity with the process as a whole has increased with the addition of more seminars between Year 1 and 2, but preparedness is more complicated.



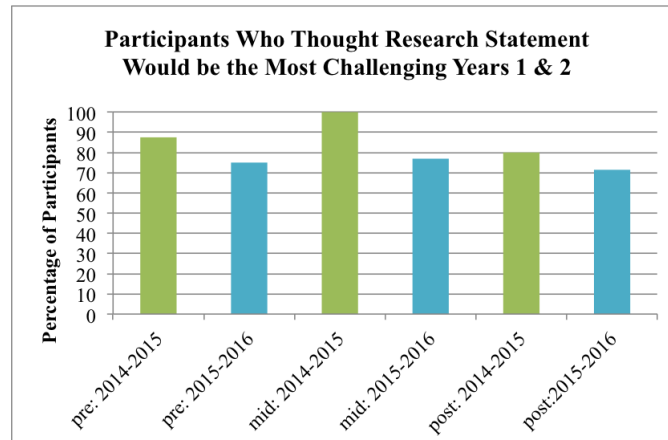
**Figure 2:** Participants Relationship with the Faculty Job Search for Years 1 & 2

Median value is shown by the black dot, Mean value is shown by the white line

**2a:** Participant Familiarity with the Job Search Process

**2b:** Participant Preparedness for the Job Search Process

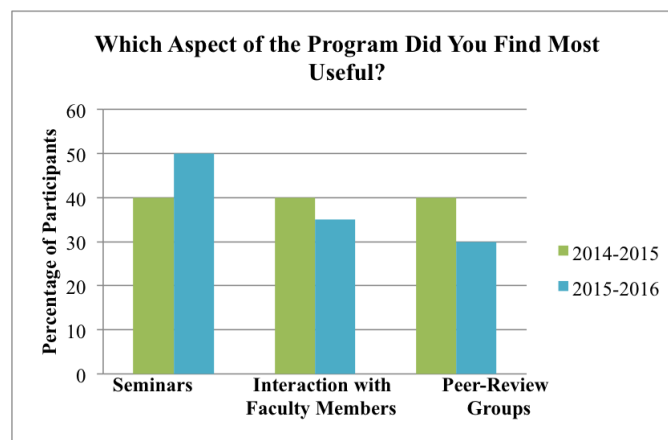
At first glance, it would seem that the changes made to the program were beneficial and the level of preparedness increases between Year 1 and Year 2. In particular, the difference between the mid surveys and the post surveys in the two years would suggest that the programming in Year 2 was better. But Figure 1 shows that the midpoint survey in Year 1 was given after the research statement was introduced, where Year 2 had not covered this topic yet. Figure 3 shows that even after participants in Year 2 wrote their own research statements, there was not a large difference in their confidence in their ability to write one.



**Figure 3:** Percentage of Participants Who Picked Research Statement as the Most Challenging Portion of a Faculty Application Package at Different Stages in the Program, Both Year 1 and Year 2

This highlights a serious barrier towards women entering academia; while quite competent in their research abilities, our participants have a difficult time formulating their own individual research ideas, even through the support of our program.

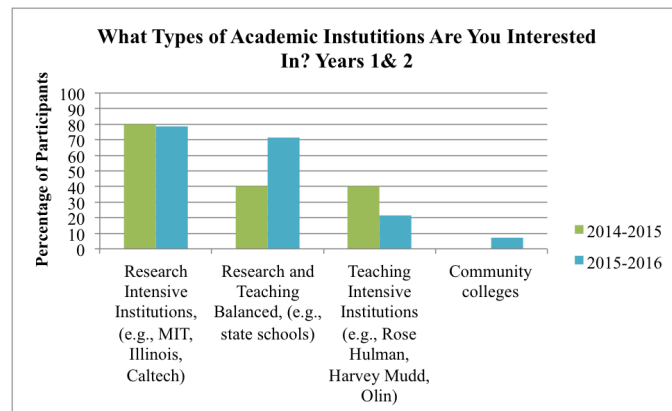
When asked about the most useful portion of iFEAT, participants actually rated peer review sessions less effective in Year 2 when compared to Year 1 (see Figure 4).



**Figure 4:** Participant Rating Of Different Aspects Of The iFEAT Program

The program coordinators suspect that since the research statement is the last of the topics for peer review, participants were overwhelmed by the magnitude of the statement and the two review sessions were not enough.

