

Research in Learning, Assessing, and Tutoring Effectively

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MIT group Detects and Suppresses Homework Copying

Copying a few answers from another student's math or science homework assignment occurs much more frequently than copying on examinations, is rarely prosecuted by discipline committees, and is regarded as "not cheating" or "trivial" by over half of college students nationally. Now Palazzo et. al. show that homework copying is not "trivial" because it is associated with greatly decreased learning. Furthermore, they suggest others adopt changes in the instructional format since such changes have reduced copying by a factor of four at MIT.

This research on HW copying was conducted by the Research in Learning, Assessing, and Tutoring Effectively (RELATE) headed by Cecil and Ida Green Professor of Physics David E. Pritchard. By analyzing detailed records of student submissions to MasteringPhysics, an online homework tutor, Palazzo et. al. developed algorithms to detect copied answers based on earlier work in the group by Rasil Warnakulasooriya et. al.. The group found that copying of homework problems that required analytic responses correlated with two letter grades worse performance on problems demanding similar responses on the final exam, but did not adversely affect grades on conceptual questions. This decline caused repetitive copiers (students who copy over 30% of their homework problems) to have over three times the failure rate as the rest of the students in spite of starting the semester with equal ability in math and physics. According to Dr. Y.-J. Lee, now Assistant Professor of Educational Technology at U. Kansas, "The decrease of copiers' relative performance over the semester is as strong as anything in the education literature. Since the copiers do learn physics topics on which they don't copy the homework, it strongly implies that copying caused their declining performance on the analytic problems."

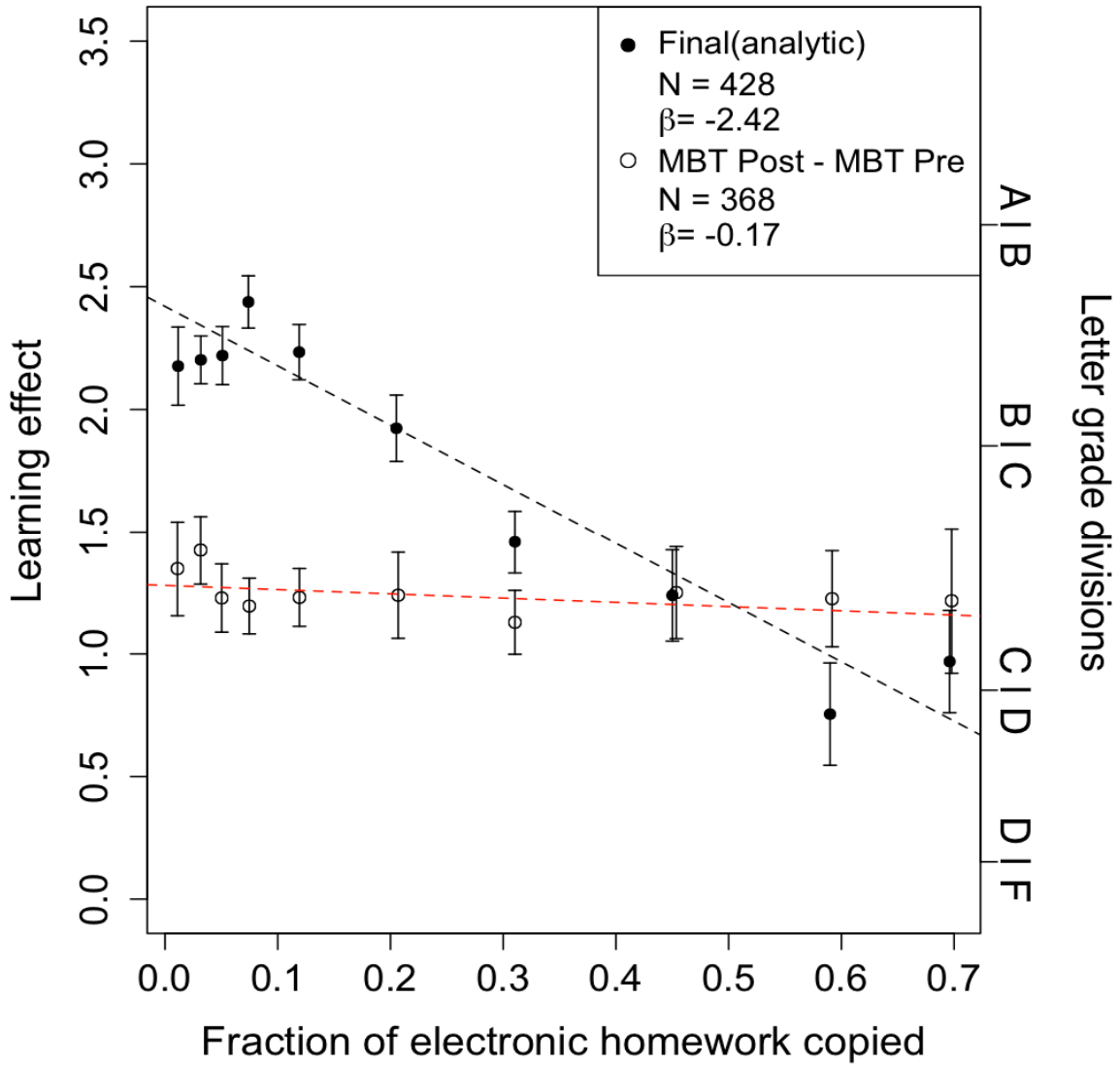
The copying showed surprisingly strong temporal patterns. Students who copied little or none of their homework had completed about half of their weekly assignment two nights before it was due, whereas repetitive copiers had done only about 15%. More importantly, the rate of copying built up strongly over the semester and was three times higher after midterm exams than during the first three weeks of the semester. "It took them about 3 weeks to establish their networks," said Palazzo who served as a Major in the US Army early in the war in Iraq.

