# WIP: Relatable Rebound Story Project: Transforming How Students View and Overcome Setbacks


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***Abstract*—This innovative practice WIP paper presents a pilot study of an educational intervention designed to transform the way students view and overcome struggles that are a normal—and essential—part of the learning process. The intervention involves sharing "relatable rebound stories" from previous students, each describing a setback or challenge encountered and the specific agentic strategies used to resolve it. Preliminary results are presented from a pilot study conducted in an entry-level computer engineering course of 168 students that requires time management and project-based learning. This study shows the positive impact of this intervention on quantitative sense of belonging and self-efficacy scales and confidence in skills related to computing, systems prototyping, and problem-solving.**



***Keywords—undergraduate, computer engineering, reflection, survey, peer mentoring, learning strategies***


## I. INTRODUCTION

When undergraduates first embark on courses specific to their major, it is common for them to question "Do I belong? Do I have the 'right' background? Am I cut out for this major?" These often intensify when students encounter setbacks such as struggling to complete assignments or receiving a low grade. Even though these struggles are a normal part of the learning process, students may view adversities or setbacks through a lens clouded by doubts about whether they belong, draining energy and focus needed to learn [1]. Knowing that these struggles are normal (in fact common and expected) is critical in reducing the anxiety that hinders learning. Seeing concrete examples of previous students with similar background or preparation overcoming specific challenges—and the strategies they used—can improve self-efficacy and persistence.

Recent studies [1], [2], [3], have shown the lasting benefit on retention of story-based social-belonging interventions that are introduced as students first enter college. In these interventions, upperclassmen share experiences with first-year students to convey that many difficulties and concerns they have about belonging are common and can be overcome.


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This paper describes a pilot study of a story-based intervention introduced to first- and second-year students entering an electrical and computer engineering major. Rather than focusing generally on social belonging, it is specifically designed to target academic-related concerns and engineering problem-solving skill development. The intervention involves sharing "relatable rebound stories" from previous students who successfully completed the course, each describing a setback or challenge encountered and the specific agentic strategies used to resolve it. Stories conclude with the results of the actions taken and optionally brief descriptions of milestones achieved such as becoming an undergraduate teaching assistant or getting an internship.

This study focuses on the research question: Among students entering the electrical and computer engineering major (first- and second-year students), what is the effect of sharing relatable rebound stories at critical points in a semester on their self-perception of skills and ability to succeed, and their sense of belonging in a foundational computer engineering course? The study assesses the impact of sharing rebound stories using pre- and post-intervention surveys that pose a combination of short reflection questions on the challenges faced and the actions planned/taken to address them and a series of quantitative scale instruments to rate sense of belonging, self-efficacy, and confidence in problem solving skills.

## II. RELATED WORK

### *A. Story-based Social-Belonging Interventions*

A recent large-scale study [1] of 26,911 students across 22 diverse institutions shows the benefit on first-year retention rates of a story-based intervention which focuses on social belonging concerns (e.g., homesickness, difficulty making friends or interacting with faculty). Our relatable rebound stories are a specialized class of these stories targeting academic-related concerns. We leveraged from that study's recommendations on how to craft effective stories. Most notably, two important

guiding principles are: 1) it is critical for the messages conveyed in these stories to be not only hopeful, but truly feasible in that equitable support is in place for the students to have similar success, and 2) the stories must include not only the description and context of the challenge faced, but also the agentic actions taken to resolve it.

Reckinger and Gregg [2], [3] have introduced a storytelling social-belonging intervention into introductory computer science (CS) courses. Their method involves videotaping interviews of recent computer science graduates who discuss their struggles and failures in CS courses. This intervention is grounded in attribution theory [4], focusing on how students *perceive* the causes of their failures and successes and working to transform these to nonpejorative attributions. During story collection, the stories are framed within a template that begins with describing a struggle/failure/anxiety, followed by an attribution (nonpejorative), and concluding with redemption (such as a positive outcome or a new perspective on the course that might be helpful or encouraging to current students). This story framework fosters valuable self-compassion attitudes and encourages a growth mindset perspective. This framework differs from our rebound story pattern in that its redemption portion typically includes reassurances that the situation improved over time or when circumstances changed, while our rebound stories highlight the agentic actions taken to overcome the challenge.

