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Using a Student Success Coach to Improve Success for Full and Part-Time Students in STEM

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Introduction

There is significant concern about students in higher education, particularly in community colleges, spending time and money on classes, but leaving their school without a degree or worthwhile certificate [1][2]. Students are presented with a large "buffet" of courses but receive inadequate guidance on which courses to take to meet their desired goal. In this "cafeteria" style of education, students may end up making wrong decisions about which courses to take or even about which program to enter[3][4]. They may not know when to seek help or where to go for that help. As a result, many may leave college without completing a marketable degree or transferring to a four-year school. In addition to leaving school without achieving a correct end-goal, they may leave school in debt.

A proposed solution to this problem is the "Guided Pathways" model of student support[5]. The model has four key pieces.

- First, colleges need to create a clear map of the required courses for each general program they offer.
- Second, colleges need to provide guidance and counseling to incoming students to allow them to select that correct general program that meets their goals and needs.
- Third, colleges need to work closely with the students to make sure they stay on the track for their program in terms of registering for the correct courses each term.
- Fourth, colleges must closely monitor the student to ensure they successfully complete these required courses and rapidly intervene with extra support when students appear to be struggling.

It is the third and fourth pieces, sometimes referred to as "intrusive advising", that are of interest to this paper [6][7]. The College of DuPage has received a grant from the National Science Foundation's (NSF) Scholarships in Science, Technology, Engineering, and Mathematics (S-STEM) program to support financially needy science, technology, engineering and math (STEM) students. As part of this support, the selected students were provided with a Student Success Coach who worked closely them to make sure they selected the correct courses for their major and monitored their progress. This method of the Success Coach is very close to the methods used in the intrusive advising proposed by the Guided Pathways model. By evaluating the effect of the Success Coach on the students supported by the grant, we may be able to predict the results when such support is provided on a broader scale under the Guided Pathway system[1].

[1] The first two pieces of the Guided Pathways model are also completed in this case. The first piece in completed since this project only involves students who have already selected a STEM major and the second piece is completed since most STEM programs such as engineering rather have a rather rigid and clearly defined pathway of required courses.

The Grant

The College of DuPage is a large community college in suburban Chicago with an enrollment of approximately 22,000 students enrolled in credit classes with a full-time equivalent enrollment of approximately 12,000 students. There are approximately 250 to 300 students enrolled in its engineering program who plan to transfer to a four-year engineering school. A smaller, but significant number of students plan to receive degrees in other STEM fields.

In the fall of 2016, the College of DuPage received a grant from the National Science Foundation's S-STEM program to "(1) increase the number of financially needy and academically talented full-time students who graduate or transfer in a STEM program; and (2) Improve the retention and completion rates of students in STEM programs by providing individual and cohort student support, internships and research opportunities" [8].

Students selected for the program had to be majoring in the STEM fields of biological science, computer science, chemistry, math, or physics[2]. Students were selected for the program based on both financial need and academic talent. Financial need was determined by evaluating their Free Application for Federal Student Aid (FAFSA) information. Initially, applicants were required a minimum Composite ACT score of 21 and grade point average (GPA) of 2.5 for incoming freshman or a GPA of 2.5 if already enrolled in college although the ACT requirement was later dropped as fewer and fewer student took this test[3].

Students selected for the program received a scholarship that would cover the tuition for 32 credit hours and an allowance to cover $375 of book cost per academic year. Funds were also provided to support summer research programs and travel for five STEM students per year.

In addition to the purely financial support, the selected students received the support of a Student Success Coach. The Success Coach was a half-time employee completely dedicated to monitoring and supporting these 20 to 24 students.

Support provided by the Coach included:

- Student support services: Provides proactive individualized academic advising and career support through case management and coaching
- One-on-one meetings: both electronic and in-person
- Academic monitoring: the use of mid-term grade sheets or electronic records to monitor progress; mandatory meetings with the coach before dropping any classes
- Resource guides: on career exploration, resume creation, external scholarships and internship searches created and distributed to students
- Workshops: on mindfulness, setting priorities and goal-setting along with meetings with Career Services, 4-year college visits and meeting with successful COD alumni.

Table 1 shows the number of students selected and supported during the entire original five-year grant along a sixth year extension funded by the NSF. To support a total of 22 to 24

[2] The majority of the students selected turned out to be engineering majors.

[3] The terms of the NSF grant also required that selected students were also required to be a US Citizen, US National, US Permanent Resident, or Admitted Refugee.

students each year, 16 to 17 new students were selected each year after the initial year depending on the graduation and transfer rates of the students selected.

