# GIFTS - Boosting Students Who Demonstrate Non-Thriving Characteristics Early in the Semester

## Introduction

This GIFTS paper investigates a process used by the First-Year Engineering Program at a private midwestern university to identify students who show signs that they may be non-thriving at the end of the semester and boost them towards success and improved course performance. The earlier in the semester, an educator can identify students who show signs similar to those of previous students who were ultimately non-thriving at the end of the semester, the more time the current students have to utilize resources and ultimately thrive in a course. Prior to the COVID-19 pandemic, one author conducted a study aimed at this purpose [1], which included:

1) Using historical data, a trigger that, when met, increased the likelihood that the student would be non-thriving by the end of the semester was identified. The aim was to create a trigger that identified as many ultimately non-thriving students as possible while minimizing the identification of students who would ultimately thrive by the semester's end (i.e., false positives). The trigger must be based on the first few weeks of performance so the faculty can boost these students before the semester progresses too far. The trigger was based solely on the student's performance for two reasons: (i) the authors did not want to identify students based on their demographics or preparation levels; instead, only on their performance, and (ii) for transferability to future courses, as other course instructors may not have additional information.

2) Using this trigger, the instructors identified "at-risk" students and asked them to create a personal action plan that they would use to help them thrive. Once the instructor identified the students who met the trigger, the instructor boosted these students. This boost involved a personalized email to the student, mentioning their performance met characteristics that in the past have sometimes resulted in students who ultimately are non-thriving by the semester's end. The email invited students to complete a personalized action plan, which helped them build meta-cognition and identify what steps they would take to help boost their performance. This personal action plan connected students to various resources on campus to help support them.

3) The study tracked the boosted students to see if they were thriving by the end of the semester. The previous study showed that students who created a personal action plan had statistically higher grades at the end of the semester, on average, than those who did not.

This initiative (initially conducted in Fall 2019) was repeated in the Fall 2024 semester (it was not repeated in between due to bandwidth limitations). The Fall 2024 effort, while similar to the Fall 2019 effort, took place in very different environments (pre-pandemic vs. post-pandemic), and some changes were made. A few of the major questions investigated in this paper are:

1) How has the number and percentage of students who met the trigger condition changed before and after the pandemic? Were there more "false negatives"?

2) How has the number and percentage of students who completed the personal action plan changed before and after the pandemic? Did the completion of the plan correlate with grades?

3) Using the results of the personal action plans, what are the reasons why students self-reported meeting the trigger condition?

**Number of Students**

The number and percentage of students who met the trigger condition (which is an 80% or lower on one of the first three homework assignments) for both semesters are shown in Table 1.

**Table 1.** Comparison of the Number of Students Meeting the Trigger Condition

| Semester | Number | Percentage |
|---|---|---|
| Fall 2019 | 28 / 406 | 6.9% |
| Fall 2024 | 39 / 466 | 8.4% |

As seen in Table 1, both the number of students and the percentage of students who met the trigger condition increased from 2019 to 2024. To investigate these changes further, Table 2 identifies the breakdown of students based on two parameters for both the Fall 2019 semester and Fall 2024: (i) whether or not they met the trigger condition and (ii) if they received a B or higher (deemed thriving) or a B- or lower (deemed nonthriving).

**Table 2.** Comparison of the Number of Students Meeting the Trigger Condition

| Semester | Trigger | Non-Thriving | Thriving |
|---|---|---|---|
| Fall 2019 | < 80% on HW1, HW2, or HW3 | 12 | 10 |
| | ≥ 80% on HW1, HW2, and HW3 | 22 | 362 |
| Fall 2024 | < 80% on HW1, HW2, or HW3 | 4 | 35 |
| | ≥ 80% on HW1, HW2, and HW3 | 13 | 414 |

Table 2 indicates that in Fall 2019, 22/406 (5.4%) of the students were false negatives (i.e., they didn't meet the trigger condition, but ultimately were non-thriving). In the Fall 2024 semester, 13/466 (2.8%) were false negatives. The reduction in false negatives indicates that a larger percentage of students who may have struggled in the course were identifiable early in the course (within the first four weeks) compared to five years ago. The overall course structure is very similar between the two semesters, so there wasn't an apparent reason why the false negative rate was significantly lower in 2024 than in 2019.

**Personal Action Plan Response Rates**

Next, the response rates for the two cohorts are analyzed in Table 3.

**Table 3.** Comparison of Personal Action Plan Response Rates

| Semester | Number | Percentage |
|---|---|---|
| Fall 2019 | 17 / 28 | 61% |
| Fall 2024 | 36 / 39 | 92% |

In the Fall 2024 semester, the author utilized a reminder email to students, which resulted in a significant increase in the completion rate of the personal action plan. Less than one-third of the students who received the boost email responded before the reminder (the authors sent the reminder approximately two days after the first email), indicating that without the reminder, the percentage of those students who would have completed the boost may have been lower.

Table 4 outlines the course performance of those students who responded to the boost (i.e., completed the personal action plan) compared to those who did not. The scores were normalized to the course-wide average and median to account for different course grades by semester.

**Table 4.** Comparison of Boost Response Rates

| Semester | Trigger | Mean Score | Median Score |
|---|---|---|---|
| Fall 2019 | Responded to Boost | 0.939 | 0.956 |
| | No Response to Boost | 0.905 | 0.898 |
| Fall 2024 | Responded to Boost | 0.944 | 0.942 |
| | No Response to Boost | 0.898 | 0.887 |

In both 2019 and 2024, those who completed the boost earned higher course mean and median grades than those who did not respond to the boost. This demonstrates that simply making a personal action plan continued to help these students identify methods or strategies that resulted in improved performance by the end of the semester.

**Reasons for Lower Homework Score on One of the First Three Homework Assignments**

Table 5 outlines the most common self-reported reasons for a student earning a grade below 80% on one of the first three homework assignments. Table 5 shows various reasons, but most students struggled with time management, file submission, and careless mistakes.

**Table 5.** Self-Reported Reasons for Lower Homework Grade

| Reason | Number |
|---|---|
| Forgot / lack of time management | 11 |
| Wrong file submission type / careless mistake / technical issue | 10 |
| I am beginning to struggle to keep up with this and/or other classes | 10 |
| I am stressed about other things on campus/dorm, or at home | 5 |

**Conclusions and Future Work**

Both iterations of the study demonstrated the importance of students completing the personal action plan, as the performance of those who completed the survey was higher than those who did not. To this end, the use of reminder emails is critical to facilitate more students creating a plan. To reduce false positives, the authors will change the trigger to be an 80% or lower on one of the first three homework assignments unless there is an upward trend by the third homework assignment with at least an 80% on that assignment. Additional workshops on time management and early use of course resources are also being developed through the college's advising team.

## References

[1] A. Bartolini, C. Running, G. Ambrose, and X. Duan, “Integrated Closed-Loop Learning Analytics Scheme in a First-Year Engineering Course,” *Proceedings of 2020 ASEE Annual Conference and Exposition*, June 21-24, Virtual, doi: 10.18260/1-2--34836