Probabilistic Reasoning and Geometric Proof Coding in Tallahassee, Florida

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Introduction

- Participants have shown examples of the metacognitive processes of probabilistic reasoning and geometric proofs (Braithwaite 2022).

Hypothesis

- Individual differences in probabilistic reasoning and geometric proofs are positively related to differences in planning and evaluation while performing a probabilistic reasoning or geometric proofs task (Braithwaite 2022).

Methods

Participants

- Participants were FSU students from freshman to senior year.

Materials

- The participants first did the probabilistic reasoning task (PRT), and then did the geometric proof task (GPT).
- The PRT involved participants doing questions about probabilistic reasoning. Participants answered 16 multiple-choice trials and may or may not have shown evidence of planning while doing the problems.
- The GPT involved participants doing questions about geometric proofs. For 28 steps, participants chose one answer out of many possible answers. The participants may or may not have shown evidence of evaluation while doing the problems.
- Transcripts from the think-aloud protocols were hand-coded to indicate whether the participants showed planning and/or evaluation.
- The participants also had to think aloud as part of the protocol for the PRT and the GPT. For the criteria of planning, the participants had to describe a plan before executing to receive a code of 1. For evaluation, the participant had to state an initial answer for a problem and then provide further explanation to receive a code of 1.

Figure 1: Quotations from a Participant's PR_Evaluation Think-Aloud Protocol

P: A marble bag contains ten blue and twenty green marbles. After you drew five marbles, putting the marble bag-- marble drawn back into the bag after each draw. A sequence of five green marbles was obtained. What is the most likely outcome--outcome if a marble is drawn a sixth time? A green marble, cause it has a greater proportion.

A green marble, cause it has a greater proportion. – This received a code of 1 because the participant stated an initial answer, and then provided further reasoning.

Figure 2: Probabilistic Reasoning Task (PRT) Example Trial

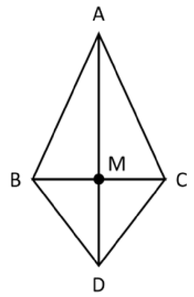
A ball was drawn from a bag containing 10 red, 30 white, 20 blue, and 15 yellow balls. What is the probability that the ball is neither red nor blue?

- 30/75
- 10/75
- 45/75

Figure 3: Geometric Proofs Task (GPT) Example Step

Proof 1

Given:
ΔABC is a triangle with $\overline{AB} \cong \overline{AC}$,
and ΔDBC is a triangle with $\overline{DB} \cong \overline{DC}$.
Prove: $\overline{AD}$ bisects $\angle BAC$.



Assertion
$\overline{AB} \cong \overline{AC}$

Correct Justification
Things are Congruent to Themselves, Side-Side-Side, Given, Definition of Congruent Triangles, Definiton of Bisecting an Angle, Side-Angle-Side, Definition of Bisecting a Line Segment, Definiton of Perpendicular Lines, Angle-Side-Angle **(These are Possible Answers)**

Results

Table 1: Percentage of Trials for All Participants' Code

PR_Planning	6.67%
GP_Planning	3.40%
PR_Evaluation	24.7%
GP_Evaluation	23.0%

Figure 4: Percentage of Trials for Each Participants' Code in PR_Planning and GP_Planning

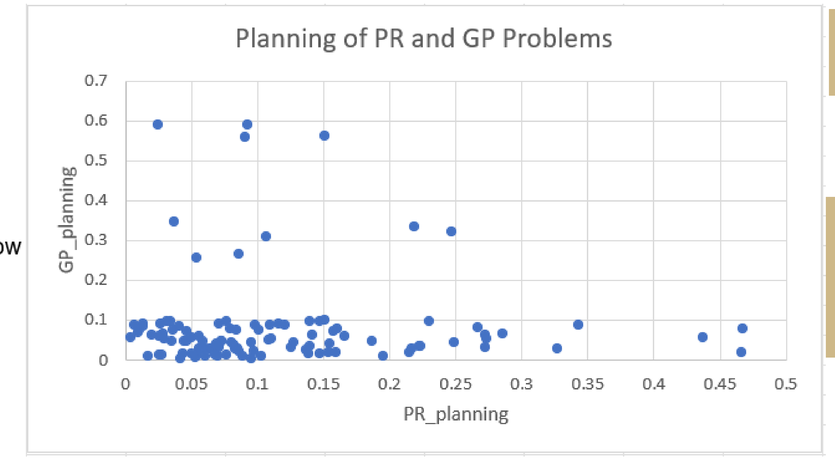
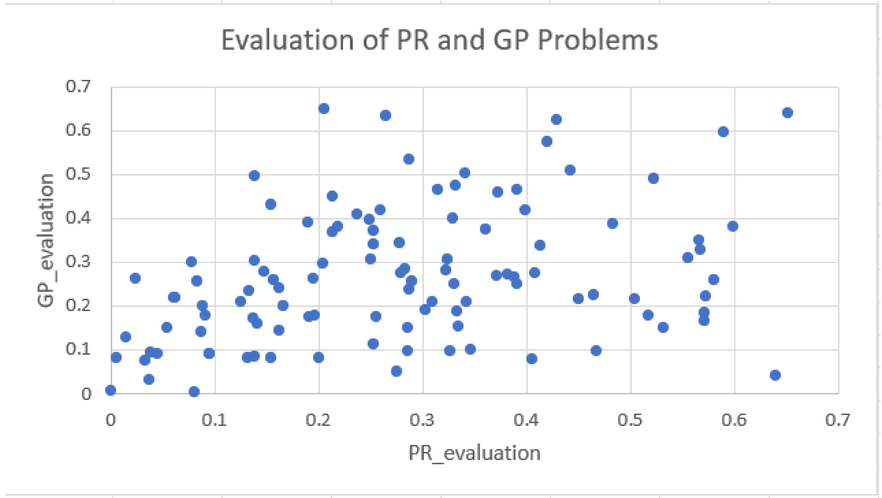


Figure 5: Percentage of Trials for Each Participants' Code in PR_Evaluation and GP_Evaluation



Discussion

- Most participants were not given a code of 1 for planning or evaluation.
- Students with more math knowledge may not show either planning or evaluation because they did not need both components for problem solving. Other people may show planning or evaluation because they are unsure of their math, and they want to take their time showing the process they took to solve a problem.
- For the participants that were assigned a code of 1, more participants showed code for evaluation than planning.

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References

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