### B. Storytelling as Peer Mentoring

The storytelling approach complements traditional forms of peer mentoring which have been found to be highly effective particularly in promoting academic and social integration in the initial phase of academic studies [5]. While traditional peer mentoring programs select a small subset of students to serve as peer leaders and teaching assistants from the most academically successful students, the rebound story intervention invites a large, broad set of students to contribute their rebound stories. These stories share wisdom, experiences, and advice from students at all levels of achievement for the primary purpose of improving attitude and well-being, as opposed to focusing solely on academic achievement. Student-to-student interaction across semesters builds community as more experienced students convey how they overcame challenges.

D'Abate and Alpert [6] qualitatively explore the benefits of storytelling as an effective mentoring tool in conveying contextualized insights and guidance, giving encouragement, and providing empathetic emotional support, among many other functions. This is a key motivation for the Story Collider program [7] which hosts live storytelling shows featuring scientists, science writers, teachers, among others, giving firsthand personal narratives of their real-life experiences in short 15–20 min segments. It produces a podcast of the shows, enabling broad science outreach, inspiration, and advocacy. Another rich source of mentoring stories are college student blogs that are curated by many college admissions and news outlets (e.g., [8], [9], [10]). These typically include essays and videos covering a broad range of topics affecting students, perspectives on campus culture, fostering well-being and self-care, in addition to transformative struggles (e.g., "Flipping failure" [11]), relating to a variety of academic and nonacademic student experiences. In contrast, relatable rebound stories are short (100–400 words) so that students can digest at least three per intervention activity and are primarily focused on academic concerns. This paper presents a formal study of their impact.

## III. Intervention Method

The rebound story intervention was designed and evaluated in a core, foundational computer engineering (4-unit) course at Georgia Tech, ECE2035, in which students learn how to acquire knowledge about techniques and tools for developing efficient, reliable embedded software in a system that integrates multiple hardware components. As in real world settings, this involves experimentation, asking questions to get missing information, frequent false starts and exploration that may lead to dead ends before a solution is found.

### A. Intervention Design

Collecting relevant stories was an essential prerequisite for the study. We sought voluntary submissions from students in the spring 2023 semester (prior to the beginning of the study) from recent students in earlier semesters who we knew had encountered challenges in the course. The solicitation briefly introduced the intended use of the stories and provided an online survey. If the student indicated a willingness to participate, subsequent survey items asked them to describe a challenge they had faced in the course, relate how they overcame or lessened the challenge, and share any advice they would have for students in a similar situation. A few additional optional questions allowed the respondent to give further context, including other successes they had achieved, and to indicate whether they wished to remain anonymous. Altogether, about 210 invitations were sent out, and over 40 respondents provided stories.

The stories were curated by undergraduate research assistants who could judge their appeal to typical students. The best stories were edited for the most engaging presentation by adding graphics, memes, or videos as appropriate. After curation, 28 stories were available by the time of the interventions in the spring semester of 2024. They were made available on a web site only to students enrolled in the class during the intervention activities. For ease of browsing, each story was annotated with key words to allow users to filter stories by key words of interest.

Some example story titles include: "*Balancing work, life, school & coming back from failing grades*," "*From a low test grade to becoming a UTA*," "*You can't do it alone*," and "*I have a failing grade, should I drop?"*

### B. Example Story: *"Not knowing where to start"*

**Q: What challenge did you face in ECE2035?** A: For me, the biggest challenge was project one... I remember opening up the project, reading the problem statement, and just feeling panic.

**Q: How did you overcome this challenge or lessen the concern?** A: For the project, that first night after stressing out, my roommate and I, who was also in the class, spent a good part of the night just thinking and talking about the algorithms that could work. We didn't write any code, we just talked, and we talked a lot. That's a super important part of this class, understanding the problem before attempting to solve it. By the

end, we had quite a few useful ideas, and it didn't feel hopeless anymore! The next day, I went to office hours with the TAs, and continued to discuss it and figure out edge cases I would need to handle. I didn't start coding until 3 days after the assignment dropped, but that wasn't procrastination. After that, I started coding, and I kept going back to the TAs if I had a question. I ended up doing very well on the assignment! Start early!

**Q: What advice would you like to give to other students who may face a similar situation?** A: Talk to your peers and talk to the TAs! Start early! Get enough sleep, and know when to stop for the night. If you're stuck, and it's past midnight, go to sleep! Start again in the morning! I promise you'll get more work done and you'll feel less bad!

**Q: Information about you?** A: I'm the son of an immigrant, and no one in my direct family is an engineer, or STEM inclined. In a lot of ways, I kind of fell into this career, which is a huge blessing, but I wasn't setup for this when I was younger. I didn't even start at Tech, I transferred as a 3rd year.

