



## **Recruitment, Mentoring, and Retention through the Aerospace and Industrial Engineering (ASPIRE) Scholarship Program**

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# **Recruitment, Mentoring and Retention through the Aerospace and Industrial Engineering (ASPIRE) Scholarship Program**

## **1. Introduction**

The overarching goal of the Aerospace and Industrial Engineering (ASPIRE) Scholarship program is to improve recruitment and retention of aerospace engineering (AE) and industrial (IE) engineering students. With support from the NSF S-STEM program, the ASPIRE program provides scholarships to academically talented, full-time AE and IE students with demonstrated financial need. The ASPIRE program enhances the educational experience of ASPIRE students through mentoring and networking events. The objectives of the ASPIRE program are to:

- Prepare students for the workforce.
- Provide educational opportunities while reducing the need for external employment.
- Increase students' engineering self-efficacy.
- Increase recruitment of aerospace and industrial engineering students.
- Encourage students to pursue advanced degrees.
- Increase student retention in engineering.

The ASPIRE program strengthens and supports students through a program of mentoring, networking, and academic design. The primary features of the program include continuous mentoring of all ASPIRE students by peers, faculty, and industry representatives; four face-to-face interactions with all ASPIRE students, mentors, and faculty per semester; and enrollment in common courses.

A total of 36 undergraduate ASPIRE Fellows will have been directly supported over the five year duration of the project. Eligible applicants are evaluated based on financial need, academic talent, and interest in the field. ASPIRE Fellows receive a \$2,500 per semester award for up to eight semesters. The Fellows' progress is monitored from both an academic standpoint (i.e., GPA) and a personal development standpoint (i.e., relationship with mentors). The ASPIRE program success is determined by retention and graduation rates, combined with surveys that collect information about ASPIRE students' external employment and perceptions of the program.

This paper presents details of the ASPIRE program including descriptions of the recruitment and selection process, mentoring program, networking events, and academic design programs. Additionally, the design of the assessment and evaluation plan and data from the 2016-2017 cohort will be reported.

## **2. Recruitment and Selection**

Incoming freshmen in AE or IE are eligible to apply for the ASPIRE program. Recruiting applicants for the ASPIRE program focuses on advertising the program to as many high school juniors and seniors as possible. Consequently, in addition to advertising the ASPIRE Scholarship on the university's Office of Admissions and Scholarships webpage, the College of Engineering's webpage, and on departmental webpages, we developed a brochure that is sent to high school students and guidance counselors.

ASPIRE Scholarship eligibility is determined by a combination of financial need, academic talent, interest in the field, and extracurricular activities. The Office of Admissions and Scholarships determines financial need based on the results from the Free Application for Federal Student Aid (FAFSA). The selection committee is provided a rating of (a) high, (b) medium, (c) low, or (d) no need based on a student's unmet need for the application year. Academic talent is judged from applicant transcripts with emphases on relevant coursework, high school GPA, and class rank. Interest in the field is evaluated from student responses to short essay prompts that are part of the application. Student resumes are reviewed to determine the breadth and depth of involvement in extracurricular activities. While selection committee members view engineering-related activities as positive, members are aware that not all high schools and communities offer such activities. Involvement in multiple activities while maintaining high academic standards is viewed as indicative of effective time management and potential success in engineering. All ASPIRE applications are ranked individually by committee members for each of the review criteria described herein. Then, the selection committee meets as a group to further evaluate and discuss top candidates. Awards are made upon consensus of the selection committee.

### **3. ASPIRE Student Support Services and Programs**

The ASPIRE program is focused on supporting a cohort of academically talented students in AE and IE so that they are retained and graduate with engineering degrees. The first two years of the undergraduate curriculum of these two majors is very similar, thereby facilitating the development of a cohort. We provide mentoring, cohort-building activities, and shared coursework early in the students' academic careers to aid in the development of a cohort experience for this group. Our program consists of four organized cohort interactions per semester: two networking events for strengthening the cohort community and two professional development events to facilitate student successes.

#### *3.1 Mentoring Program*

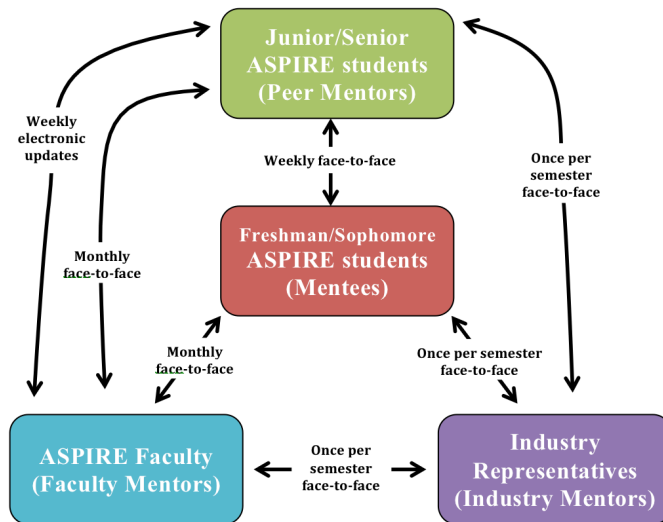
The ASPIRE mentoring program has three components: peer mentoring, faculty mentoring, and industry mentoring. The interconnection of these components is shown in Figure 1. The ASPIRE mentoring program attempts to ensure weekly mentoring while balancing time demands of faculty and industry representatives. This results in a comprehensive plan that combines mentoring from peers (weekly), faculty (monthly), and industry representatives (semesterly).