Despite the possible confusion or nervousness from the participants, Figure 5 shows that institutes that conduct research (either at the R1 level or mid-level) are still the most sought after job locations of our attendees over both years.



**Figure 5:** Academic Institution Interest for Participants at the end of iFEAT Years 1 & 2

Based on these results, the main focus for the program changes in Year 3 is to reduce confusion with regards to the research statement. We, the authors and coordinators of the program, hypothesize that by reducing confusion with regards to the research statement, participants overall opinion of their ability to apply for faculty positions will increase.

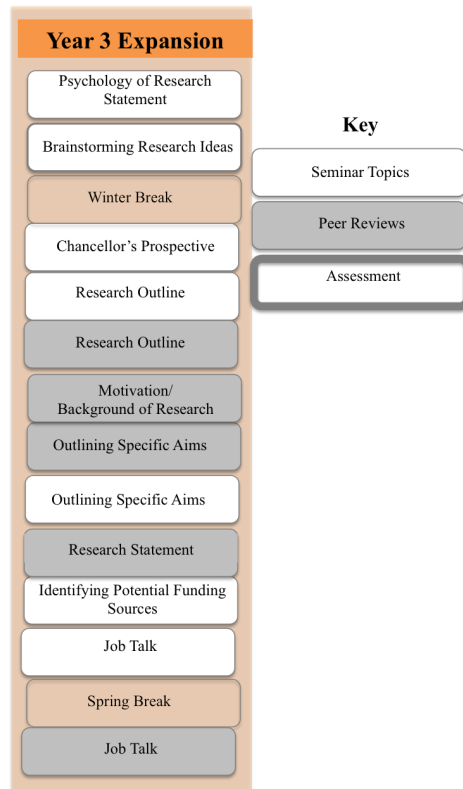
For Year 3, we have two specific goals:

1. Providing more detailed information about what should go into a research statement
2. Giving our participants more chances to get feedback at various intervals during the statement writing process

### **iFEAT Year 3 Plan:**

To achieve our goals, we changed the structure of our program significantly. The breakdown of new sessions can be found in Figure 6.





**Figure 6:** New Segment of iFEAT Program Year 3 Dealing with Research Statements

Our theory is that, instead of counting on the participants get all of this information out of one seminar, giving each topic its own seminar would be more beneficial. The peer reviews were broken down into smaller deliverables as well to increase participation. In the past, participants were likely to skip the research statement portions or possibly only come with an outline. Dividing the statement into smaller goals should make it more accessible to the women, especially those who are farther away from graduation and might not have their research ideas solidified. Year 3 included seven new seminars and five new peer review sessions.

The “Psychology of Research Statements” panel session was added to help participants begin to think about the type of research they would like to conduct in the next phase of their careers. This session came about from a discussion with an Education professor on how writing a research statement for faculty positions is a different type of writing compared journal articles and a dissertation that participants may be more familiar with.

The “Brainstorming Research Ideas” session was added so that participants could hear from faculty on their process of generating new research ideas. A key question to motivate the session was where does one’s creativity or inspiration for research ideas come from, and how does that translate into research proposals.

The “Chancellor’s Perspective” session was an opportunity to hear from female STEM faculty

member on her diverse experiences in academia as professor, department head, provost, and chancellor across many institutions.

The “Research Outline” seminar session was designed to help participants review sample research statements, and to help overcome a common question concerning what topics or headings does one include in the research statement. Participants were given the opportunity to help outline their research statement via peer review. This session is seen at a first attempt at beginning to think about the next series of projects that one could undertake. In other words, what are projects that the participant would like to conduct in the 1-3, 3-5, and beyond five-year range.

The “Motivation/Background of Research” peer review was added to help participants begin to draft the introductory portion of their research statement. Participants would receive constructive feedback to help hone in on what research problem(s) they identified and would seek to address in their future research.

We have added both a peer review and panel session for “Outlining Specific Aims”. The goal of these sessions is to help participants begin to identify the broad research themes in their statements. We have scheduled the peer review before the panel session so that participants could receive constructive feedback and guidance from faculty after they begun developing their own ideas.

The “Research Statement” peer review session is designed to serve as a review of the research statement completed this far. At this point in the program, we feel that participants should have reasonable draft of a full research statement.

