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Controlled experiments on millions of students to personalize learning

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Abstract. Khan Academy is a personalized learning resource that enables students to watch educational videos and answer questions across a variety of levels of mathematics and other subjects. With over one billion problems solved, Khan Academy has a massive dataset from which to draw evidence and make inferences about student learning behaviors. Our goal is to use this unprecedented quantity of data to learn what content each student will benefit the most from seeing, and to present it to them. Towards this goal, we have run more than one hundred massive controlled experiments, evaluating hypotheses about learning.

We focus here on personalizing the learning experience by using student responses to assessment items to adaptively suggest new content. We discuss the metrics by which we measure student improvement and the tradeoffs that occur when increased exercise difficulty reduces student engagement. We further discuss personalizing content such as exercise or video suggestions, and measuring student responses to such interventions. Leveraging massive data to personalize learning is one of the greatest promises of online education, and this work represents first steps towards fulfilling that promise for millions of users worldwide.

Keywords: personalized learning, data mining, machine learning, massive data, Khan Academy