**Q: Do you have accomplishments you would like to share?** A: I interned the summer after I took ECE2035, and I started TAing ECE2035 right after I took it as well, and did that for 2 semesters. I also started research in Silicon Photonics, and I am now about to starting my PhD in that field (finished undergrad in May 2023)! I have one 2nd author publication, and I'm currently working on more!

### *C. Data Collection/Analysis*

We collected data by conducting pre- and post-intervention surveys and requesting institutional course grade data for the course in which the intervention was run during the Spring 2024 semester. We chose two points during the semester for interventions based on when they would be encountering their two most difficult programming experiences. We dedicated most of one class session for the first intervention, including an oral presentation of one of the rebound stories by the author. Students browsed the other stories during additional allocated time of that first intervention. The surveys and the story browsing (at least three stories) were performed outside of class for the second intervention.

All 168 students in the course participated in the intervention activities for participation credit, including the surveys. Of these, 103 students voluntarily gave informed consent for us to use their anonymized data. Our protocol for collecting the data was approved by Georgia Tech's Institutional Review Board.

In addition to reflection questions, the surveys include questions drawn from three survey instruments: the Sense of Belonging Scale (SB) [12], the General Belongingness Scale (GBS) [13], and the New Generalized Self-Efficacy Scale (NGSE) [14]. Due to time constraints on the activities, we selected a subset of the scale items in each category and slightly rephrased four questions to contextualize them to the course. We also included questions for students to rate their confidence in skills related to computing, systems prototyping, and problem-solving. Most questions were rated on a 5-point Likert scale (where 1 = Strongly disagree and 5 = Strongly agree). In addition, a pair of surveys were conducted at the beginning and end of the semester which included questions focused on skills and self-efficacy, where the change in skill confidence was rated on a 3-point scale.

The pre- and post-intervention surveys include the following questions (the three-character codes before each question are used in figures in Section IV).

Belonging: (asked both before and after the intervention)

BQ1: I feel included in the course and ECE [13]
BQ2: I feel connected with others in the course and ECE [13]
BQ3: I am committed to participating in this course. [12]
BQ4: I feel supported in this course by peers, TAs, and faculty [12]
BQ5: I am accepted in ECE and in this course.[12]

Existing Challenge? The student answers Yes or No to whether they are currently experiencing a challenge. This is asked before reading the stories and again after (i.e., have the stories brought to mind challenges currently occurring).

The beginning and end of semester surveys include the following groups of questions:

Self-Efficacy: (all from the NGSE [14])

SQ1: I will be able to achieve most of the goals that I set for myself.
SQ2: When facing difficult tasks, I am certain that I will accomplish them.
SQ3: I believe I can succeed at most any endeavor to which I set my mind.
SQ4: I am confident that I can perform effectively on many different tasks.
SQ5: Compared to other people, I can do most tasks very well.
SQ6: Even when things are tough, I can perform quite well.

Skills: These are specific to the nature of ECE2035. Each of these begins with "I am…" :

SK1: confident in my understanding of prerequisite material.
SK2: confident in my ability to learn to code in assembly language.
SK3: confident in my ability to learn to code in C.
SK4: confident in my ability to deal with errors (e.g., identify and fix programming bugs).
SK5: skilled at solving problems that can have multiple solutions.
SK6: able to explore multiple solutions to balance conflicting efficiency constraints.
SK7: confident in my test-taking skills and ability to adapt them to the course.
SK8: confident in my ability to independently work on a project over several weeks and to keep myself on schedule.
SK9: confident in my ability to build a circuit that interacts with software, as part of an embedded system.

The pre- and post-intervention surveys also included brief reflection questions asking students to describe challenges or concerns they are currently encountering, planned actions, and to rate relevance and inspiration factors of the stories.

## IV. Preliminary Results

We analyzed the distribution of student responses to each of the belonging survey questions before and after the first (Fig.1) and second (Fig. 2) intervention. Each stacked horizontal bar shows the percentage of responses in each Likert category, from 1 – Strongly Disagree (red) to 5 – Strongly Agree (dark green). The bars are centered on the midpoint of the Likert scale for ease in comparing relative percentage changes.