During the 2015-2016 program, we did not have funding session like the 2014-2015 program did. For the 2016-2017 program, we have decided to add this session back in. We are contacting a wide variety of faculty that have been successful in securing funding from a variety of government agencies and other sponsors.

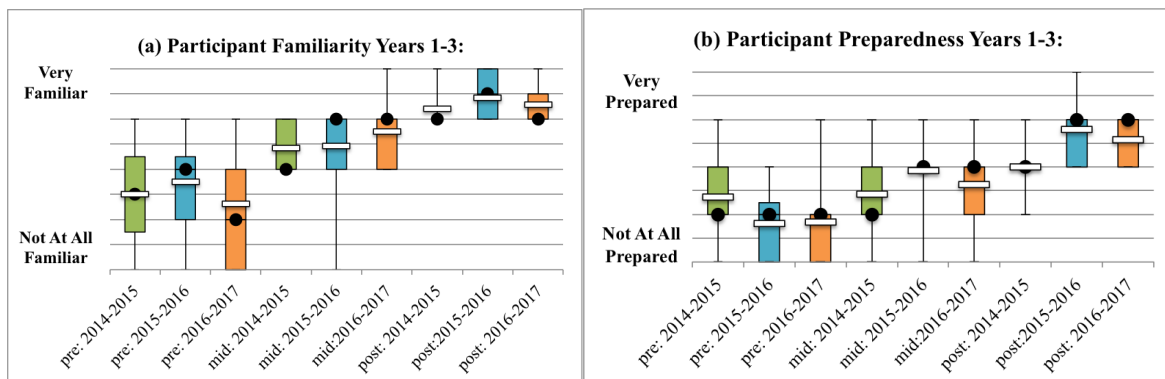
As most of our participants are interested in pursuing positions involving research, we recognize that the research presentation will be a critical component of their job seeking experience. The 2016-2017 program represents the first time we have offered participants the opportunity to gain explicit information on the job talk as well as practice it.

In order to study the efficacy of these changes, we will be conducting different surveys of our participants. Three large surveys will be conducted at the time points indicated in Figure 1 (pre, mid, and final). Final interviews will also be conducted with participants. A new survey method was implemented for year 3; small surveys were given during each session. For seminars, attendees were asked their knowledge of the topic being presented at the beginning and end of the seminar, as well as how knowledgeable the speakers were. For peer reviews, participants were asked how prepared their materials were at the beginning and end of the session, as well as how helpful the feedback was from the peer review. The goal of these new surveys is to get more immediate feedback on the programming itself. While the larger surveys can give good data

about the overall feelings of the program, participants often forget small details about individual seminars by the time we give the larger surveys. Asking them the day of ensures more accurate feedback, which can be used to make more meaningful changes in the future. Participants were also asked to participate in an end of the year interview to give more detailed feedback. The results from all surveys and interviews can be found below.

## Results:

Figure 7 shows the familiarity and preparedness of participants for Years 1-3 at the all three survey points.

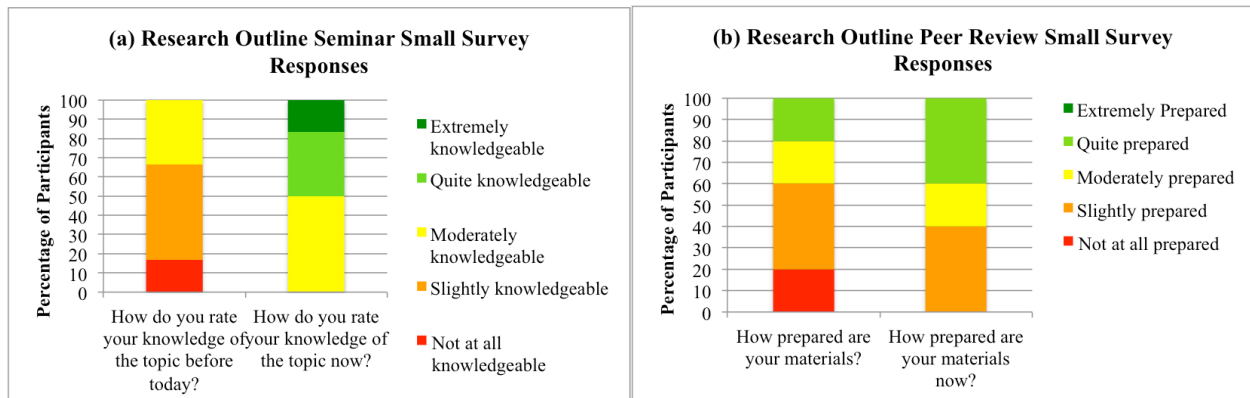


**Figure 7:** Participants Relationship with the Faculty Job Search for Years 1-3  
Median value is shown by the black dot, Mean value is shown by the white line

