

# PLUS Tutoring

Beneficial Impacts of Goal-setting with Rewards on Tutoring



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# What is PLUS Tutoring?

PLUS is an award-winning, human-AI tutoring program striving to double math learning for middle school students

PLUS is 1 of 7 global teams in the [Learning Engineering Virtual Institute](#)

**Carnegie Mellon University**

**CARNEGIE  
LEARNING**

 **Stanford  
University**



# Context



PLUS' in-school, human-AI tutoring program uses students' past performance on math software to determine which students need human tutoring.

## Technology Partners



MATHia



# Context



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## **Challenge:**

How might we increase student motivation to practice math?

## **Hypothesis:**

Setting collaborative goals and rewarding students for meeting goals can improve student outcomes

# Overview of methods

1. Motivation: Using ed-tech data to orchestrate student goals
  - a. Calibration to realistic goals that ensure success and motivation
  - b. Regular feedback and rewards through classroom teachers
  
2. Foundation: Making evidence-based interventions adaptive, data-driven
  - a. Behavioral contracting (79% of interventions show learning benefits; Alwahbi, 2020)
  - b. Set goals with students

# Feasibility Study - Method

110 students with IXL at PA school

Paper contracts tracked manually by CMU researchers. Fruit snacks given as rewards

As part of the contract, I, the student, agree to:

- Spend 23 minutes per week practicing math with IXL. (Recommendation: 20 minutes).
- If the promise above is met, the PLUS team or your teacher will reward you, the student, by: >> **Providing a fruit snack at the end of each week.**
- Optional: When practicing math in IXL, I want to master 3 skills every 2 week(s).

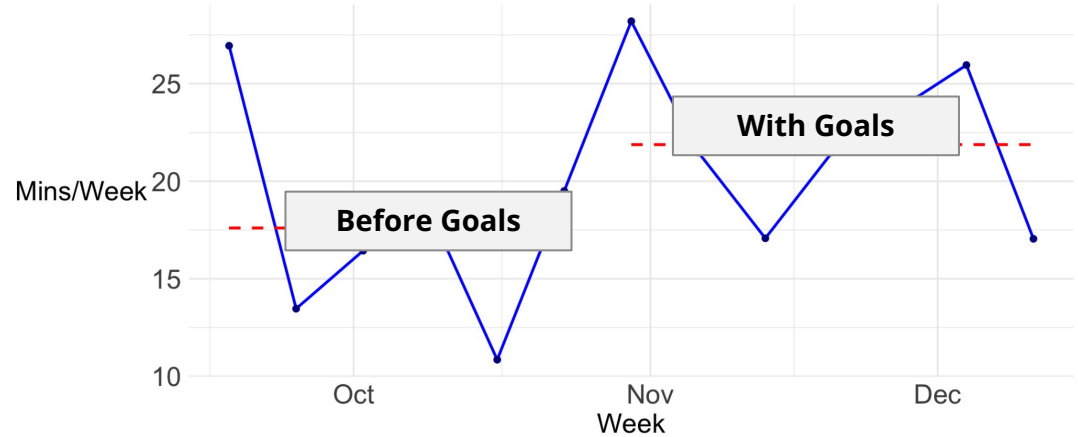
As part of the contract, PLUS tutors will be available to:

- Help you reach your goals in IXL
- Help you practice math in IXL



# Feasibility Study - Results

- 25% more practice time
- 40% more skill mastery
- 80% more goals achieved



Borchers, Conrad & Houk, Alex & Aleven, Vincent & Koedinger, Kenneth. (2025). Engagement and Learning Benefits of Goal Setting with Rewards in Human-AI Tutoring. 10.1007/978-3-031-98459-4\_4.

