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BOARD # 426: Preliminary results of an interactive dashboard for mentoring NSF S-STEM students

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Dr. Liz Johnson (Lead Evaluator) left a career in academia to consult and work as an educational evaluator in 2020. Since, she has focused primarily on evaluation of NSF and USDA grant-funded programs that center faculty learning and systems-embedded student supports toward persistence and matriculation in STEM degree programs; in many cases at Hispanic Serving Institutions. Prior to 2020, Liz worked as a full-time faculty member at St. Edward's University in Austin, TX and City University of New York on Staten Island. Her research includes qualitative case studies that engage youth in P-16 settings. Her initial foray into evaluation includes three years (2004-2007) at the National Center for Restructuring Education, Schools and Teaching at Columbia Teachers College on the Bill & Melinda Gates funded Institute for Student Achievement project. As part of that project, she conducted appreciative evaluation of small school reform implementation at various school sites across the New York region.

Title: Preliminary results of an interactive dashboard for mentoring NSF S-STEM students.

Context: This study focuses on an interactive tool used during the mentoring sessions of the S-STEM community college students during their freshman and sophomore years studying engineering or artificial intelligence and machine learning. It is known that Individual Development Plans (IDP) are used during mentoring sessions for graduate students and postdoctoral professionals. Online resources to create IDPs are available for biology, chemistry, humanities, and social sciences students (Stephanie Gage, 2024). A UK report summarized the effectiveness of Personal Development Planning (PDP), such as learning logs, journals, reflective practice, self-assessment, and self-regulation to track progress toward course outcomes. Most studies report a positive effect of PDP on learning (David Gough, 2033). A study was conducted among 84 Master's students in Business at Babson College in Massachusetts. The students were directed to complete a mandatory course-based development plan over eighteen months. They discovered a trend from the students who self-reported a high degree of progress versus those who noted little progress. The value of development planning appears to be enhanced by a sense of personal agency (James M. Hunt, 2017). IDPs are increasingly implemented in higher education, and students have reported its benefits and challenges. A report on Canadian graduate students highlights that the informational interviews and the mentor meetings were the most valuable to the students (Emmanuelle Arnaud, 2024).

As IDPs are known to provide strong guidance to achieve academic or career goals, with the preponderance of research for graduate and postdoctoral education, a custom interactive IDP dashboard has been created to support S-STEM engineering and artificial intelligence students in their freshman and sophomore years.

The National Science Foundation (NSF) awarded a second track S-STEM grant to this community college to support engineering and artificial intelligence students called Scholarships, Mentoring, and Professional Support to Improve Engineering & Artificial Intelligence Student Success at Community Colleges. The grant program started in the Fall of 2023 and has served 26 unique students and will continue until 2028. This grant, entitled Reaching Engineering and Artificial Intelligence Career Heights (REACH), empowers students with scholarships, personalized academic mentoring, and industry-oriented activities.

Methodology: The IDP interactive dashboard has 3 main purposes: 1. gathering data to assess the success of the mentoring program, 2. helping the mentees to formulate their academic goals, identify actions to achieve them, and identify supporting activities and networking interactions, and 3. Monitoring reflection, creating accountability, and celebrating achievements, given that mentors read the IDP.

In the dashboard, the students record monthly quantitative and qualitative data.

The quantitative data are:

- **GPA** for each course (about 100)
- **Confidence** to complete their courses (about 10)

- Number of **working hours** per week

- Number of **extra-curricular activities** (e.g., club meetings, university labs visits, guest speakers events)

- Number of **interactions with professionals** (e.g., industry mentor contacts, professional networking event conversations, industry visits)

The qualitative data are:

- **Goals** with this instruction: Students should submit a measurable goal that will assist in their academic or personal growth to be accomplished before the next monthly meeting.

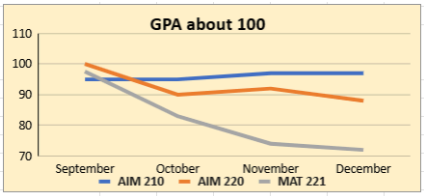
- **Actions** with this instruction: Students will develop a minimum of one action they will take to achieve the academic or personal growth goal for the month.

