# AUTOMATED FEEDBACK FOR TEACHERS RESEARCH SUMMARY

Automated feedback for teachers is a growing and promising field of research aimed at supporting teacher professional development, and ultimately, improving student learning outcomes. Across 3 randomized controlled trials and other studies with TeachFX, researchers found consistent improvements in the following areas:

- Instructors' use of high-leverage practices
- Students' optimism about their academic future
- Instructors' morale and job satisfaction
- Students' academic performance

## *Improving Teachers' Questioning Quality*

A randomized controlled trial with 523 math and science teachers in Utah evaluated the impact of using the TeachFX feedback platform on teachers' use of focusing questions [4]. Teachers in the treatment condition received automated feedback on their focusing questions through an email. While the control group was able to record classes through TeachFX, they did not receive feedback emails on their use of focusing questions.

*Main Findings*

- **Engagement with automated feedback.** 67% of teachers opened the email to review their focusing questions feedback at least once.
- **Increased question quality.** Teachers in the treatment condition asked 20% more focusing questions (4.48 focusing questions per hour) than teachers in the control group.
- **More recordings associated with more focusing questions.** For teachers who made recordings for at least 5 weeks, their rate of focusing questions reached 7.78 per hour.

## *Pilot studies with TeachFX*

In a pilot study, 300 teachers in Detroit used TeachFX to receive feedback on measures, including teacher talk and student talk time, questioning techniques, and wait time. The pilot resulted in a 45% increase in student talk in classes where 90% of students were Black and Brown. On average, teachers rated their satisfaction and learning with TeachFX as a 9 out of 10. Qualitative interviews also showed teachers had greater awareness of their talk time and a better understanding of student engagement from reflecting on their TeachFX data [5].

In another study, in partnership with Cignition virtual tutors, tutors conducted 1:1 and group tutoring sessions for 14 weeks. The study revealed a strong association between the tutors' use of wait time per hour (0.60, $p<.001$) and their uptake of student ideas (0.33, $p<.001$) and overall student talk time. From pre and post-study student surveys, 99% of students agreed or somewhat agreed that they meaningfully participated in collaborative discussions compared to 95% at the beginning of the study [1].

**Independent Research with Automated Feedback for Teachers**

Our research partners have pioneered research in using automated feedback similar to the insights provided in TeachFX in various educational contexts. We highlight their work and findings here.

***Improvement of Teacher Uptake of Student Ideas***

In a randomized controlled trial with 918 instructors in a 5-week online programming course, the treatment condition received email reminders to view their feedback while the control group did not receive email reminders [3]. The feedback focused on 4 instructional practices: 1) the number of uptakes of student ideas per hour, 2) the number of questions per hour, 3) the number of repetitions of student ideas per hour, and 4) the teacher talk ratio compared to student talk.

*Main Findings*

- **Engagement with automated feedback.** 71.2% of instructors in the treatment condition checked their feedback at least once compared to only 17.6% of instructors in the control condition.
- **Automated feedback associated with improvements in uptake of student ideas and questioning.** Compared to teachers in the control condition, instructors in the treatment condition increased their use of uptake by 7% ($p<.05$) and their questioning by 6% ($p<.05$).
- **Checking automated feedback associated with increased improvements.** When accounting only for the teachers who checked their feedback at least once, teachers in the treatment condition showed even greater improvements in their uptake (13.2% more than control), questioning (11.4% more than control), and student assignment (6.6% over control).

***Improving Student Outcomes with Automated Feedback***

A randomized controlled trial with 414 graduate student instructors on a mentorship platform for high schoolers examined the impact of automated feedback on instructional practices and students' experiences and optimism about their academic future [2]. Instructors in the treatment condition received automated feedback on talk time, uptake of student ideas, and actionable guidance for reflection and improvement. Instructors in the control condition did not have access to this feedback.

*Main Findings*

- **Engagement with automated feedback.** 84% of instructors in the treatment group checked their feedback at least once.

- **Automated feedback associated with improved uptake of student contributions and words.** Compared to instructors in the control group, instructors in the treatment group showed greater uptake of student contributions (9% more than control, $p<.05$) and higher rate of repeating students' substantive words (6% more than control, $p<.05$).
- **Reduced instructor talk time.** Instructors in the treatment condition reduced their talk time to 69% of the total class time, a 5% decrease overall ($p<.01$).
- **Improved student outcomes.** In classes with an instructor in the treatment condition, students reported a 4% increase in their relative optimism about their academic future compared to the start of the course ($p<.05$).

**References**

[1] Cignition Report. 2023. AI-Generated Feedback for the Virtual Tutoring Community: Lessons Learned through Design Research.

[2] Dorottya Demszky and Jing Liu. 2023. M-Powering Teachers: Natural Language Processing Powered Feedback Improves 1:1 Instruction and Student Outcomes. In Proceedings of the Tenth ACM Conference on Learning @ Scale (L@S '23). Association for Computing Machinery, New York, NY, USA, 59–69.

[3] Dorottya Demszky, Jing Liu, Heather C. Hill, Dan Jurafsky, and Chris Piech. 2023. Can automated feedback improve teachers' uptake of student ideas? evidence from a randomized controlled trial in a large-scale online course. *Educational Evaluation and Policy Analysis* (2023): 01623737231169270.

[4] Dorottya Demszky, Jing Liu, Heather C. Hill, Shyamoli Sanghi, and Ariel Chung. 2023. Improving Teachers' Questioning Quality through Automated Feedback: A Mixed-Methods Randomized Controlled Trial in Brick-and-Mortar Classrooms. EdWorkingPaper No. 23-875." *Annenberg Institute for School Reform at Brown University* (2023).

[5] Kristie Ford, and Kendra Welling-Riley. 2021. Student talk in science class. *The Learning Professional* 42, no. 3 (2021): 58-61.