By measuring actual copying, this work provides a checkpoint for the large body of work on academic dishonesty based on anonymous surveys of students. The actually observed rate was about 50% higher than on a similar anonymous survey given to the MIT students. In addition, copying patterns confirmed to three demographic indicators found in previous self-reported work: men copied significantly more than women, business majors copied much more than either

scientists or engineers, and those interested in obtaining a grade copied more than those wanting an education. It appears that students interested in just passing delay starting serious work and resort to copying under pressure of the deadline.

The group observed the overall copy rate decline by a factor of four over three years, corresponding with helpful changes in the instructional format. The largest reduction of copying occurred when 8.01 was changed from lecture-recitation format to the more intimate Technology Enabled Active Learning (TEAL) format featuring more personal contact with teachers. A further factor of two reduction occurred in 8.02 when the interface in the tutoring program was changed to make copying more difficult and the grading system was changed from pass/no record to A, B, C/ no record.

The research showed that MIT students reported nearly twice as much copying of written homework as online homework, and they reported engaging in only half of the academic dishonesty as students nationally. Therefore it is difficult to escape the conclusion that copying written homework is a serious cause of course failure nationally, especially in large lecture-recitation courses. The RELATE group came upon homework copying through research on learning in an online environment, rather than through moral concern. But these results show so much that they place a moral imperative on teachers to confront homework copying and to reduce it. Fortunately we found some changes that dramatically reduce copying without turning teachers into policemen.



Students who copied more of their homework did much worse on analytic exam problems (solid points) but learned equally much on conceptual exam problems (open circles). The left scale is in standard deviations, and the right scale shows the corresponding letter grade transitions (e.g. C to B).

Publications

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Modeling Applied to Problem Solving Andrew Pawl, Analia Barrantes, and David E. Pritchard *AIP Conference Proceedings* **1179** 2009 PHYSICS EDUCATION RESEARCH CONFERENCE M. Sabella, Ch. Henderson, C. Singh, Eds. pp. 51-54