DISMANTLING THE DATA IVORY TOWER:
Empowering Teachers with Data-Driven Decision Making

ABSTRACT
Teacher-facing dashboards have become the dominant way to present student data in learning analytics (LA). This success has made dashboards the norm for teachers and led to that teachers cannot interpret the data especially as modern educational systems produce large volumes of highly dimensional student data. A natural progression for the field is to bring machine learning (ML) into dashboards to condense data signals into understandable explanations of student behavior. This paper examines how StrongMind created a teacher-facing dashboard that aggregates all useful student data points for the StrongMind learning management system (LMS) ecosystem. Furthermore, StrongMind developed an ML model to evaluate student academic risk. The dashboard used this model to present student data in order of academic risk, using moment-to-moment updates to show teachers which students most needed their help. StrongMind then provided this dashboard to an affiliated school. After several months of dashboard use, StrongMind found that student final grades had improved by 3.05% ($p < 0.05$) and that the proportion of disengaged students had significantly dropped compared to the previous year when there were no dashboards.

METHODS
Student Grade Counts for Dashboard and Comparison Groups

Group	9th	10th	11th	12th	All
Dashboard	134	227	210	450	1021
Comparison	234	495	577	828	2134

RESULTS

Research Question

What effect did the introduction of the dashboard have on student academic outcomes?

What effect did the introduction of the dashboard have on the proportion of students who were disengaged in their course?

Does displaying students by Machine Learning determined risk lead to the lowest performing students having the largest academic gains?

Results

Following the introduction of the dashboard, mean student final grade improved ($p < 0.05$, % = 3.05, d = 0.10).

A reduction in the proportion of disengaged students in the dashboard group compared to the comparison group ($p < 0.05$, % = -2.62%).

All quartiles except the top quartile experienced significant improvements in average final grade ($p < 0.05$). The largest significant gains in average final grade were seen in the third quartile of performers ($p < 0.05$, d = 0.29), while the smallest were in the bottom quartile ($p < 0.05$, d = 0.18). These results do not show that the dashboard's risk sort helped the lowest performing students most.

DISCUSSION

• Introducing a teacher-facing dashboard improved mean student final grades and reduced the percentage of disengaged students.

• The risk sort method in the dashboard did not confer larger gains to the lowest-performing students compared to higher-performing students.

• The highest performing students did not experience any change in academic performance suggesting that struggling students can be helped without harming high performing students.

STRONGMIND℠