	Year 1		Year 2		Year 3		Year 4		Year 5		Year 6	
	Fall 2016	Spring 2017	Fall 2017	Spring 2018	Fall 2018	Spring 2019	Fall 2019	Spring 2020	Fall 2020	Spring 2021	Fall 2021	Spring 2022
New to program	11	0	12	4	14	3	12	5	12	3	0	0
Continuing in program	0	11	8	16	8	18	13	19	13	22	13	8
Total	**11**	**11**	**20**	**20**	**22**	**21**	**25**	**24**	**25**	**25**	**13**	**8**

***Table 1** – The number of new and continuing students supported by the grant. The goal was to have 22 to 24 students supported by the grant at any given time.*

General Student Response

Students in the program were surveyed at the end of each year to determine their satisfaction with the program and to ask for feedback on possible improvements. Figures 1 and 2 summarize surveys for the first five years of the grant and show solid student satisfaction with the program and the success coach.

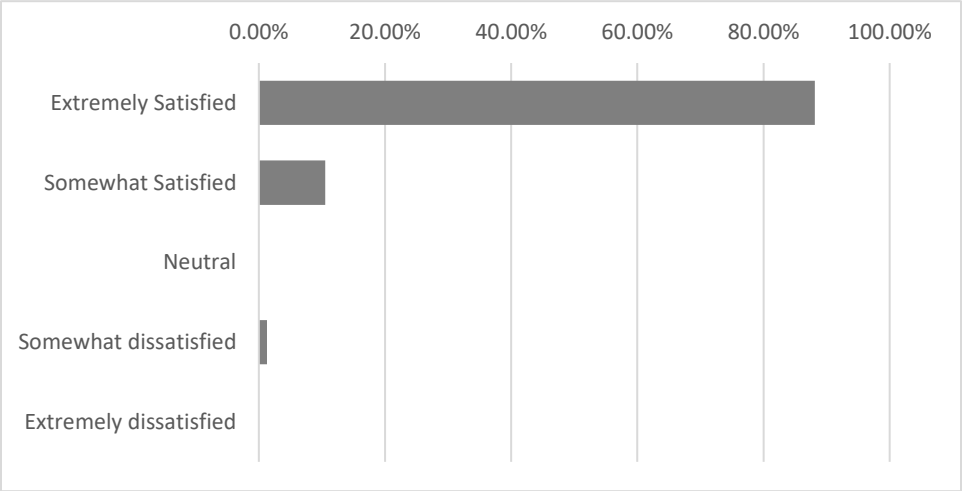

***Figure 1– How satisfied are you with the S-STEM program so far?** -Student Survey results from the first five years of the project showing solid student satisfaction with the program.*

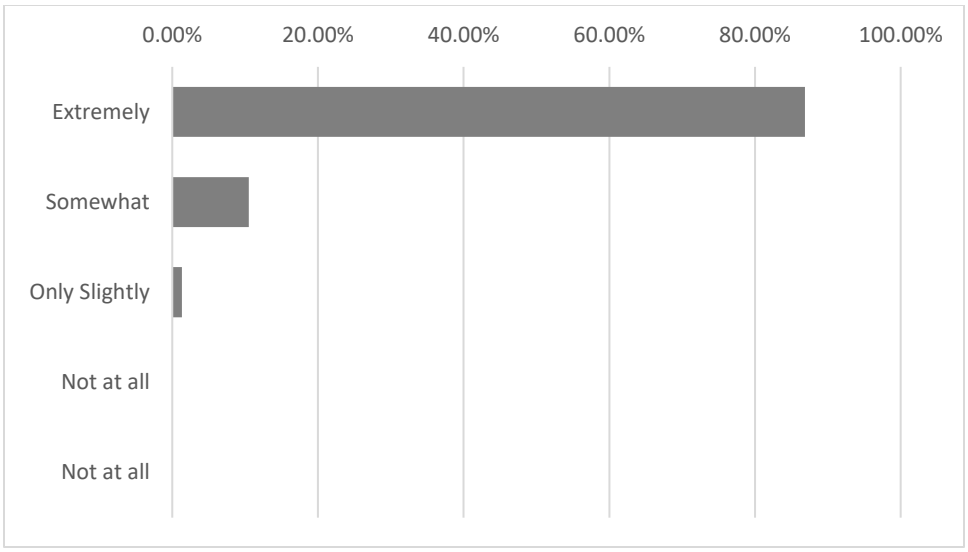

Figure 2–– *How informative do you think your meetings with your Success Coach were?* - *Student Survey results from the first five years of the project showing solid student satisfaction with the Success Coach.*

Surprisingly, figure 3 shows that even when awarded a full-tuition scholarship, more than 60% of the students work in outside employment at least quarter-time and more than 20% work at least half-time.