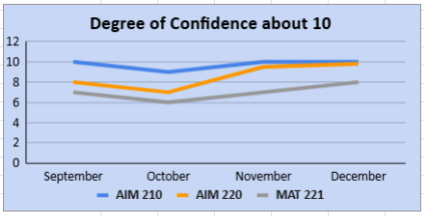
- **Proud moment** with this instruction: Students are encouraged to identify a moment(s) during the past month they were proud of, related to their academic or personal growth.

- **REACH Project Activity** with this instruction: Students are encouraged to document and reflect on a project activity (e.g., club meeting, workshop, speaker series, STEM-related job interview, etc.) that they participated in the past month that fostered their academic and professional growth.

The IDP dashboard is illustrated in Figure 1. It shows the setup of the dashboard for one semester and the relation between the data and the 3 interactive graphs.

Semester: Mentee: Mentor:	September Meeting Date (between week 1 to week 4)	October Meeting Date (between week 5 to week 8)	November Meeting Date (between week 9 to week 12)	December Meeting Date (between week 13 to week 16)
Gpa (about 100%)	**September**	**October**	**November**	**December**
AIM 210	95	95	97	97
AIM 220	100	90	92	88
MAT 221	97.56	83	74	72
Confidence about	**September**	**October**	**November**	**December**
AIM 210	10	9	10	10
AIM 220	8	7	9.5	9.8
MAT 221	7	6	7	8
Overall (from 1 to 10)	**September**	**October**	**November**	**December**
How many hours am I	30	40	30	20
Extra curricular activities	1	1	2	0
Contact with professionals	1	3	3	0
	September	**October**	**November**	**December**
Goal	Find Extra Curricular Activity to Support Growth in AI or Programming in relation to robotics	Complete NCAS Week	Increase my calculus grade	Get an A on my Calculus Final
Action	Seek direction from AI professor about a project that involves robotics, programming, AI, or engineering.	Accept Letter/ Request to watch AI lectures that week	Do at least one problem every day for calculus, review quests, and complete the prep packet	Same as previous; finish a paper for upcoming capstone class
Proud Moment	Got in-person tutoring met in-person (with my child) with my mentor	Joined AI club, did well on my second quest and brought grade up	Completed NCAS Week	TBD
REACH Project Activity	Sept 20th Women in Tech at Insight Global	watch a former guest seaker event	AI Summit	None





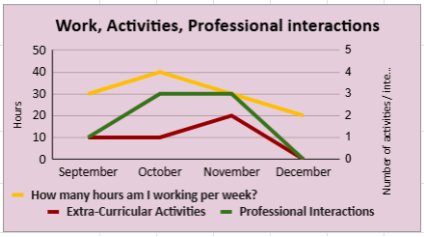


Figure 1: IDP Dashboard example for one semester

All students' dashboard data have been compiled for statistical analysis.

The annual evaluation report made by the external evaluator included feedback from a focus group with four mentees and interviews with two faculty mentors on the use of the IDP dashboard, and some of the data will be included in the results. For example, scholars and mentors were asked to describe how they used the IDP tool, and how useful the IDP tool was to their work as mentors or mentees.

Results: 19 students (as Fall 2024) are or were enrolled in the program, including 7 in AAS, in Artificial Intelligence and Machine Learning, and 12 in AS, with Emphasis in Engineering, with 7 females and 12 males (Table 1).

Table 1: Students by gender and discipline

Degree	Female	Male	Grand Total
AAS AIM	1	6	7
AS Engineering	6	6	12
Grand Total	**7**	**12**	**19**

The 19 students' dashboards totaled 36 semesters spread over Fall 2023, Spring 2024, and Fall 2024, and 144 months are included. The dashboards were filled at 84%, 121 months had data, but only 42% (15/36) of the semesters were filled for the 4 months. Most of the time, when not all the months were filled, the data for the last semester was missing. During that same time, the students completed 150 of about 155 courses with an A or a B grade and withdrew (with a W) from 5 of the 155 courses (3 students).

Their workload decreased on average from 21.8 hours per week during the first semester to 15.8 hours per week during the last semester, with the student's workload ranging from 0 hours per week to 50 hours per week. Students reported freeing some time for their final exams at the end of the semester(s). Only 3 of the students don't have paid employment. The students attend on average 1.5 extra-curricular activities per month, with a peak during the third month of the semester at 2.2 events. The students reported 1.8 connections with professionals per month and also showed the largest number of professional interactions during the third month of the semester, with an average of 2.6 connections with professionals (Figure 2).

