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Using Goal Setting Assignments to Promote a Growth Mindset in IT Students

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Abstract

This paper explores how goal-setting activities in a course were used to promote a growth mindset in students. Research shows many benefits for students with a growth mindset that emphasizes learning and addressing challenges by focusing on effort and process rather than judgments about success or ability. Activities designed to prompt students to improve general skills that would make them better students and prepare them to be lifelong learners were introduced in two upper level IT courses. The activities were designed to promote a growth mindset by focusing on the efforts made and processes used rather than the outcomes. Assessment of the activities found that students demonstrated a growth mindset in their work, saw clear value in the activities, and made progress in improving specific skills.

Keywords: Growth mindset; goal setting; life-long learning; IT education; pedagogy

1. INTRODUCTION

We teach, but our real goal is for students to learn and prepare for success in life. For instructors, there are many parts to this. We must learn about the latest technologies and update classes to add technologies that employers seek. We need to adjust content and delivery to address the move to hybrid and online courses. Ever present concerns about retention and completion statistics mean that we must ensure that students are actively engaged in our programs and institutions. In addition, all fields, but especially IS/IT must prepare students to be lifelong learners.

At the center of all of these efforts are our students, with the instructor in the classroom as the main person engaged in helping the student learn. The instructor can't do it all, so institutions provide a range of services to support students – learning assistance centers, tutoring, study skills courses, etc. Some students take advantage of these support services, and others may not need them, but there are students who need to improve their skills but fail to make use of these services.

This failure to develop needed skills is puzzling. Students are given clear feedback about skills they need to improve – writing, time management, etc. – along with information about where they could find assistance, but no improvement is seen. Discussions with students offered many explanations for not developing these skills that would help them in all of their courses. Two themes stood out. First were the students who knew that poor skills were limiting their ability to succeed, but did not feel that they could improve these skills, demonstrating the fixed mindset identified by Dweck (2016). Another theme was students who set goals for improvement but struggled to take action and make progress towards their goals.

This information prompted thought about expanding course activities and assignments to help students foster a growth mindset, set goals, and make progress towards achieving these goals. These efforts serve many purposes, but fundamentally, the goal is to help students

improve their skills as students. Improved skills will help them learn more in a specific course, help them in later courses, and make them more confident in their ability to complete their degree program. After they graduate, employers will benefit from new employees who can take ownership of planning and executing the learning and improvement necessary to remain valuable employees.

2. MOTIVATION

Mindset

Work looking at individuals' attitudes has identified two mindsets that affect how people respond to the challenges they encounter in their life (Dweck, 2016). People with a fixed mindset believe that their "qualities are carved in stone" (Dweck, 2016, p6) and feel they have a fixed intelligence and personality. People with a growth mindset believe that these qualities can be developed through their efforts, strategies, and the help of others.

The two mindsets drive significant differences in an individual's behavior and how they react to challenges. People in the fixed mindset feel they are constantly being evaluated – are they smart or dumb, will they succeed or fail, will they win or lose? A challenge is seen as a test where they must succeed or fail. They focus on the judgment and may ignore feedback about how to improve their performance. If they do not succeed in their first effort, they may give up. With the growth mindset, people are not interested in proving themselves, but rather improving themselves. The person with the growth mindset feels smart when "learning something over time: confronting a challenge and making progress (Dweck, 2016, p 24). The person with a growth mindset seeks to overcome a challenge by working harder, trying different strategies, and seeking help from others.

There are connections between mindset and the concept of grit, defined as "perseverance and passion for long-term goals" (Duckworth and Peterson, 2007, p 1087)" which has been shown to predict success factors beyond those predicted by IQ. Duckworth (2013) identified the growth mindset as "the best idea I've heard about building grit in kids."

A growth mindset seems ideal for learning, and studies have explored the impact of mindset in education. A recent study by the Center for Community College Student Engagement explored many aspects of mindset. One finding was that "More students have fixed mindsets for math then for either English or overall intelligence" (CCCSE, 2019, p6). The growth mindset also correlates with higher GPAs in both math and English. These findings could affect student success and retention and have specific interest for IS/IT educators since math is seen as a closely related field. Another finding from the study is a relationship between maturity and mindset, with non-traditional age students showing more optimism when facing challenges.

Research on connections between mindset and poverty shows how a growth mindset helps poor students overcome some of the obstacles they face. Research on a national scale looked at the mindset of public school students in Chile (Claro, Paunesku, Dweck, 2016). This work found that mindset and socioeconomic factors are both strong predictors of academic achievement. The study found that a growth mindset was more common with students from higher income families. The finding that "students in the lowest 10th percentile of family income who exhibited a growth mindset showed academic performance as high as that of fixed mindset students from the 80th income percentile" highlights the potential value of promoting the growth mindset (Claro, Paunesku, Dweck, 2016, p8664).

