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TITLE: IMPROVING STUDENTS' LONG-TERM KNOWLEDGE RETENTION

 THROUGH PERSONALIZED REVIEW

ABSTRACT: Human memory is imperfect. Individuals of all ages and abilities gradually forget previously learned knowledge and skills. Robust, durable learning is achieved only through periodic review. Although academic curricula could benefit from incorporating review in a comprehensive, systematic manner, two challenges must be overcome. First, students at every educational level are faced with an ongoing imperative to master new material, which demands a time-efficient means of reviewing an ever-growing body of old material.

Second, the effectiveness of review crucially depends on its timing, but efforts to predict the optimal timing have not adequately considered individual differences. To address these challenges, we developed an adaptive method for personalizing study based on a Bayesian model of forgetting that leverages psychological theory and collaborative filtering. Here, collaborative filtering involves using data from a population of students studying a variety of material to infer the dynamic knowledge state of an individual student for specific material. The method was incorporated into a semester-long middle school foreign language course via retrieval-practice software.  In a cumulative exam administered one month after the semester's end that compared time-matched study strategies, personalized review yielded a 16.5% boost in course retention over current educational practice (massed study) and a 10.0% improvement over a one-size-fits-all strategy for spaced study.  Our results demonstrate that integrating adaptive, personalized software into the classroom is practical and yields appreciable improvements in long-term educational outcomes. We discuss the impact of this experiment on the school curriculum, as well as follow-on studies we are conducting now.

[Both Mike and Rob will present. The work is a collaboration with Jeff Shroyer and Hal Pashler.]