The Effects of Direct Instruction of Metacognitive Skills Through Self-Regulated Learning and Self-Efficacy Development in the Mathematical Sciences.

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Background

Over my years as an educator, I have observed students struggling with independence in their learning due to an inability to accurately articulate areas of weakness as well as identify and utilize resources or strategies to adjust their misconception. Students may be able to state an area of weakness, but cannot create meaningful strategies to independently move through the learning process. The intent of this research project is to provide the students with the tools to bridge this gap.

Research Question

What are the effects of systematic and direct instruction of self-efficacy (growth mindset development) and self-regulated learning (metacognition) skills on student self-sufficiency, self-confidence, and intrinsically driven academic growth?

Sub-Question 1
How does the treatment impact student's ability to articulate areas of confusion as well as identify and utilize strategies to improve academic performance and content mastery?

Sub-question 2
How does the treatment impact self-efficacy and metacognition? If so, how does self-confidence impact the ability to independently drive learning?

Sub-question 2
How does the treatment impact my ability to foster a learner-centered classroom?

Data Collection Matrix

	Surveys	Interview	Pre/Post Assessment Analysis	Student Journals	Teacher Observations	Third-party Observations
Primary Question	X	X	X	X	X	
Sub-Question 1	X	X	X	X	X	
Sub-Question 2	X	X	X	X	X	
Sub-Questions 3	X	X		X	X	X

Sample Group

The treatment was completed in a small, rural k-8 school outside of Kalispell, MT.. There is a wide disparity of socio-economic levels within the school population – 31% of the student population qualify for free-and-reduced breakfast and lunch.   The treatment was completed with 25 sixth-grade students (N=25): 16 girls and 9 boys.

I analyzed the variations in growth through several instruments to compare the impacts of the treatment on the sub-groups. The groups were defined by the fall benchmark math MAP test using the Percentile Rank measure.

- 26% of the students scored in the +80 % range;
- 32 % were in the 50 – 79 percent range;
- 42 % were below 50 percent range

Treatment

The treatment included an eight-week study skill class with a contextual practice component integrated in the sixth-grade math class.

- Self-Efficacy development was modeled using Carol Dweck's principles of Growth Mindset.

- Self-regulated learning curricula was modeled after Barry Zimmerman's triadic feedback loop framework: plan, perform, and self-reflect.
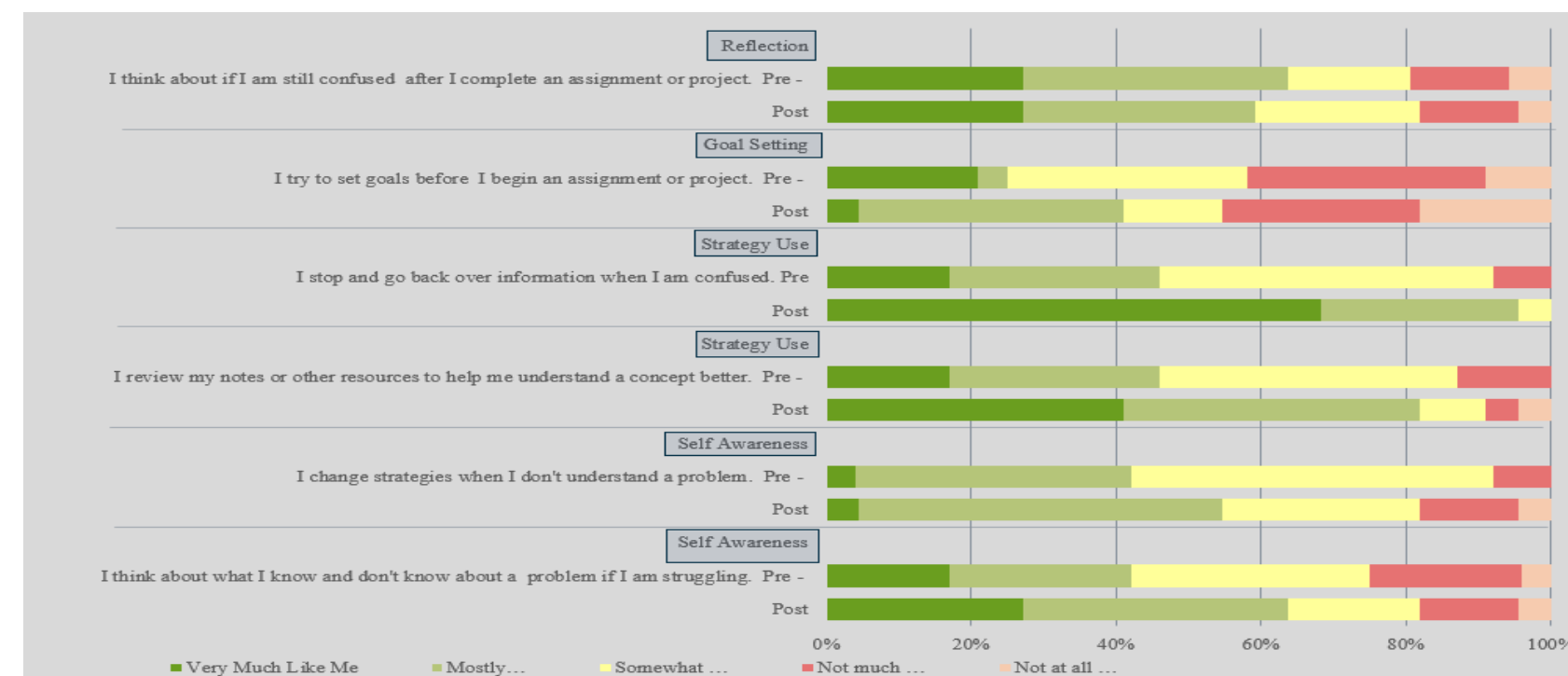
Results