Ultimately, the peer mentoring component of ASPIRE will allow junior and senior ASPIRE students to mentor freshman and sophomore ASPIRE students. In this system, incoming students are assigned a junior ASPIRE student (mentor), who will continue to mentor the freshman ASPIRE student through his/her sophomore year. Mentors have face-to-face interaction with mentees on a minimum weekly basis. In the first two years of the ASPIRE program, we phased in mentoring by hiring junior and senior AE and IE students to serve as mentors.

#### *3.2 Professional Networking Events*

Two networking events are designed to facilitate the cohort experience and relationships. The first event, regarded as the Annual ASPIRE Kick-off event, is held at the beginning of the fall semester to introduce S-STEM Fellows to their mentors and introduce the ASPIRE program. At

this event, the faculty team distributes an orientation packet summarizing our program (e.g., mentoring activities, the organized ASPIRE events, staff contact information, important dates and reminders). The second networking event is a Midterm Mashup that provides a discussion forum for participants to express any issues or concerns and for the ASPIRE faculty to discuss strategies for future academic success. Its main intent is to maintain connection with the ASPIRE fellows and foster their sense of belonging to the engineering cohort community.



**Figure 1. Mentoring Flowchart**

### 3.3 Academic Design

AE and IE students have common core courses during the first two years of their academic programs. ASPIRE faculty work directly with ASPIRE students and the university advising staff during freshman orientation each June to ensure registration in common courses and course sections. This promotes a strong, consistent, and continuous cohort experience early in the students' academic careers. After the first two years, students in each discipline continue to enroll in the same upper level courses.

ASPIRE academic design also involves two professional development events each semester from which knowledge and skills can be acquired for career advancement and academic success. ASPIRE leverages existing alliances to arrange industry field trips, seminars, and facility tours once per semester. These events add relevance to the ASPIRE students' education, and inform the students of local and regional professional opportunities. The second event focuses on providing direction for career readiness. ASPIRE faculty leverage university resources such as the Career Center, Writing Center, and Center for Teaching and Learning, to plan a workshop focusing on topics such as resume preparation, interviewing, time management, writing skills or presentation skills.

### 3.4 Program Summary

The primary message that is conveyed to the ASPIRE students with regards to retaining their scholarship and ASPIRE student status is: (a) *Maintain high grades*, (b) *Meet with your mentor*,

and (c) *Participate in the four S-STEM events each semester*. Student support services can be summarized by the following actions:

- Continuous mentoring of all ASPIRE students
- Enrollment in same STEM core courses during the first two years for all participants.
- Four face-to-face interactions per semester: (a) Kick-off Banquet, (b) Industry Field Trip or Seminar, (c) Midterm Mashup Social, and (d) Career Preparation Workshop

We note that all interactions (e.g., mentoring, networking, industry trips) are planned with consideration of the academic calendar and the ASPIRE students' schedules to allow for maximum participation. An ASPIRE student absent from a scheduled event is allowed to make up their attendance by attending an additional professional development seminar offered by the MSU Career Center, MSU library, or the student's professional society.

#### 4. Assessment and Evaluation

We monitor the ASPIRE students progress within their degree programs from both an academic standpoint (i.e., grades) and a personal development standpoint (i.e., relationships with mentors). Students must maintain a 3.0 GPA to remain in the scholarship program. If a student's semester GPA drops below a 3.0, they can submit a written appeal that explains the reason for their poor performance and specific plans to improve their grades. Upon acceptance of the appeal, the student is allowed one semester to achieve a 3.0 GPA. Regarding the monitoring of the students' personal development, the frequent (weekly) interactions between mentor and mentees allows for personal and social issues to be addressed in an expedient manner.

ASPIRE student success is determined by retention and graduation rates, and ASPIRE student perceptions. We collect data through a variety of surveys aligned with program objectives. Data Collection is summarized in Table 1.