**7a:** Participant Familiarity with the Job Search Process

**7b:** Participant Preparedness for the Job Search Process

Overall, participants in Year 3 seem to be at a slight disadvantage, both in familiarity and preparedness compared to their Year 2 counterparts. While this difference is not statistically significant, it is surprising, particularly for the familiarity levels based on the midpoint surveys. Details from the individual session surveys reveal that the peer reviews surrounding the research statements might be the cause of these lower results. Figure 8 shows the immediate survey results from the research outline seminar (8a) and the research outline peer review (8b).



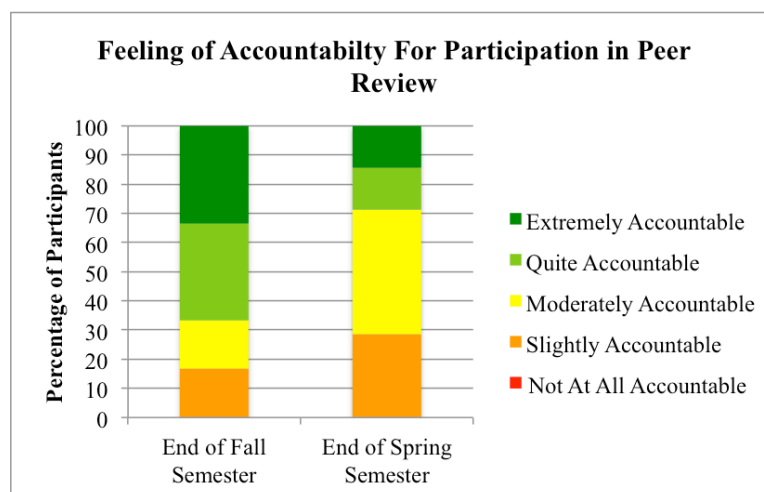
**Figure 8: Research Outline Topic Small Survey Responses**

8a: Seminar Results

8b: Peer Review Results

Despite the seemingly high comprehension after the seminar, participants had difficulty putting it into practice one week later during the peer review. Overall, the peer reviews for the second half of the program had bad attendance (some only had two people attending besides coordinators) and very few people actually created complete research statements. Since a large aspect of this program is designed around preparing materials for the application process, this was concerning to coordinators.

Looking into the lack of participation, we noticed a shift between fall and spring semester. When asked how accountable participants felt for preparing materials, they had the following response, as seen in Figure 9.



**Figure 9: Participant Accountability for Peer Review Documents**

Participants felt much less inclined to participate in the peer review during the research statement portion of the programming. What about the second half of the program caused this shift? To

answer this question, we looked at the in-person interviews. When asked about the peer reviews, participants had the following things to say:

“I just feel like the proposal section I need more time.”

“Well, I guess I liked it, especially during the fall semester, when I knew what I was doing. For research statements, I actually struggled developing my research materials, so I felt I wasn’t able to give very good feedback to others. That was again me, not other students or speakers.”

“...that had more to do with the content of the spring semester compared to the fall just because I am not quite there yet in applying. There wasn't really any motivation to get the research statement part done and then without having anything it sort of felt like maybe I shouldn't be there because I don't have anything to contribute.”

It is clear that despite the additional breakdowns for peer reviews did not improve the participation or reduce the confusion as much as hoped when designing this portion of the new structure. Details on how this will be addressed in the future can be found in the following section.