TABLE I. Belonging Scale Statistics[a]

| BQ | Activity 1 (N = 103) | | | | Activity 2 (N = 95) | | | |
|---|---|---|---|---|---|---|---|---|
| | ***B*** | ***A*** | ***%Δ*** | ***p*** | ***B*** | ***A*** | ***%Δ*** | ***P*** |
| BQ1 | 3.87 | 4.17 | 7.5 | < .001 | 3.92 | 4.06 | 3.8 | .013 |
| BQ2 | 3.46 | 3.90 | 12.9 | < .001 | 3.74 | 3.99 | 6.8 | .001 |
| BQ3 | 4.47 | 4.61 | 3.3 | .008 | 4.40 | 4.43 | 0.7 | .593 |
| BQ4 | 3.98 | 4.34 | 9.0 | < .001 | 4.12 | 4.19 | 1.8 | .163 |
| BQ5 | 4.14 | 4.25 | 2.8 | .064 | 4.07 | 4.14 | 1.6 | .333 |

[a] Column meanings: Before, After, Percent mean difference, p value (alpha = 0.05)

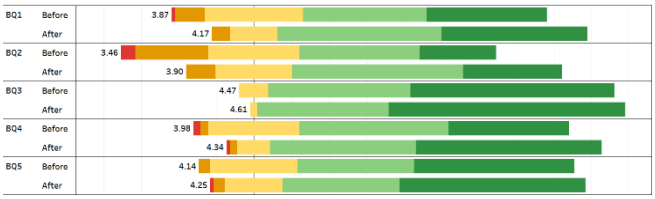


Fig. 1. Activity 1: BQ1–5 before/after intervention, N = 103. The mean is shown to the left of each bar. The median for all BQ before and after is 4, except for BQ3, where median before and after is 5.

Student data show a consistent, positive increase in each of these factors before and after reading the rebound stories, with a more pronounced change after the first intervention exercise than the second. The most significant difference occurs in the response to BQ2 ("I feel connected with others...") with a 13% increase in the mean ($p << 0.001$) in the first intervention and a 7% increase ($p = 0.0011$) during the second intervention. This is notably also the metric on the belonging scale that has the lowest mean overall, indicating that it is a key factor to attend to and is positively improved by this intervention.

A consistent improvement is seen in the responses to BQ1 ("I feel included in the course and ECE") with a 7.5% increase in the mean ($p << 0.001$) in the first and 3.8% ($p = 0.013$) in the second intervention.

The response to BQ4 ("I feel supported in this course by peers, TAs, and faculty.") shows a 9% improvement in the mean ($p << 0.001$) in the first intervention. This might be attributed to the fact that the most common actions conveyed in the stories involve help-seeking and making use of academic resources. The mean scores on this remain high in the second intervention, with no statistically significant difference before and after ($p = 0.163$).

Responses to BQ3 ("I feel committed to this course...") and BQ5 ("I feel accepted...") are modestly improved. Only BQ3's 3.3% difference in its mean in the first intervention is statistically significant ($p = 0.008$). Both have consistently the highest mean scores before each intervention, with a median of 5 in the case of BQ3, giving less opportunity for impact.

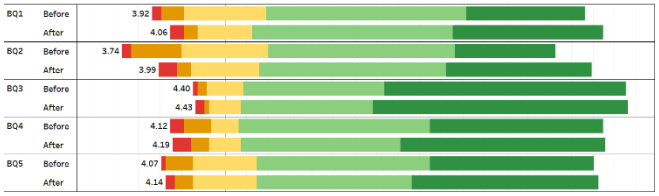


Fig. 2. Activity 2: BQ1–5 before/after intervention, N = 96. The mean is shown to the left of each bar. The median for all BQ before and after is 4, except for BQ3, where median before and after is 5.

The responses for the self-efficacy scale questions asked at the beginning of the semester and at the end are shown in Fig. 3. All the factors show an improvement over the semester, particularly in factors referring to dealing with difficulty (SQ2, SQ6) or with many different tasks (SQ4). The greatest improvements occur for SQ5 ("Compared to other people, I can do most tasks very well") and SQ6 ("Even when things are tough, I can perform quite well") with 5.8% and 6.8% change in means ($p = 0.036$ and $p = 0.010$, respectively). These are the two factors that have the lowest starting mean. Both SQ1 ("I will be able to achieve most of the goals that I set for myself") and SQ3 ("I believe I can succeed at most any endeavor to which I set my mind") have high mean scores with little change and that are statistically insignificant (SQ1 $p = 0.123$, SQ3 $p = 0.055$).