**Table 1. Summary of Assessment and Evaluation Plan**

<b>ASPIRE Program Objective</b>	<b>Data Source</b>
Prepare students for the workforce	Survey of junior and senior ASPIRE students, and industry partners
Provide educational opportunities	Annual survey of all ASPIRE students
Reduce the need for external employment	Survey of all ASPIRE students
Increase student self-efficacy	Annual Self-efficacy survey for all AE and IE students
Increase recruitment of aerospace and industrial engineering students	Annual survey of Freshmen ASPIRE Fellows
Encourage students to pursue advanced degrees	Survey of junior and senior ASPIRE Fellows
Increase retention	BCOE retention and graduation rates

#### 5. 2016 Cohort Results

The 2016 ASPIRE Cohort, the initial cohort, consisted of 12 students. These students entered the program in Fall 2016. We surveyed the cohort and their mentors in May 2017 at the end of the

second program semester. The survey focused on evaluating the following objectives: (a) provide educational opportunities, (b) reduce the need for external employment, and (c) increase the recruitment of AE and IE students. This section presents the insights we learned from our initial assessment.

### *5.1 Results: Provide educational opportunities*

In response to the survey question, “*Is there anything you would like the ASPIRE faculty to know with regards to future ASPIRE events?*” students were very positive about all of the ASPIRE program activities. With regards to mentoring, students detailed how the ASPIRE program increased their sense of belonging within their majors. For example, one student detailed how the peer-mentoring program helped her connect to other activities within her major:

*Through this program I met Laura, my mentor, and she helped me get involved in Xipiter. Xipiter has helped me fall in love with Aerospace Engineering and I have no doubt in my mind now that this is my major to be in. Thank you for all that you do!*

Another student praised the ASPIRE student co-registration and peer-mentoring components of the program for helping them achieve success:

*To me being able to talk to other students that were in my classes and then talk to the mentors contained the most value. I was able to see how my fellow students were doing in class and get much needed help when I was having trouble in a hard class. The mentors also gave pointers as in which teachers to take/avoid which I think is an important aspect to achieve success sometimes. In the end, being able to make new friends and network was my favorite part*

ASPIRE students also praised the career-focused speakers. The study skills speaker was able to connect with the academically-talented students in our program. For example:

*The study skills speaker definitely helped me continue with my studying patterns for the rest of the school year and the rest of my schooling going forward. The speaker was very knowledgeable about the tactics for smart college students that should be applied in undergrad.*

In addition to the positive comments about meeting industry representatives and discussing potential jobs, one student noted that the blend of AE and IE industries was positive as well:

*The Aurora Flight Center tour was very appealing to me. As an Industrial Engineer, I was able to see the process that are held within the aviation field. It was a good mix of industrial and aerospace engineering which interested me.*

The above student quotes are representative of the feedback we received from all the ASPIRE students. We are continuing to provide similar activities in the current ASPIRE program year. As we add additional students to the program, we intend to examine the ASPIRE educational opportunities through more rigorous qualitative and quantitative methods and use those results to improve future educational opportunities for students at our institution.

### *5.2 Results: Reduce the need for external employment*

Our survey directly asked ASPIRE students about their external employment. Six of seven students strongly agreed or somewhat agreed that the scholarship funds made a difference in their ability to enroll as a full-time student. All ASPIRE students indicated that the scholarship funds reduced the need for outside employment. Only one ASPIRE student indicated they had worked in an on-campus job in the 2016-2017 academic year. Also, the student indicated that additional funds would not eliminate the need for them to seek that type of employment because they were doing it for the experience. We found this initial result to be promising and will continue to track this information for ASPIRE students.

### *5.3 Results: Increase the recruitment of AE and IE students*

To evaluate the degree with which we increased the recruitment of AE and IE students, we focused on examining the effectiveness of our program recruitment and understanding the choice of other majors the students were considering. Four of the ASPIRE students learned about the ASPIRE program through the university Scholarship page, two through faculty email communication, and one through the brochure. All ASPIRE students were likely to attend the university without the ASPIRE scholarship, but 7 of 8 students indicated they were considering majoring in other engineering fields, such as civil and mechanical engineering, before they found out about the ASPIRE program. While we are encouraged that alternate means of communication did reach potential applicants and that students may have been encouraged to major in AE and IE over other engineering majors, in the future, we are considering including questions about the program recruitment and intended majors on the Scholarship Application itself. This will allow us to collect data from all applicants and better understand our program recruitment efforts.

## **6. Conclusion**

Nationally, there is a significant need for a strong and large STEM workforce. Likewise, within Mississippi, there has been a recent insurgence of companies into the state that are in need of a highly skilled workforce. Particularly, a significant need for aerospace and industrial engineers exists. Concurrent with the need for increasing the number of AE and IE graduates, the local area is in need of the financial support of the ASPIRE Program. This program seeks to fill the workforce need of local and regional companies, while also positively influencing the future socioeconomic status of program participants. The success of our ASPIRE fellows will produce a well-trained workforce that will contribute to the economic growth of Mississippi and the nation.