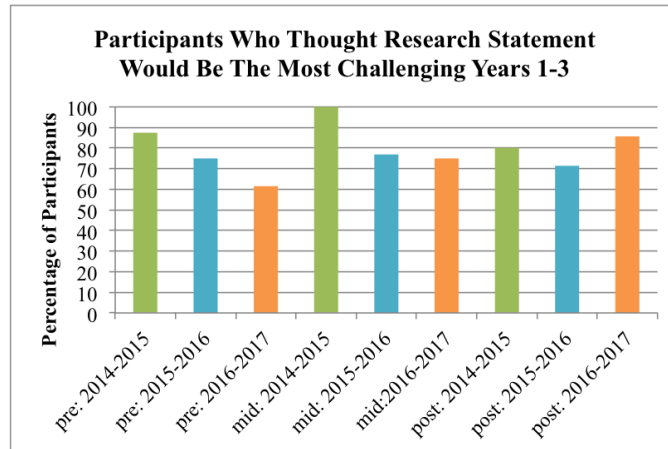
Although the peer reviews were not deemed as helpful as we would have hoped, the new panels were well received by the participants. We received comments such as:

“Excellent session -- lots of great advice”

“Excellent research statement example!”

So while the additional peer review sessions did not add as much to the program, the additional panels and seminars were a positive addition to the program in improving the participants understanding of different aspects of the application process related to the research statements.

This increase in information, while well received, possibly confused the participants as well. Figure 10 shows the percentage of participants who ranked research statement the most challenging part of the faculty application for Years 1-3 for all survey points. Year 3 actually has the highest percentage that thinks the research statement will be the most difficult aspect of the package at the end of the program.



**Figure 10:** Percentage of Participants Who Picked Research Statement as the Most Challenging Portion of a Faculty Application Package at Different Stages in the Program, All 3 Years

While this at first seems like a negative, it is possible that our participants are more aware of the difficulties of what goes into writing a good research statement. As one participant said during the interview:

“Our panel on the research statement was outstanding. That particular example was really good. It was so carefully thought out. You could see how she had worked on it over the course of for over a year. To see the difference between what I was starting with and a polished product and the things she thought about and how succinctly she could say things and pull out what was important. That was really really helpful.”

Another commented:

“Yeah, I think I really underappreciated just how important the research statements are.”

Both were aware that the research statement takes time to properly develop and will take many iterations. While that inherently makes it more challenging, it also shows that our participants are aware that developing a competitive research statement takes time. One participant had this to say at the end of their interview:

“I think it’s just been invaluable. Even if I don't get the job this time around, I am much better prepared to circle back around next fall.”

Comments like this show that our program changes have made a positive impact on the participants.

## **Program Challenges to Address Next Year:**

There were two major program challenges highlighted during this year with regards to the research statement preparation. One is the ineffective nature of the peer reviews. One participant gave this suggestion:

“Maybe it would be helpful for one or two sessions in iFEAT, instead of peer review or faculty sessions, have like a brainstorming session. Let people maybe write for 15 min...but bring laptops and do some brainstorming. Discuss so that everyone else would agree with what they came up with, what their thought process is, how they took what they heard from the panel from the previous week about say teaching statements and now they are applying it.”

Utilizing brainstorming sessions to allow participants to discuss their research ideas, instead of having to come to the sessions with pre-prepared materials, might help reduce the lack of accountability and general lack of preparation time seen from participants. Instead of trying to get a completed research statement, it might be more important to focus on helping participants develop research ideas that they can later expand on with the information gained from the panels and seminars.

The second problem was that the research statement is not addressed until the end of first semester and all of second semester. Many participants were applying for jobs in fall of 2017, so they needed advice on the research statement before we started going in depth. When participants apply to a part of iFEAT, they are informed that this program is best attended the year before applying for jobs, as the structure provides an example job package by the very end. Despite this warning, many participants were still annoyed with the iFEAT structure. Greater care will be taken next year to inform the applicants of this structure, as well as better advertisement of the program so women know about the program earlier in their PhD or postdoc. One idea to reduce this confusion is to host an information session to answer applicant questions before they apply.

## **Conclusion:**

In conclusion, we have highlighted a problem area for women in the faculty application process: the research statement. We are addressing this problem through an expansion of an already established professional development program (iFEAT). Our strategy involves breaking down the research statement into tangible segments to increase understanding of this complex topic. This breakdown has allowed for more detailed discussion, as well as more topics to be covered to further prepare our participants. At the completion of Year 3 of the program, we see that the

participants overall have a greater understanding of the research statement and both its importance and difficulty in preparing. The additional panels and seminars had an overall positive effect, while the peer review sessions need continuing improvement through planned brainstorming sessions to increase their efficacy. Some problems have arisen with the participants' choice of when to participate in the program and our new structure change, but plans have already been made to alleviate these issues for next year. Overall, the continued improvements in this professional development program have helped increase the number of female faculty in engineering.



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