

# Researcher uses mathematical modeling to predict student success, dropout rates

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Christopher Kribs, UTA professor of Mathematics and Curriculum & Instruction. Credit: University of Texas at Arlington

A researcher at The University of Texas at Arlington has used mathematical modeling to demonstrate that negative peer pressures can spread in a high-risk setting, influencing students' decisions to drop out of school.

"This study postulates that social behavior can spread interpersonally through social interactions and influences, just as infectious diseases can," said Christopher Kribs, UTA professor of Mathematics and Curriculum & Instruction. Kribs is also an expert in mathematical epidemiology with research supported by the National Science Foundation.

The study showed that students who are failing at two or more subjects

are at risk for dropping out, largely due to their increased interactions with other failing students.

"Positive parenting is clearly very important for students but the study discovered that there is a point where negative peer influences overcome positive parental influences," Kribs said.

"We feel there is a real opportunity to intervene at the school level to reduce dropout rates by controlling negative influences," he added.

The study looked at 125 students at a struggling high school in Chicago. The researchers surveyed the students on whether they were failing in core subjects such as mathematics, English, science and social sciences, the degree of [parental involvement](#) in their life and the number of failing and dropout friends of each student during the last year.

The mathematical model they developed defined students as being in one of two environments: a non-risky environment, where they are passing all core subjects or failing one and considered vulnerable; or a risky environment, where they are failing two or more core subjects and could drop out.

The data suggests that as the degree of parental involvement in a vulnerable student's life increases, the number of their failing friends decreases.

If the student is already failing two core courses and in the risky zone, the effectiveness of parental involvement changes: the number of their failing friends initially decreases, but then increases again. This may occur if students become more rebellious to a sudden increase in parental involvement at the same time they are receiving negative peer pressure from other failing students.

"Parental guidance is a significant factor only when students are under a low level of negative social influence at school," Kribs said. "If negative social influence increases beyond a critical value, the impact of parental influence becomes negligible. To manage dropout levels, we need to manage social influences at school."

The paper concludes that making sure that vulnerable and failing students are not only mixing with other failing and dropout students could achieve a sustained reduction in dropout rates.

Jianzhong Su, UTA mathematics chair, emphasized the importance of this project within the strategic theme of data-driven discovery within UTA's Strategic Plan 2020: Bold Solutions, Global Impact.

"Dr. Kribs' work shows the relevance of mathematical studies to real-life social issues and demonstrates the importance of cross-disciplinary studies on social problems," Su said. "The next step would be to roll the model out with larger groups of students to further demonstrate its accuracy and efficacy to education policymakers to make a real difference."

The full study, "Why do [students](#) quit school? Implications from a dynamic modelling study," was published in the *Royal Society Journal Proceedings A*.

**More information:** Bechir Amdouni et al. Why do students quit school? Implications from a dynamical modelling study, *Proceedings of the Royal Society A: Mathematical, Physical and Engineering Science* (2017). [DOI: 10.1098/rspa.2016.0204](https://doi.org/10.1098/rspa.2016.0204)

Provided by University of Texas at Arlington

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