The mindset of faculty can have a significant impact on students. Recent work that looked at a sample of 150 STEM instructors and 15,000 students found that students in courses taught by instructors with a fixed mindset earned lower grades (Canning, Muenks, Green, & Murphy, 2019). In addition, while students from underrepresented minorities had lower average grades than white or Asian peers, the study found that this racial achievement gap was twice as large in courses taught by instructors with a fixed mindset. This work also reviewed course evaluations and found that students were less motivated in courses taught by faculty with a fixed mindset, and were less likely to recommend a course taught by an instructor with a fixed mindset.

Dweck notes that "in truth we're all a mixture of the two" mindsets, and that various events or situations may trigger a specific mindset (2016, p 211). Grant and Dweck (2003) performed five studies that looked at the impact of goals on mindset. Ability or performance goals predict fixed mindset results where student performance and engagement suffer in the face of a challenge. In contrast, goals focused on learning and gaining new knowledge predict

growth mindset behavior - "active coping, sustained motivation, and higher achievement in the face of a challenge (Grant and Dweck, 2003, p541)." This finding shows the importance of focusing on learning goals rather than performance, providing feedback focused on effort, and offering processes to support students' efforts.

Several efforts have explored applying mindset thinking to technology courses (Murphy and Thomas, 2008; Cutts, Cutts, Draper, O'Donnell, and Saffrey, 2010; Lovell, 2014; Payne, Babb, and Abdullat 2018). An obvious starting point is an initial programming course, which can present students with many unexpected challenges along with the potential for technology-generated feedback, including syntax errors, compiler errors, and run-time errors, that are presented in a fixed mindset type success/failure format. One study found that teaching students about mindset and providing growth mindset motivated feedback to students during a six-week period had a positive impact on student's mindset and test scores (Cutts et al. 2010).

Goals Setting

With the value of processes like goals in supporting a growth mindset, it is interesting to look at research on goal setting. Research finds that goal setting in the workplace has a positive impact on employee engagement, workplace optimism, and individual performance – signs of a growth mindset (Medlin and Green, 2009).

Research on the use of goal setting in the classroom also shows benefits. When students in a management course used a goal setting worksheet to develop goals for a group project, instructors found that students actively used the goals to improve project quality and team performance (Lawlor and Hornyak, 2012).

Both of these studies found value in formal, structured goal setting processes. Lawlor & Hornyak specifically used the SMART goal approach. The first published discussion of the SMART goals defined the acronym as Specific, Measurable, Assignable, Realistic, and Time-related (Doran, 1981). Since then, several useful variations have developed (SMART criteria, n.d.), including a format that uses Achievable in place of Assignable (SMART Goals, n.d.).

3. GOAL SETTING ACTIVITIES

How can we promote a growth mindset in students and encourage them to develop skills that make them better students, and in the future, better employees? The growth mindset's focus on effort and process suggests exploring the use of goal setting as a specific process to support the growth mindset. Goal setting activities designed to promote a growth mindset and help students build general skills, rather than skills specific to one course, were developed. The goal setting activities were used in two different upper-level IT courses but were not tied to specific course projects. In addition to the goal of promoting a growth mindset, a second goal was to measure student perceptions of the goal setting activities to guide further use and development of the activities. Students in both courses are a mix of traditional age and older, non-traditional students, with many students working part-time or full-time while taking courses.

Personal Improvement Project

The Current Practices in Information Technology course is the first course in a three-semester self-directed capstone experience. For their capstone, students use technology to develop and implement a solution to a specific problem. During the first capstone course, students work individually to research potential capstone project ideas. In addition to learning about a problem, the research often involves exploring technologies and tools for potential solutions.

During the semester, students complete four three-week long research projects. Each project includes assignments for a project proposal, in-class project pitch, intermediate work product, final work product, reflection, and in-class project presentation. A challenge of this course is that students must take ownership of planning and managing their projects. Additionally, oral and written communication skills are important for the project pitch, in-class presentation, and final project report. A Personal Improvement Project activity was developed to provide a process to promote a growth mindset in the development of the soft skills used in this class.

The activity had three graded assignments during the course of the semester. In the second week of the semester, students submitted a proposal setting a goal to improve a specific non-technical skill along with a discussion of why they chose the specific skill. The proposal assignment prompted students to think about how they would measure and report

on their progress in later assignments. The assignment also provided examples of soft skills and potentially useful on-campus and online resources.