Topic Assessments Normalized Gains Distribution, Pre vs. Post-treatment (N=25)
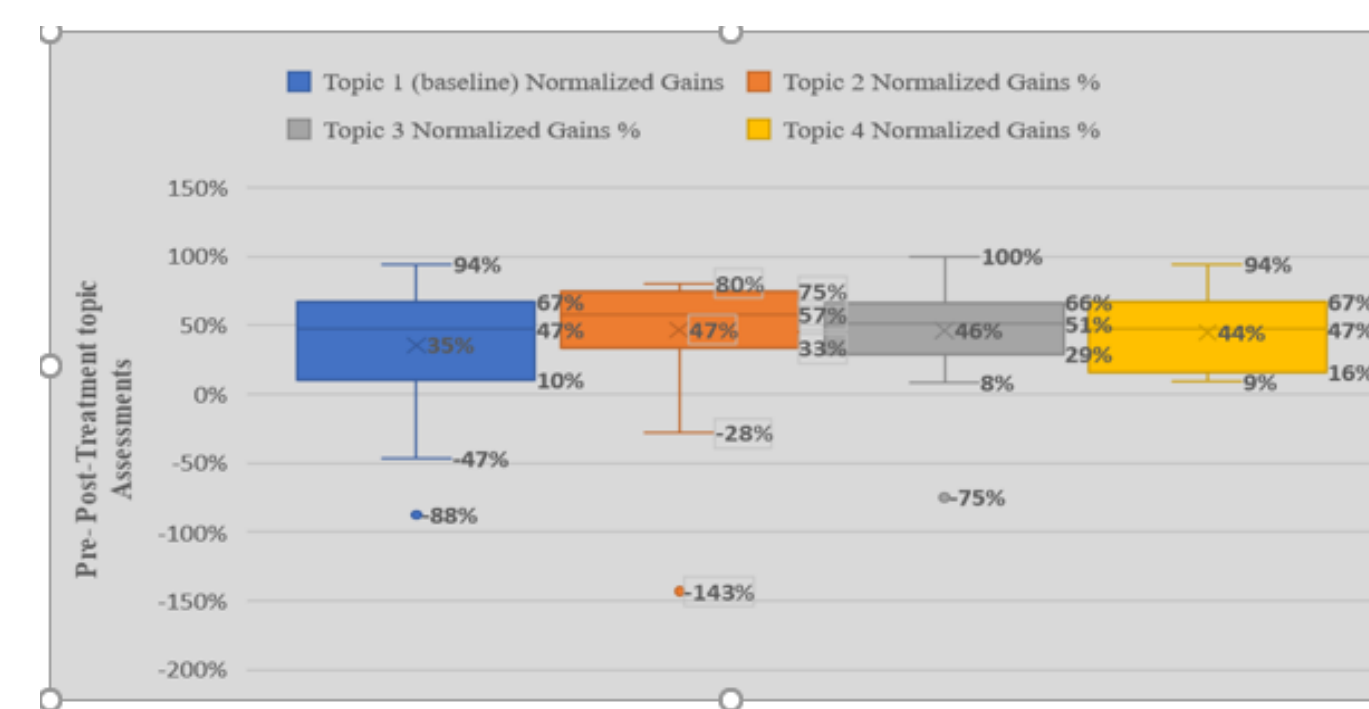
Growth Mindset Confidence Survey Pre and Post-Treatment Responses (N = 25)
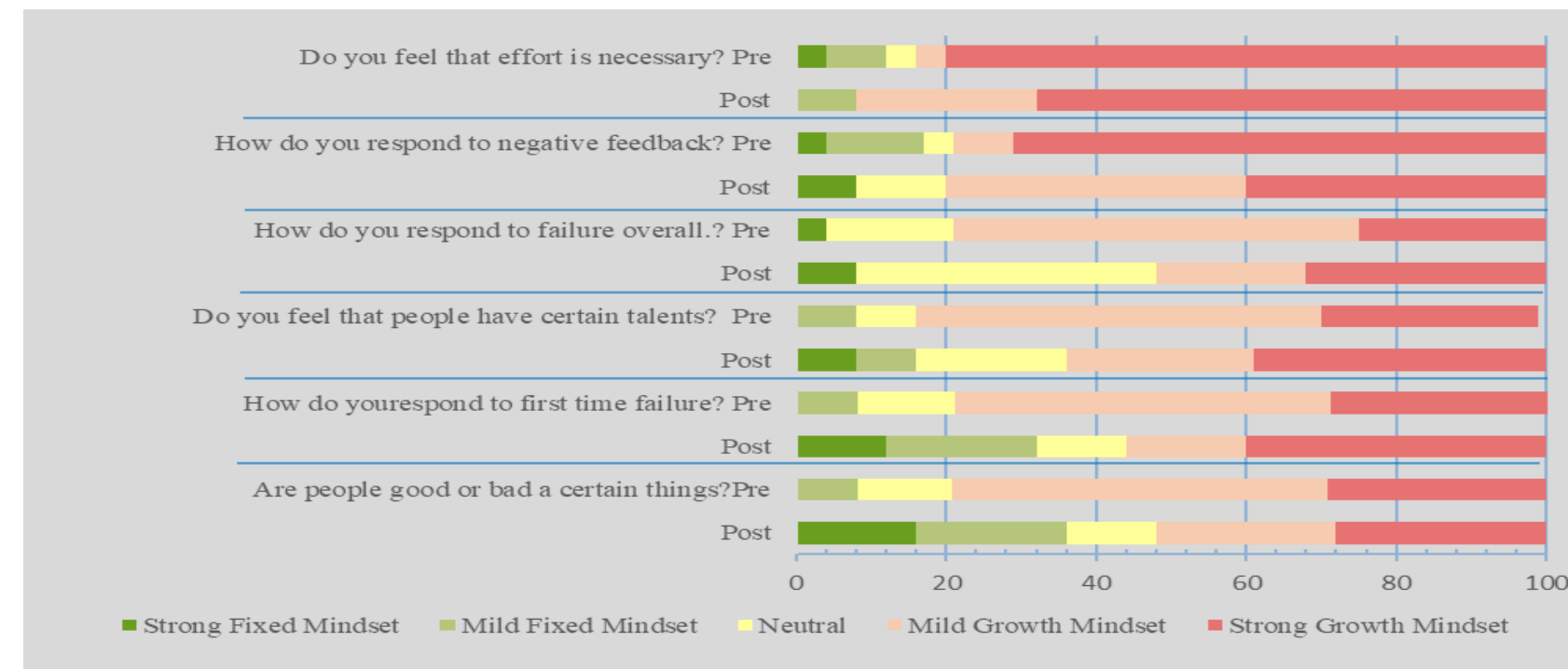
Self-Regulated Learning Survey Pre and Post-Treatment Responses (N = 23)

Data Analysis

- Quantitative data showed minimal or arguable impact of the treatment for all questions. The most significant gains were illustrated in the normalized gains distribution of topic assessments. The lower performing subgroups showed the greatest change.

- Qualitative data shows positive impact in the following areas:
  - Planning and performance stages of self-regulated learning - particularly due to confidence development in self awareness and strategy use
  - Movement towards a growth mindset in regard to positive interpretation of feedback and effort
  - My ability to foster a learner-centered classroom regarding student direction of questioning, class discussion, and strategy identification and use.

Value

Movement towards a mastery approach versus an entity approach to learning requires students to be able to independently drive and monitor their own learning progression. I will continue to provide the scaffolding and opportunities so that students can become independent learners. The hope is that students can become more adept with the self-regulated learning process and develop a mindset that supports and encourages students to see that learning is a process filled with struggles, failures, and opportunities to learn so that they can continue their learning path towards mastery.