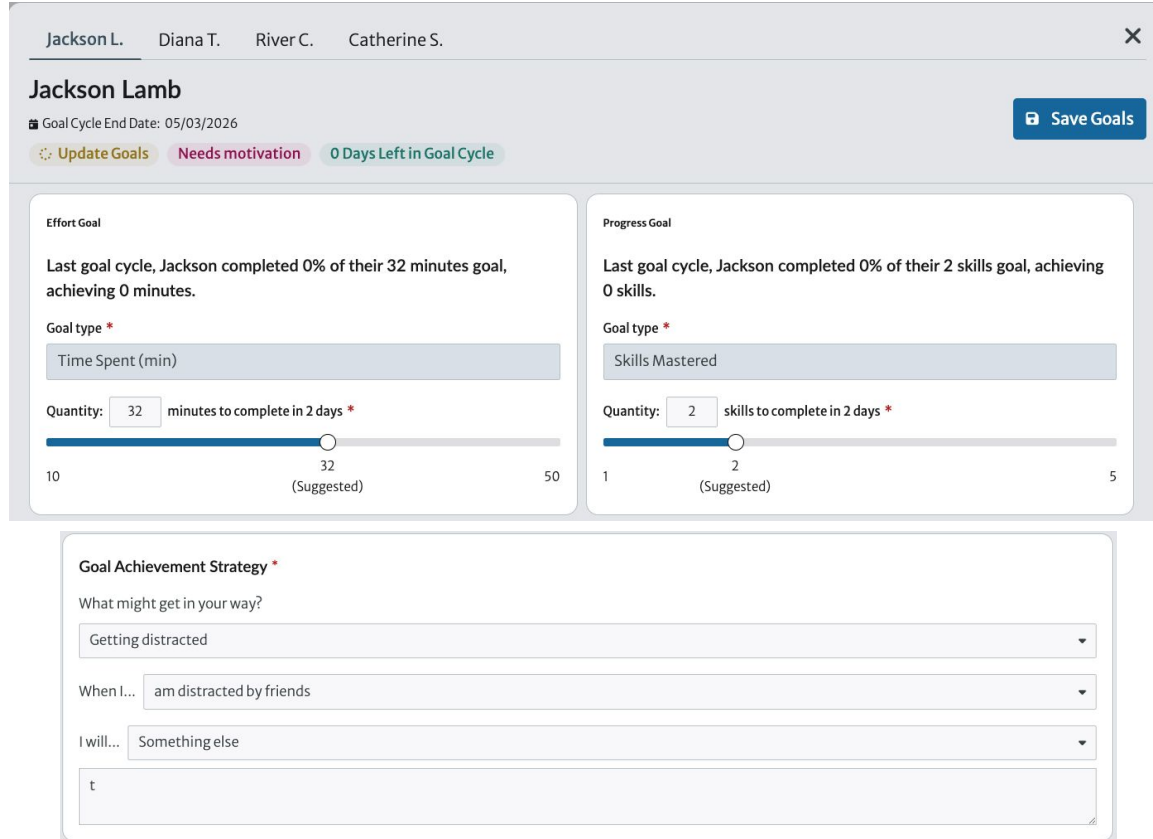
# Full Scale Study - Method

6 schools, 1000+ students

## Pathway to scale

- a. **Goal dashboard:** automatically pulls data from ed-tech and allows tutors to set goals weekly in the PLUS app.
- b. **Personalization:** recommending individual goals based on past week's data
- c. **Custom rewards:** Working with teachers to integrate rewards with existing practices such as PBIS bucks.

# Goal Setting in PLUS App



Jackson L. Diana T. River C. Catherine S. ✕

**Jackson Lamb** Save Goals

📅 Goal Cycle End Date: 05/03/2026

🔄 Update Goals Needs motivation 0 Days Left in Goal Cycle

**Effort Goal**

Last goal cycle, Jackson completed 0% of their 32 minutes goal, achieving 0 minutes.

Goal type \*

Time Spent (min)

Quantity:  minutes to complete in 2 days \*

10  50  
(Suggested)

**Progress Goal**

Last goal cycle, Jackson completed 0% of their 2 skills goal, achieving 0 skills.

Goal type \*

Skills Mastered

Quantity:  skills to complete in 2 days \*

1  5  
(Suggested)

**Goal Achievement Strategy \***

What might get in your way?

Getting distracted

When I... am distracted by friends

I will... Something else

t

Tutor sets goal with student.

Suggested goal based on past performance/global rules.

Goal achievement strategy to facilitate deeper discussion.

Most common obstacles to goal achievement students shared:

- “quiet space,” “missing headphones,” “ask friends to be quiet”

# Further Results and Evidence

Study	Software	Sample Size	Time Benefit	Skill Benefit
Study 1 (Researcher-Driven)	IXL	1 school, 110 students	25%	40%
Study 2 (Teacher-Driven)	IXL	1 school, 199 students	22%	65%
Study 3 (Tutor-Driven)	IXL, Khan, MobyMax	6 schools, 1,440 students	28%*	52%*

\*based on early results from 4 schools, evaluation ongoing

# Practical Takeaways

- **Collaborative goal setting and rewards can improve motivation, effort and learning**
- Schools have existing rewards systems that can be leveraged
- Tradeoff: Goal support vs. math instruction time
- Goal recommendations that retain student agency
- Monitoring implementation fidelity

**Thank You!**

Q&A