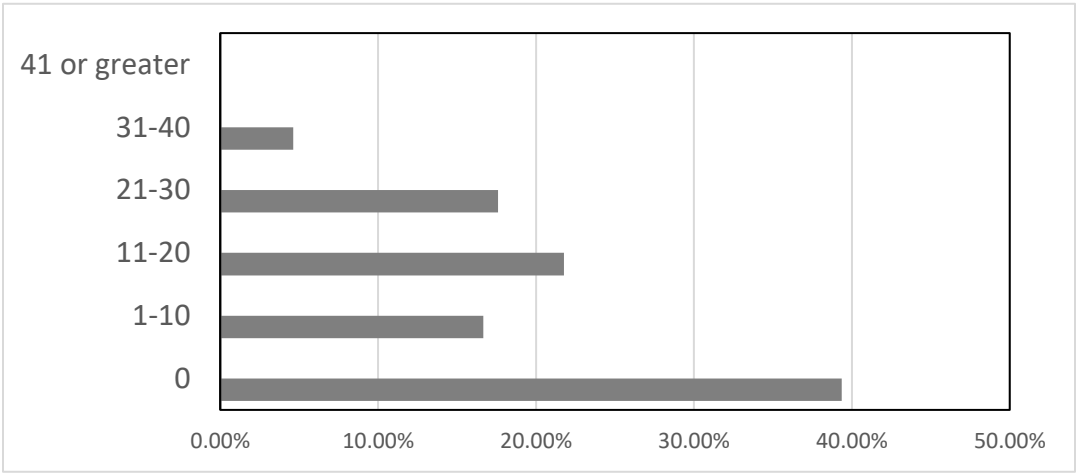

Figure 3– How many hours a week did you work during the last school year? *-Student Survey results from the entire grant showing students significant work schedules even when receiving a full- tuition scholarship.*

Effect of Success Coach on Completion Rates

The effect of the Success Coach was evaluated by comparing the rate of successful class completion for S-STEM students and a comparison group of students with similar backgrounds. The success rates of major interest were the success rates in classes taken predominately by STEM students such as Calculus or Engineering Dynamics.

To create the comparison group, the college's Office of Research and Planning created a cohort of students that

- Were Full-time (i.e. taking at least 12 credit hours),
- Had begun enrollment at COD relatively recently (i.e. after the fall term of 2014),
- Have a composite ACT score of at least 21[4],
- Received at least $3000 financial aid per semester and
- Appeared to be a STEM student either because (a) they have declared they intend to graduate with either an associate of science (AS) or an associates of engineering (AES) degree or (b) are taking a significant load of STEM courses (e.g. calculus).

The above criteria for the comparison group is an attempt to make it as similar as possible to the S-STEM student group. Table 2 shows the average composite ACT scores for students selected for the S-STEM grant and the comparison group. (The size of each sampled group is shown as a small number in parenthesis to the right of the score.) There is no statistical

	Composite ACT Scores	
Group	**Mean**	**Standard Error**
S-STEM Students	24.94 (32)	0.76
Comparison Group	24.28 (571)	0.13

Table 2 – *The composite ACT scores for the S-STEM students and the comparison group. This small number in parenthesis is the size of the group. There is no significant difference for a one-tailed T-test between these scores.*

difference for the composite for the two groups for either score. Based on this information, the two groups are assumed to have equal levels of preparation when entering college.

[4] An analysis was also completed in which the students in the comparison group were required to have a Math ACT score of 21 as opposed to Composite ACT score of 21. The fundamental results of that analysis were the same as the analysis presented here.

Table 3 shows the percentage of students receiving a C or better in seven standard S-STEM courses (e.g. calculus) for both the S-STEM students and the comparison group during the entire grant. In six of the seven classes, S-STEM students fared better than the comparison group. Unfortunately, because of the relatively small sample size in the S-STEM group, this difference is not statistically significant.

	Success Rate	
Course	**S-STEM Group**	**Comparison Group**
Calculus I	53% (38)	46% (89)
Calculus II*	70% (37)	56% (57)
Calculus III	83% (30)	79% (33)
Physics I	88% (32)	79% (39)
Physics II	81% (37)	78% (32)
Engineering Statics	84% (19)	79% (24)
Engineering Dynamics	82% (17)	91% (11)

Table 3 – *Percent of student passing standard individual STEM courses with a C or better for the S-STEM and the group. Small numbers in parenthesis represent the numbers in the sample group.*

Table 4 shows the percentage of students in each group receiving a C or better in courses with a STEM Classification of Instructional Program (CIP) code (e.g. CIP code 14 for Engineering) and for all courses taken. The data are broken down term by term for the entire period of the grant. The size of the comparison group decreases over time because of the requirement that comparison group students have an ACT score of 21 while the number of students taking the ACT has decreased[5]. In ten of the eleven terms in the study, the S-STEM group performed better in every term in both sets of data. The difference between the performance of the S-STEM group and the comparison group was statistically significant at the 0.01 level both of the grand total of all terms and for several individual terms as shown with marked with a "**".