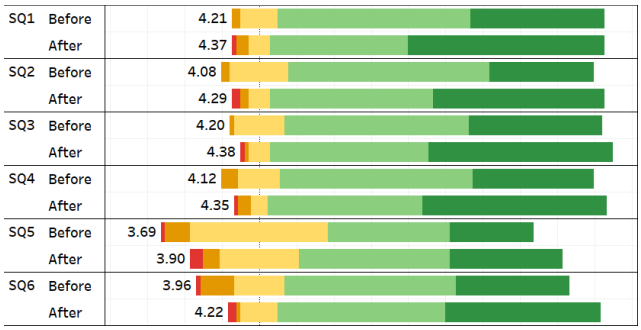


Fig. 3. Sp24 BoS/EoS: SQ1–6 before/after stacked horizontal.

In the end-of-semester survey, students were asked whether their confidence in nine different skills increased, decreased or stayed the same, and the results are shown in Fig. 4. Not surprisingly, for every skill, a majority of students reported an increase in confidence, albeit only 53.9% for SK7 (test-taking). The three skills most directly related to the course, and particularly to the projects that many students found to be their greatest challenge, were SK2, SK3, and SK4. The percentages of students reporting an increase in confidence in those skills were 85.4%, 88.8%, and 83.1%, respectively.

Over the semester, 87% of respondents reported that they were experiencing challenges and of these:

- 97% found similarity between challenges in the stories to their own situation,
- 97% indicated that the stories inspired them to take actions similar to the stories, and

- 52% reported in a reflective response that they planned help-seeking actions after reading stories who did not mention this before the activity.

Specifically related to the last item, increased likelihood in asking for help was the most common result after reading stories. In a categorization of the free-form responses to actions taken, asking for help was over twice as likely as the next most common response, improving time management.

Overall, during Spring 2024, the rate of withdrawals/grades below C decreased by 11% and 30% compared to Fall 2022 and Spring 2023, respectively, when the intervention was not performed.

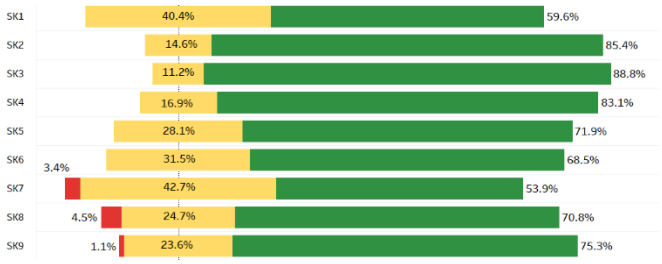


Fig. 4. Confidence in skill set improvement at end of Spring 2024 semester.

## V. Discussion and Future Work

The preliminary results show that sharing rebound stories has a consistently positive impact on students' sense of belonging, perceptions of self-efficacy, and confidence in skills related to computing, systems prototyping, and problem-solving.

This paper focuses on the quantitative survey responses, but the surveys also included brief reflection questions asking students to describe any challenges they are currently encountering and their planned actions. These reflections will be analyzed in the future. The benefit of self-reflection in learning is well-established. Articulating challenges and proposing steps to resolve them has complementary benefits to reading the stories. Future work will explore whether reflective responses correlate with self-efficacy and belonging scale factors. This will also allow us to assess the coverage of the stories and guide further story collection to fill gaps.

Some evidence exists that interventions, as a whole, were less impactful in the second intervention. Possibly, this was due to a lasting effect of the stories from the first intervention. Further studies (or more analysis of the existing data) could focus on only the first challenge encountered (whether it be in the first intervention or the second) and its possible remediation by the intervention.

One limitation is this study so far is understanding the degree to which the interventions actually caused long-term improvements in self-efficacy, belongingness, or confidence. The end-of-semester data reflects all the experiences of the student, including the interventions as well as the normal experience of the course curriculum. Whether increased confidence came from the interventions or the acquisition of knowledge cannot be known for certain, although the surveys given both before and after interventions were designed to capture as much localized effect as possible.

## VI. Conclusion

This paper shows the positive impact of sharing rebound stories on student self-perceptions of belonging and self-efficacy, encouraging resilience and persistence. The relatable rebound story intervention was introduced in a foundational computer engineering course with challenging multi-part projects ranging over several weeks. This course integrates "learning to learn" strategies, a key element of Fink's significant learning theory [15]. Writing their own stories enables previous students to contribute back what they learned about learning as a way of valuing and reflecting upon their experience. These stories, in turn, can help future students better cope with the inherent challenges of courses requiring similar computing or engineering problem-solving skill development.

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