In the middle of the semester, students completed a status check assignment. Using a growth mindset approach, the assignment prompted students to think about effort and process. Students submitted a reflection about what they had done, whether they wanted to make updates to their initial goal, whether they needed help to work towards their goal, and their plans for working on their goal during the rest of the semester.

The final assignment was an end of the semester wrap up. Again, students reflected on their work to achieve their goal and discussed whether they would continue working on the goal or add a new goal.

Student Performance Planning

Goal setting was also used in a course that covers IT strategy and management. This course covers a wide range of topics, but one specific learning outcome covers the management of IT staff. Material supporting this learning outcome includes hiring, promotion, and employee performance planning and evaluation. To help students understand employee performance planning and appraisal, student performance planning and evaluation activities were developed. These activities are spread throughout the semester and provide processes to promote a growth mindset.

The course text uses a novel like format to follow a business leader unexpectedly thrust into the role of Chief Information Officer (CIO) at a fictional company (Austin, Nolan, and O'Donnell, 2016). The book starts with this leader moving into his new role, similar to students starting a new class. In the first week of class, a discussion of goal setting and performance planning for the main character in the book is used to support a discussion of goal setting and performance planning for students. The discussion introduces the SMART goal concept, along with examples of writing SMART goals.

In the first performance planning assignment, students develop a student performance plan for their work in the course during the semester. Students are provided a performance planning template and develop goals organized into three groups, with examples provided for each group:

- General Student Activities – activities a student might do in any course they take.
- Achievement of course learning outcomes – activities to help the student achieve this specific course's learning outcomes.
- Teamwork – goals to support team assignments in the course.

The class has several team assignments, and students work in the same teams for all assignments. While students are developing their teamwork goals, the teams are also working on a team organization and planning assignment and are encouraged to connect their personal teamwork goals with the plans developed by their team.

In the middle of the semester, students complete a two-part midterm performance assessment. First, students assess their progress for at least two goals in each of the three groups in the performance plan. Students are encouraged to submit data to support their self-assessment. For example, one student with a goal about the number and quality of classroom contribution submitted a spreadsheet documenting and assessing each of their classroom contributions. Secondly, students reflect on how creating and following a performance plan has helped their overall performance in the class, with specific discussion of:

- Their execution of activities to support their goals.
- Whether they wrote the right goals
- How they might improve their goals or their work to achieve them.

The final assignment in the performance planning activities was an end of semester assessment of the performance plan. The assignment had two parts. The first was the same as the midterm assessment – an assessment of progress on the goals, ideally supported with data. The second part asked students to reflect on how the performance planning activities had helped their performance in the class. Students also discussed how they might use performance planning, including specific goals, in future courses or a work environment. All of the performance planning assignments contributed to the student's final course grade.

4. ASSESSMENT

Two methods were used to assess the two goal setting activities. The student submissions were reviewed to determine how students engaged in the activities and assess their mindset. An end-of-semester survey collected data about student views on the value of the activities and effort required.

Personal Improvement Project

Students in two successive semesters completed the personal improvement project. The course enrollment was thirty-one (31) in the first semester and eleven (11) in the second. In both semesters, student goals covered a range of topics. The most popular covered time management (procrastination, scheduling, and work/life balance), self-care (meditation, exercise, stress management), and communication (writing and public speaking).

The end of semester wrap up assignment was reviewed to assess what mindset students exhibited in discussing their work on the personal improvement project. Of the thirty-three (33) students who consented to participate in the research, all but one completed this assignment.

The student submissions provided clear discussions of what the student learned and the impact of the projects. Students showed pride and even surprise in what they were able to accomplish. All of the student discussions addressed one or more concepts associated with the growth mindset. These included the effort they made, the processes they used, and the progress they made. Many also discussed plans to continue work on their goal.

Nine of the responses included judgments or similar content associated with a fixed mindset. Four of these were positive – noting the accomplishment of a goal or the success of the project. The other five submissions used terms reflecting disappointment, failure, or scoring their effort poorly. At the same time, all of these submissions also included discussion of the effort and progress that the student had made in working on their goal, and all of these students exhibited signs of a growth mindset by discussing how they would continue to work on their goal.

Students completed a short, anonymous survey on the last day of class. In the first semester, twenty-three (23) of the students completed the survey (74 % response rate), and in the second semester, ten (10) students completed the survey (91 % response rate).

The first four questions used a 5 point Likert scale, asking students to agree or disagree with the statements:

1. I felt that the personal improvement project helped me improve my skills as a student.
2. I felt that the mid-semester status check on the personal improvement project helped me assess how I was doing with my improvement project.
3. I saw the value of the personal improvement project for improving my work as a student.
4. The feedback provided by the instructor encouraged my efforts to work on this project.