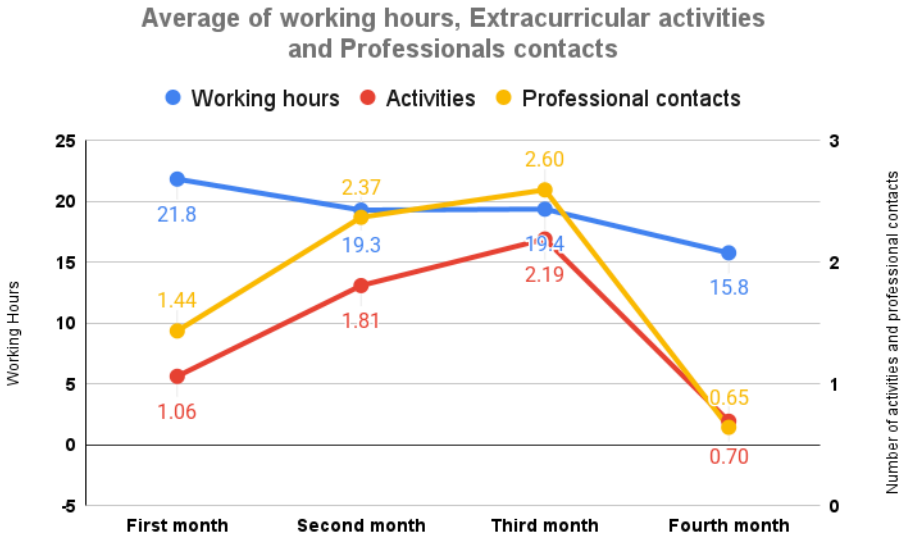


Figure 2: Number of working hours per week, number of extra activities, and professional contacts for each first, second, third, and last month of the semesters.

During the small group interviews with the external evaluator, scholars (mentees) were asked to rate how useful the IDP was. On a three-point Likert scale from not at all useful to extremely useful, 3/4 of the scholars initially rated the IDP extremely useful, and 1/4 found it somewhat useful. One participant changed their rating to somewhat useful during the discussion. Scholars who found the IDP extremely useful highlighted its role in visually organizing essential information about program performance and progress in an easy way. One scholar explained, "I'm also a visual person, so having everything out there and just I feel like my mind is more organized with it, so I feel like it's [the IDP tool] extremely useful". One scholar noted that it informed mentor/mentee conversations. Another scholar appreciated how it improved their organization. One scholar noted that it could help students if they struggle with their courses, but it was not their case. One scholar reported the IDP as making them “want to continue their progress and keep their grades up and that it gives them (mentee and mentor) something to talk about right away.“ One mentor summarized the IDP tool as allowing them “to consider where they can support their mentee(s).” All interviewed mentors reported that the IDP tool was useful to start conversations about how things had been going between regular mentoring sessions; a finding that echoed Fiss, Irwin and Tan’s (2021) early reports of IDP use in mentoring sessions.

Conclusion: The IDP dashboard allows tracking data including GPA progress, working hours, connections with professionals, and extra-curricular activities during the semesters, which helps the student, the mentee, and the program leaders. This tool also provides accountability and supports the celebration of the monthly achievements. The students show an excellent completion rate in their courses and prevent failing the class by anticipating difficulties, setting goals, and identifying actions to overcome their academic challenges. The IDP dashboard provides strong support for the mentoring sessions as the mentors can focus on the challenges faced by the mentee(s) during this specific month.

Some improvements will be made to the IDP. This study brought up the question of including the last month of the semester, as the data for that particular month was frequently missing. A mentor suggested breaking up and listing out the options of extra-academic activities, as they are key to keeping students engaged in their academic journey. Metrics such as networking, volunteering, participating in professional organizations, listening to speakers' presentations, and touring university partners and industry companies will be added to the dashboard. And as students complete their 2-year Associate's degrees and prepare to transition to 4-year bachelor's degree programs, project leaders are honing qualitative data collection to extend student reflection across the two years and refine program implementation. New questions for graduating scholars may include: most valuable program supports, changes in understanding the mentee's field of study, future career or school plans, and expectations for mentor-mentee relationships beyond community college. A final exit page will be added to gather data before the scholar leaves the program. As the research on the effectiveness of IDP, and PDP, has been focusing on graduate and postdoctoral education, we will continue to gather data and provide more in-depth analysis until the end of the S-STEM program.

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