[5] The size of the both the S-STEM and comparison groups are slightly different that numbers provided in our previous report on this project [8] because the previous analysis required analyzed S-STEM students to have an ACT score and included part-time students in the comparison group.

	STEM Courses		All Courses	
Term	S-STEM Group	Comparison Group	S-STEM Group	Comparison Group
2016FA	92% (24)	75% (255)	89% (37)*	78% (563)
2017SP	90% (29)	81% (235)	92% (38)*	84% (535)
2017FA	88% (50)**	73% (304)	91% (67)**	79% (662)
2018SP	92% (48)**	72% (253)	93% (73)**	77% (531)
2018FA	80% (61)	77% (274)	85% (97)	80% (552)
2019SP	80% (55)	72% (239)	83% (82)	77% (459)
2019FA	86% (64)**	75% (162)	86% (105)*	79% (351)
2020 SP	91% (47)	89% (104)	94% (98)*	89% (244)
2020FA	86% (66)	80% (92)	88% (100)	84% (183)
2021SP	93% (67)**	74% (65)	93% (105)**	81% (120)
2021FA	*65% (34)***	*86% (51)*	*67% (51)***	*87% (78)*
Grand Total	86% (545)**	76% (2034)	89% (852)**	80% (4278)

Table 4 – *Percent of students in each group receiving a C or better in courses with a STEM CIP code and for all courses. Small numbers in parenthesis represent the number of courses analyzed in the sample group. Pairs marked with a "**" indicate a difference at the 0.01 level of significance and at the 0.05 level when marked with a "*".*

The single striking exception to the better performance of the S-STEM students is the last semester of the analysis, the fall of 2021. Here the S-STEM students did statistically worse than the comparison group. While this semester should not be dismissed, it should be noted that it was a very unusual semester. First, it was at height of the Covid pandemic with almost all of the classes and student interaction done over the internet. Second, because it was last semester of the grant, there were no incoming students and so the size of the S-STEM group was small, roughly half the size of the previous semester. This small size made the calculation of the success rate vulnerable to the failure of just a few students who did poorly in this remote learning situation. In this case, the success rate was dominated by a small set of four students who dropped or failed a significant number of their courses.

Taking this last semester as a statistical fluke, the S-STEM group is clearly performing better than the comparison group. The question is what causes this difference. The selection criteria for the comparison group and a comparison of the ACT scores of the two groups suggest that the two groups were equally well prepared for college level courses.

The first possible answer is that because the S-STEM students received a full-tuition scholarship, they had to work less to pay for school and so had more time to study. We argue that this is unlikely to be the complete cause for two reasons. First, Figure 3 shows that over half of the S-STEM students work at least quarter-time even when provided the scholarship. Second, students in the comparison group did receive at least $3000 in financial aid from the college in

the term being analyzed, roughly comparable to the average $4817 in annual support provided to the S-STEM students.

Another possible answer is that there is an unseen difference between two groups of students. This may be true, but the difference is not obvious. Both groups are attending the same school and taking roughly the same set of courses. The average ACT score of both sets is the same and both sets received financial aid in some form. That said, there may be an undocumented level in motivation. The application process for the S-STEM scholarship was slightly more demanding that the application process for standard financial aid. This additional demand, however slight, may have required the S-STEM students to be more motivated and organized.

We argue that the dominant cause was "intrusive advising" or personal attention of Success Coach worked as suggested by the Guided Pathways model. This idea is supported the data in the first two rows of table 4. The Success Coach was hired in March of 2017 and so had no effect on the students taking courses in the fall of 2016 and only minimal effect of the students taking courses in the spring of 2017. While the S-STEM student has a slightly higher success rate during those two terms may be explained by the two reasons stated above, it is only after the Success Coach is fully on board that largest success rates and the largest statistical difference happen.

It may also be a combination of factors. It could be that the students applying for the S-STEM grant were slightly more motivated to begin with but it is only after the personal support and attention of the Success Coach was added in that the effect appears significant.

The above arguments are made based on the assumption that the striking results during the last semester are statical fluke caused by some very unusual circumstances. We are applying for addition NSF support to continue our support of the students and, if that support is granted, we should be able to confirm or refute that assumption.

Future Plans

We are currently applying for a second grant from the NSF in order to continue our support of STEM students, but would like to expand the population of students supported. We feel that the use of intrusive advising and the support of the Student Success Course may have an even more powerful impact on part-time students. There are indications of this in other studies [9]. Our next application will request support for this group.

Part-time and non-traditional students are a significant population supported by two-year colleges. By expanding our financial aid and Success Coach support to simultaneous serve both full and part-time students, we can not only support this relatedly unique population but fully document the results.

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