For all four questions, the average response was at least 4.0, with at least 75% of students agreeing or strongly agreeing, indicating that students saw clear value in the activities and that instructor feedback promoted a growth mindset.

The remaining questions used a 7 point Likert scale for students to rate (not much to very much):

5. How effortful was it for you to work on your personal improvement project?
6. How much did the personal improvement project help your ability to complete the research projects in the course?
7. How much did you enjoy the personal improvement project?
8. How much would you like to do a similar personal improvement project in future courses?

For question 5, the average was 5.2, showing the project required some effort. The results from the remaining questions were all positive (4.8 – 4.9) showing that the work was beneficial and enjoyable. Question 8 had the widest distribution of answers, with ten (30 %) very much wanting to do a similar project in a future course, but also with thirteen (39 %) unsure.

Student Performance Planning

The student performance planning activities were used in a recent semester of the course with twenty-four (24) students. Goal setting and the assignment to write a student performance plan were introduced in the first week. The SMART goal concept was also introduced with in-class discussions and

examples and supporting online material. Students identified good goals but struggled to document them as SMART goals. The main issues were goals that were not measurable or were not specific. To address these problems, specific feedback was provided. Students were encouraged to discuss their goals with the instructor and allowed to resubmit their student performance plan.

It was a pleasure to read the student reflections submitted with the final performance evaluation. The reflections showed that students had made clear progress in accomplishing their goals. The student reflections also showed that students had put significant effort into working on their goals. For many students, their discussion of how goal setting had helped them improve as students matched what was observed in their class participation and submitted assignments.

All of the student discussions addressed the effort and process concepts linked to the growth mindset. All of the students mentioned goal setting and performance planning as a valuable process. Many also mentioned how the performance plan motivated them to be accountable to make an effort to work on the goals. Two students did make clear judgments that they were not able to achieve their goals, but their discussions focused on lack of effort, a sign of a growth mindset, rather than lack of ability, a sign of a fixed mindset.

An anonymous end of semester survey was used to collect information about several class activities, including the student performance plan, and sixteen students completed the survey (67 % response rate).

The first five questions on the survey used a 5 point Likert scale, asking students to agree or disagree with the statements:

1. I saw the value of the performance planning activities for learning how to write good performance goals for the course.
2. I saw the value of the performance planning activities for evaluating my own performance.
3. I saw the value of the performance planning activities for planning to improve my own performance.
4. I saw the value of the performance planning activities to prepare me for performance planning I might do in a professional workplace.
5. I felt that the performance planning activities engaged me in thinking about how to improve my performance as a student.

For questions 1 – 4, a clear majority (69 – 88%) of students agreed that they saw value in the different goals of the activities. For question 5, the majority (69%) also agreed that the activities prompted them to engage in the process of self-improvement.

The remaining questions about the performance planning activities used a 7 point Likert scale for the students to rate (not much to very much):

6. How effortful was it for you to write your initial performance plan?
7. How effortful was it for you to complete your mid-term performance evaluation?
8. How effortful was it for you to complete your final performance evaluation?
9. How much did you enjoy the performance planning activities?
10. How much did you learn about setting good goals?
11. How much did you learn about a planning process for improving your work in a class or similar long term activity?
12. How much would you like to do similar performance planning activities in future courses?

For questions 6 – 8 about the effort for the activities, averages were 4.1 – 4.5, with writing the initial performance plan requiring the most effort. The response for question 9 about the enjoyment was overall neutral – 4.1. For questions 10 and 11, the averages show students learned about both processes that could be used to support a growth mindset - goal setting (5.1) and performance planning (4.9). For the final question, 50% of the students wanted to do similar activities in future courses. Several students in the course were about to graduate, which may have affected the responses to this question.

5. CONCLUSIONS AND FUTURE PLANS

Students in both classes demonstrated a growth mindset and saw value in the goal setting activities. The presence of a growth mindset is not clearly linked to the class activities, but both activities met the goals set when the activities were developed. The activities were beneficial to the majority of the students, did not require too much effort, and were well received by students. From the instructor's perspective, the time required to develop and grade the assignments was minimal, and the student

submissions provided good insight into the effort and progress students were making. There was also clear evidence that students appreciated and acted on the feedback they received.

The results are encouraging, supporting further efforts to use goal setting in the future. The design of these activities to focus on general, non-technical skills should allow use in a wide range of courses.

Goal setting activities are being developed for two introductory courses. These will use a version of the personal improvement project with more frequent status updates. One of the introductory courses also includes first-year experience content that all new students at the university are required to take, which will provide an excellent opportunity to discuss the mindset and SMART goal concepts.

Goal setting is just one process that can support a growth mindset. Further work will review other aspects of the course environment to identify additional opportunities to encourage the growth mindset.

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