



*The Department of Mechanical Engineering presents:*

# ***The Master's Thesis Defense of Luofeng Xu***

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## **Hidden Costs of Gamification to Improve Study Behaviors in an Engineering Course**

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Dr. Thomas F. Stahovich, Chairperson

Consider an introductory-level college course in engineering in which students must hand in weekly assignments. Previous work has shown that engaging in recommended study behaviors such as working on weekly assignments more than 24 hours before the deadline is related to learning outcomes (as measured by exam score) in an introductory-level engineering course. However, many students choose to work on their assignments within 24 hours of the deadline. Here, we used smartpen technology to digitize students' work and introduce a gamification to change their behaviors. The goal of the present study is to examine techniques for improving student study behavior in such a course. Specifically, the goal is to examine the effectiveness of adding gamification features to an introductory-level engineering course aimed at rewarding students for working on weekly homework assignments more than 24 hours before the deadline, finishing reading assignments and submitting lecture notes. With multiple measurements we are trying to figure out the hidden costs of the gamification and how it affects the study.

This work examines how students' behaviors affects the learning outcomes, how gamification affects students' learning behaviors and how gamification affects students' learning outcomes. The result proves the strong and consistent relationship between the students' learning behaviors and learning outcomes. Furthermore, this works shows that changing the students' learning behaviors by adding extrinsic motivator, such as gamification, is not an effective way to improve the students' performance on engineering courses.